

**INTERNATIONAL SCIENTIFIC  
CONFERENCE  
DENTISTRY 2017 NOVI SAD**



**2017**

**08.06.**

**PRINCIPLES OF GOOD CLINICAL PRACTICE IN RESTORATIVE AND  
AESTHETIC DENTISTRY - POSSIBILITIES, PROBLEMS AND  
SOLUTIONS**

**09.06.**

**PRINCIPLES OF GOOD CLINICAL PRACTICE IN ORAL SURGERY AND  
REGENERATIVE DENTISTRY - POSSIBILITIES, PROBLEMS AND  
SOLUTIONS**

**Novi Sad**

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*On behalf of the Organizing and Programme Committee, I'm pleased to welcome you at the International Scientific Conference Dentistry 2017 Novi Sad. You will be able to attend an interesting scientific programme with well known and respectable speakers from the entire world. They will present contemporary achievements in different fields of dentistry, dental engineering and technology.*

*We hope you'll enjoy high quality lectures and interesting presentations, followed by stimulating discussions. Apart from the scientific aspect of the conference we wish you to experience the traditional hospitality of Novi Sad and to strengthen the existing friendships and create a lot of new.*

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***08.06.2017. Invited lectures***

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# COMPREHENSIVE CENTERS FOR TREATMENT OF PATIENTS WITH HEMOPHILIA

**Sanja Vujkov**

Assistant Professor at the Department for Pediatric and Preventive Dentistry,  
Faculty of Medicine, University of Novi Sad

## Abstract

The care of children with hemophilia and other inherited bleeding disorders, has been significantly improved over the last fifteen years. The tremendous evolution in prognosis of severe hemophilia from chronic and often fatal condition to one which patients can anticipate a fairly normal quality of life occurred throughout parallel improvements in several aspects of hemophilia care over the last decades. The advances in diagnostics, development of safe effective replacement proteins, prophylaxis and parental and self-infusion of factor concentrate in the home environment, development of other therapies like the fibrinolytic inhibitor epsilon-aminocaproic acid and the other local haemostatic measures, significantly contributed to progress in care of patients with inherited bleeding disorders. The most important reason for this improvement is development of specialized centers to deliver hemophilia comprehensive care, which includes hematologists and other health-care providers like pediatricians, internists, genetics, physical therapist, social workers and dentists. But, the dental management of pediatric patients with inherited bleeding disorders still causes considerable problems in some countries. This article reviews the evidences of prevalence of oral diseases in patients with inherited bleeding disorders and guidelines and strategies for the dental management and prevention of oral diseases in these patients.

## INTRODUCTION

Inherited bleeding disorders are group of diseases characterized by a failure in haemostasis. Hemophilia is an X-linked congenital bleeding disorder caused by a deficiency of coagulation factor VIII (F VIII) in hemophilia A or factor IX (F IX) in hemophilia B. The deficiency is the result of mutations of the respective clotting factor genes. Hemophilia A is the most common of these and accounts for about 80% of bleeding disorders. Von Willebrand's disease is a related condition in which there are low levels of factor VIII and lack of platelet adhesion [1,2]. Hemophilia has an estimated frequency of approximately one in 10 000 births. Estimations based on the WFH's annual global surveys indicate that the number of people with hemophilia in the world is approximately 400 000 [2]. However, both *F8* and *F9* genes are prone to new mutations, and as many as 1/3 of all cases are the result of spontaneous mutation where there is no prior family history [3].

The treatment of the patients with either hemophilia A or hemophilia B involves the replacement of the deficient clotting factors by intravenous infusion to either control or prevent bleeding [2]. This therapy has some potential complications, such as viral transmission, development of inhibitors when human-derived blood products are used, and high cost of recombinant coagulation factors. A further potential complication of factor replacement therapy is the development of antibodies or inhibitors to factor VIII or IX. Antibodies have been found in 8 to 20% of the patients with severe hemophilia A, and in 2.5 to 16% of patients with severe

hemophilia B [3,4]. The presence of inhibitors effect the management and dental treatment of these patients.

## ORAL HEALTH

Oral diseases may affect general health and may, in people with a bleeding tendency, cause serious bleeding. Surgery, such as tooth extraction and some local anesthetic injections can cause bleeding that persists for days or weeks and cannot always be controlled by pressure alone. People with hemophilia or congenital bleeding tendencies are priority group for dental and oral preventive health care [5]. Spontaneous bleeding can occur in hemophilia patients with and gingivitis and periodontal disease. Some mouth bleeding can occur during tooth eruption. Minor trauma, such as tooth brushing or food abrasion, and infection can cause bleeding in gingival tissues in patients with hemophilia [5,6].

The studies of oral hygiene and gingival status of children with inherited bleeding disorders showed that children with hemophilia have significantly higher gingival index (GI) than healthy controls [6,7,8]. Higher index results are consequence of neglected or insufficient tooth brushing. Patients with hemophilia neglect their oral hygiene because of the bleeding during tooth brushing [6]. The prevalence of caries in patients with inherited bleeding disorders differs in various parts of the world. The results from Northern Ireland, UK, Germany and Lithuania revealed that the children with hemophilia have significantly lower prevalence of dental caries in the primary and permanent dentition, compared with matched healthy controls [1,9,10,11]. Our study has showed higher prevalence of oral diseases in patients with inherited bleeding disorders than healthy controls.

Properly designed and implement oral health educational programmes in hemophilic groups are proven to be successful in improvement of oral health. Oral health programmes and preventive measures can significantly reduce the need for conservative treatment, eliminate the need for tooth extraction and reduce the utilization of factor [12,13].

## DENTAL TREATMENT

The dental treatment of patients with inherited bleeding disorders has been widely discussed in the literature with the aim of developing guidelines for common procedures. The majority of guidelines recommend the use of clotting factor replacement therapy before invasive oral surgery and the use of the inferior alveolar nerve block for restorative dental treatment. Successful guidelines are result of cooperation between hematologists and dentist [14-20].

Regular dental visits provide an opportunity for the early diagnosis, prevention and treatment of oral diseases and conditions in early stages [14,15]. Maintaining the dental health of hemophiliacs should be a priority at least because of the risks in providing dental treatments to hemophiliacs and the inherent costs related to medical management of such patients, particularly during extensive dental treatments[14-20]. It is important to increase professional awareness about the provision of safe dental treatments for hemophiliacs which are possible due to innovations in the medical management of hemophilia patients [21-24].

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# **TREATMENT OF CLASS III PATIENTS - TRUTHS AND MISCONCEPTIONS**

**Prof.dr Predrag Vučinić**

Faculty of Medicine, University of Novi Sad

Skeletal class III malocclusion can occur due to hereditary cause although environment factors like oral habits and parafunctions play an important role. The skeletal class III malocclusion due to genetic origin can occur due to – excessively large mandible, forwardly placed mandible, smaller than normal maxilla, retroposition of the maxilla or a combination. Prevalence varies among different ethnic groups.

Also, individuals with class III malocclusion may have combination of skeletal and dentoalveolar components. Although skeletal Class III malocclusions with mandibular prognathism have limited treatment outcome and sometimes surgery is unavoidable, treatment of maxillary retrusion can generally show favorable results with only orthopedic procedures.

Timing of orthodontic treatment has always been somewhat controversial. Many practitioners, after some frustrating experiences with complexities of treatment in the mixed dentition, have chosen to postpone most orthodontic treatment until all permanent teeth are present. Extraoral anchorage and functional appliances have proven very useful in correcting Class II conditions in the growing patient. Unfortunately, the same enthusiasm for interceptive treatment in the developing Class III patients has not gained such popularity. Even today, many Class III patients are not treated until the orthodontist feels that active growth is complete. A large number of clinicians feel that a developing mandibular prognathism will reach a predetermined genetic potential that cannot be altered by earlier treatment. His approach predetermines that many young people must experience facial and dental disfigurements with far-reaching physical and psychological ramifications during some of the most important formative years of their lives.

The purpose here is to emphasize the need for early diagnosis and possible treatment for these Class III malocclusions and their associated facial patterns.

Optimal timing is important because the goal in early treatment is to provide a more favorable environment for normal growth and to improve the psychosocial development of the child. Early orthopedic approaches in prepubertal and pubertal stages shortens the total treatment time and, if mandibular growth can be controlled after the treatment, an adequate anterior occlusion can be maintained. However, other researchers reported that, comparison of the measurements of the treatment effect according to age showed no statistically significant difference. Different cephalomeric variables such as position of mandible, corpus length, gonial angle, ramal height should be assessed in order to be able to better predict treatment outcome.

Goals of early class III treatment are:

- To prevent irreversible soft tissue or bony changes
- To improve occlusal function
- To improve skeletal discrepancies and provide more favorable environment for future growth.
- To simplify phase II comprehensive treatment, if needed
- To provide good facial esthetics.

**Indication and contraindication of early class III treatment**

Early treatment should be considered for patient that presents positive characteristics, like:

- Good facial esthetics
- Mild skeletal disharmony
- No hereditary prognatism
- Presence of anterioposterior functional shift
- Convergent facial pattern
- Symmetrical condylar growth.
- Good patient's cooperation

In patients with negative characteristics, treatment should be delayed until the growth is completed, like:

- Poor facial esthetics
- Severe skeletal disharmony
- Hereditary
- No anterioposterior shift
- Divergent facial pattern
- Asymmetric condylar growth
- Growth complete
- Poor patient cooperation

### **Possible approaches to early treatment of skeletal class III malocclusion:**

#### **Chin cup therapy**

Skeletal class III malocclusion with normal maxilla and moderately protrusive mandible can be treated with chin cup therapy and are popular among Asian population as its effect is favorable on sagittal and vertical dimensions. Main objectives of this treatment approach are to provide growth redirection and posterior positioning of the mandible.

Orthopedic effects observed during chin cup therapy are:

- Redirection of mandibular growth vertically, backward rotation of the mandible.
- Remodeling of the mandible and gonial angle

Commonly chin cups are designed with occipital pull, with force level of 300-500 g/side and worn 14 hours per day.

#### **Protraction facemask**

The protraction facemask is used in growing patients having prognathic mandible and retrusive maxilla. It aids in pulling the maxillary structures forward while pushing the mandible in backward direction. According to Guyer and coworkers, 57% of patients with normal or prognathic mandible shows maxillary deficiency, so protraction facemask appliance effect on skeletal and dental structures are beneficial.

In order to minimize the tipping of palatal plane, the protraction elastics should be attached near the maxillary canine with downward and forward pull of 30degree from the occlusal plane. In some cases maxillary expansion appliances are fabricated as anchorage for maxillary protraction and used to „loosen“ palatal and midface sutures to enhance forward displacement of the maxilla.

Facemask is worn for 12 hours per day, with orthopedic force level of 300-600 gram/side depending upon age of patients.

Clinical studies have shown, that maxillary protraction was effective in the primary, early mixed and early permanent dentition. In perspective clinical trials, treatments started in the mixed dentition were stable 2 years after the removal of appliance, with overcorrection and subsequent use of functional appliance as retainer for 1 year.



Random clinical trials that followed patients until completion of pubertal growth, have shown that 67% will have favorable outcome. The others, due to unfavorable growth pattern, need orthognathic surgery.

## Conclusion

The present knowledge suggests that most Class III malocclusions could benefit from an early interceptive regiment. Even though there is no question that some severe skeletal dysplasias will require surgical correction at a later time, an attempt should still be made to at least improve the problem. When a sincere attempt at early interception has been made, and surgery is still necessary, the clinician can feel morally certain that everything possible has been done.

Some improvements can be achieved in most patients, although ultimately, surgery may still be needed in some.

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# COMPOSITE RESIN APPLICATION IN PEDIATRIC DENTISTRY

**Miloš Beloica, Dušan Kosanović, Ivana Radović, Jelena Juloski**

## ABSTRACT

Adhesive systems and composite materials have been used in dentistry over fifty years. Introduction of acid etching technique by Buonocore is considered as the beginning of adhesive dentistry. Composite materials were evolving together with adhesive systems. These materials started as macro filled, evolved into micro filled, hybrid and got to contemporary nano filled materials. With introduction of each new group, mechanical as well as esthetic properties were improved.

Nevertheless, these materials are not perfect and some disadvantages remain. The main issue is the polymerization shrinkage which is 1.5 to 5% of materials volume.

Despite the problems, these materials have found their place in almost all the branches of dentistry. Composite materials are used in preventive and pediatric dentistry as well as periodontology, in treating trauma and prosthetics.

In pediatric dentistry, composite materials are used as pit and fissure sealants, as a filling material, for restoring traumatized teeth, for immobilization and for prosthetic restorations. With further improvements, it is possible that these materials will incorporate themselves in remaining branches of dentistry.

Adhesive systems and composite resin material application beginning is connected with the name of dr Oscar Hagger whom invented the first chemically polymerized monomer in the year 1950. and his research led to later development of dental adhesive systems [1]. In 1955 even more important progress have happened as dr Michael Buonocore suggested acid etching [2]. At first Buonocore suggested enamel treatment with 85% phosphoric acid for 30 seconds. Research that had happened in the following years led to acid etching concentration reduction to 50% [3] and later on to contemporary 32-37%.

At the same time, with the development of adhesive systems composite resin materials have improved. In the early 1960s macro filled composites were introduced, in the late 1970s micro filled, 1980s condensed, hybrid and flowable and in the early 2000s nano filled composite materials were introduced [4, 5].

Composites are the materials for dental fillings. Their composition is 70-80% inorganic matter and 20-30% of organic matter. Organic part is BIS-GMA while inorganic part is made of different size particles of filler [6]. While organic part is in charge of plasticity and time and type of polymerization, inorganic part determines esthetic and physical properties of composite resin materials.

Despite all the improvements in composite resin materials, these materials are not perfect and they have disadvantages which remain unsolved. The biggest issue with the composite resin materials remains polymerization shrinkage [7]. Polymerization shrinkage of composite resin materials makes 1.5 to 5% material volume. In case of light cured composite resin materials polymerization shrinkage is guided towards the energy source or in this case the light source [8]. Recommended solution is to use adequate curing apparatus and to cure 2 millimeter layers trough the tooth [8]. With bulk composite resin materials manufacturers' depth of cure recommendation should not be exceeded.

Despite their imperfection, composite resin materials have found their place in almost every branch of dentistry. In preventive dentistry these materials are used as pit and fissure sealants as well as preventive fillings. In pediatric dentistry they are used as restorative material for caries damaged teeth in both deciduous and permanent dentition. In traumatology they may be used for restauration of fractured teeth as well as immobilization of traumatized teeth.

Anomalies of shape would be impossible to treat without composite resin materials. In orthodontics these materials are used to bond brackets of fixed appliances and as immobilization material in periodontology. In prosthetics they are used to construct crowns, veneers, denture substructure and as cementation material.

In pediatric dentistry, composite resin materials are most often used as filling materials and pit and fissure sealants. Even though glass ionomer cements are the gold standard for filling materials in pediatric dentistry, composites are used for fillings for all the preparation classes mostly due to their esthetic results. Problem with composite resin materials in deciduous dentition is the possibility to achieve dry working field. If it is possible to manage adequate isolation and dry working field, composite resin material application is recommended in deciduous teeth. However, the difference in morphology between deciduous and permanent teeth may represent an issue in the sense of pulp vulnerability in deciduous teeth on different kinds of agents and even composite materials. Having this information, some authors recommend application of  $\text{Ca(OH)}^2$  pastes as liner in younger children and adolescents regardless on the type of dentition [5].

Pit and fissure sealing is a well known technique that has been in procedure for over a century [9]. Since the first ideas of pit and fissure sealing with zinc phosphate cement, materials and technique by itself have come a long way [5]. Research show that approximately 85% of caries process begins in fissure system even though that part is 15% of the whole surface tooth area regardless of the type of dentition [5].

Pit and fissure sealing procedure is simple and fast. It is necessary to remove all the plaque of the teeth by brush or a pumice and a polishing paste without fluoride. After rinsing, intact enamel should be etched with ortho phosphoric acid. Material application is performed after acid rinsing and light curing is needed using adequate curing apparatus (Image 1 and 2). Sealing may be performed using sealant, flowable composite or selfadhering composite material. Regardless of the composite materials which is used articulation and excess removal is mandatory as well as polishing procedure (Image 3).



Image 1. Composite sealant application



Image 2. Light curing



Image 3. Sealant after polishing procedure

Composite resin materials are a material of choice for reshaping of structurally altered teeth. Most often it is possible to reshape teeth, deciduous or permanent, without any preparation (Image 4 and 5). Total etch adhesive systems achieve durable bond strength between composite resin and the tooth which can withstand the mastication pressure.



Image 4. Structural anomaly on teeth 12, 22



Image 5. Composite build ups on teeth 12, 22

In pediatric dentistry quite often dentists treat dental trauma which happens when children fall at school, playground, at home, etc. If endodontic treatment is needed or at least a third of a crown is missing it is recommended to have an additional retention in a root canal. Introduction of endodontic composite posts has made a huge impact on dentistry. Elasticity of these posts which is similar to dentine and composite materials represents an advantage compared to cast and metal posts. Modulus of elasticity of cast and metal posts is a several times greater than the one in composite posts which may lead to root fracture especially in thin root walls in children [10, 11].

The main requirement for longevity of the post inside the root canal is the cement. Fiber reinforced composite posts may be cemented with composite resin cements or glass ionomer cements. Composite resin cements are used with responding adhesive systems or they may be used without the adhesive system if they are selfetching. Even though the cements that are used with adhesive systems are more technique sensitive, they represent materials that have a higher bond strength values compared to selfetching cements [10, 12].

In children, if the injury is complicated or if teeth are lost as a result of trauma or caries complication malfunctions in speech and/or mastication may occur as well as tooth migration and irregular occlusion, psychological problems, etc. (Image 6.). In these cases it is necessary to restore the lost teeth with either partial denture or adhesive bridge until the implant placement is possible. Adhesive bridges are more favorable solution compared to dentures because of their preservice of healthy tooth substance, needing no or minimal preparations, reduced costs and



generally good patient acceptance. Also they tend to remove pressure from mucosae and alveolar ridge (unlike tissue supported partial denture), therefore reducing the risk of alveolar bone resorption and possible complications with future implant therapy [13]. Fiber reinforced resin bridge can be modeled directly in the oral cavity, or indirectly in the laboratory on the plaster casts in articulator, and then cemented in the mouth as a second step. Fibers must be placed on the model and composite resin material should be placed and a tooth should be modeled (Image 7 and 8). After the modeling cementation should be performed in patients mouth (Image 9).



Image 6. Tooth 11 lost as a result of trauma



Image 7. Placement of fiber on the model



Image 8. Composite resin tooth



Image 9. Cementation using silicon key



Image 10. Cemented bridge-palatal



Image 11. Cemented bridge-labial

There are many composite resin material advantages and some of them are: wide range of indications and application, mechanical properties, excellent esthetic and their price. With constant improvements like selfadhering flowable composites, bulk composites and better mechanical properties it is possible that composite resin materials will have even wider range of indications in pediatric as well as restorative dentistry for adults.

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# **RUBBER DAM AND HOW TO MASTER IT?**

**Vesna Miletic**, BDS, MSc, PhD, Assistant Professor  
University of Belgrade School of Dental Medicine, DentalNet Research Group

## **Abstract**

Rubber dam is the “gold standard” in restorative dentistry and endodontics for moisture and infection control. Despite being part of a modern undergraduate curriculum for over a decade, rubber dam has yet to find its way to standard and mandatory use in everyday clinical practice. Among the most often stated reasons for avoiding the use of rubber dam are inadequate training, excessive time for rubber dam placement, in situ difficulties (e.g. tight contacts, excessive coronal destruction), belief that efficient moisture control can be achieved without rubber dam as well as patient discomfort. High-quality clinical trials on the effects of rubber dam on restoration longevity and outcome of root canal treatment are virtually non-existent. A few that do exist confirm the positive effects of rubber dam. Several application techniques are at dentists’ disposal. The most frequently used is a combination of a square dam, winged or wingless clamps and a separate frame although other types of rubber sets are available, such as prefabricated dam-frame sets and mini-dams for isolation of no more than two teeth. Apart for mini-dams, other rubber dam sets may be used invariably in both restorative dentistry and endodontics. Mastering rubber dam application techniques at undergraduate student level or early in the professional career as part of continuous medical education is the most effective approach to increase the use of rubber dam in everyday clinical practice.

## **Introduction**

Rubber dam has long been known to dentists as a potential tool for tooth isolation. Historic records show that dental rubber dam was invented in 1860-ties by a US dentist Dr. Sanford Christie Barnum [1]. PubMed search using key words “rubber dam” and “dentistry” reveals 950 articles dating back to late 1940-ties and the first articles published by Gottlieb [2] and Berry [3]. It is interesting that as early as 1950 rubber dam was considered “old-fashioned, useless and inhuman” [4]. On the other hand, Heling&Heling stated that rubber dam must be used during all endodontic procedures, with their primary concern being prevention of instrument swallowing rather than infection and moisture control [5]. In its traditional form, rubber dam is a thin, square, rubber sheet. One or more holes are punched with a designated puncher so that the dam can be placed over one or more teeth to separate or isolate their crowns from the rest of oral cavity. Despite remarkable developments in material science, adhesive dentistry and endodontics including nanomaterials, rotary NiTi files and especially regenerative potential of stem cells, tooth isolation remains a cumbersome procedure rather unpopular among dentists.

## **Current approach to tooth isolation**

Benefits of tooth isolation in restorative dentistry and endodontics include efficient cavity preparation, moisture and infection control, soft tissue retraction, better visibility and prevention of inhalation and ingestion of instruments and materials. The traditional approach to moisture control by cotton rolls is considered inefficient and insufficient in maintaining a dry operatory field but is still widely used. Also, modern endodontic treatment involves root canal irrigation with high concentrations of sodium hypochlorite. This corrosive irrigant requires a physical barrier to prevent its direct contact with intraoral soft tissues.

The European Society of Endodontology (ESE) is the leading European society with the expertise to issue guidelines on the standard of care in endodontics. The ESE issued two key documents: Quality guidelines for endodontic treatment: consensus report of the European



Society of Endodontology [6] and Undergraduate curriculum guidelines for endodontology [7], which installed rubber dam as the standard of care or “gold standard” in tooth isolation during endodontic procedures. On graduation, dentists are expected to “be competent at performing rubber dam isolation for endodontic procedures” meaning they should “demonstrate a sound theoretical knowledge and understanding of the subject together with an adequate clinical experience to be able to resolve clinical problems encountered independently or without assistance”[7].

To the best of my knowledge, there are no such solid guidelines by an international professional association for the use of rubber dam in restorative dentistry. Nevertheless, it is generally accepted as a standard procedure in tooth isolation during cavity preparation and especially restoration placement. This approach is based on the well-known fact that clean and dry tooth tissues, devoid of saliva and blood, are required for effective bonding of restorative materials in adhesive dentistry.

### **Rubber dam in clinical practice: dentists’, students’ and patients’ perspective**

Regarding the use of rubber dam in daily practice, a review by Ahmed et al. [8] shows a steady, but slow increase in the prevalence of this type of tooth isolation over the past decades. For example, the percentage of UK dentists who never used rubber dam exceeded 80% in 1983, varied between 56% and 73% in National Health Service practices by 2001, and further decreased to about 33% by 2009. In the US, data show that 15% of general dentists never used rubber isolation during endodontic treatment [8] whilst this percentage dramatically increased to 63% of dentists who never used rubber dam in restorative procedures [9]. The fact that general dentists were surveyed in both studies indicates that issues with the technique may not be the main reasons for this discrepancy. It is more likely that the main reason for reduced rubber dam isolation in restorative dentistry is dentists’ belief that sufficient moisture control may be achieved without the use of rubber dam.

Various studies investigated the attitudes of dentists [10], students [11] and patients [12] towards the use of rubber dam in daily practice. Dentists often state that rubber dam placement is time-consuming, cumbersome and difficult to apply. Nearly half of the surveyed dentists believe that root canal treatment without rubber dam is as successful as with rubber dam isolation. Conversely, more than half of dentists believe that rubber dam does not contribute to longer lasting restorations [10]. This study indicates that excessive time for rubber dam placement, in situ difficulties (e.g. tight contacts, excessive coronal destruction) and belief that efficient moisture and infection control can be maintained without rubber dam are among the main reasons for dentists to avoid the use of rubber dam.

Students are generally more aware of potential benefits of rubber dam isolation than general dental practitioners. However, students’ main problem is difficult placement of rubber dam so much that the majority of final year dental students state they would reduce the use of rubber dam in their later practice [11]. This finding indicates the necessity to enhance students’ practice at the undergraduate level in order to establish and preserve positive clinical experience with rubber dam isolation.

Though it is conceivable that patients’ main concern with rubber dam would be discomfort, literature data indicate the opposite. In one such survey, 77% of patients stated a higher level of comfort during treatment with rubber dam than without it whilst even more (86%) patients indicated a positive attitude towards future use of rubber dam [12]. Obviously, careful placement of the rubber dam by the dentist is the main precondition for patients’ comfort during the entire clinical procedure. Avoiding gingival injury by clamps and maintaining sufficient breathing pathway are probably the two main concerns for patient comfort during rubber dam isolation.

### **Does rubber dam really ensure more successful restorative and endodontic practice?**

A recent Cochrane literature review by Wang et al. [13] evaluated the effects of rubber dam isolation in restorative dentistry based on randomised controlled clinical trials. The authors stated that only four such trials were included in the review, all of which were at high risk of bias. Nevertheless, the data indicate a higher survival rate of Class V composite restorations in non-carious cervical lesions when rubber dam was used as opposed to cotton rolls. Rubber dam was also associated with lower risk of failure in atraumatic restorative treatment of primary molars in children as well as reduced treatment time of fissure sealing. This Cochrane review concluded that more high-quality clinical trials are required to ascertain the effects of rubber dam in restorative dentistry [13].

Similarly, a review on the use of rubber dam in endodontic practice indicated the lack of clinical trials confirming the favourable effects of rubber dam isolation on the outcome of endodontic treatment [8]. However, because rubber dam is already the standard of care, the authors stated that a clinical trial “with a control group treated without using rubber dam would simply be unethical and inconceivable” [8].

A nationwide population-based study assessed the effects of rubber dam isolation on the survival rate of 517,234 endodontically treated teeth [14]. Although the difference between the rubber dam and non-rubber dam group was found to be statistically significant, the survival rates in both groups about 3 years post-treatment were quite high (90.3% with rubber dam and 88.8% without rubber dam). The findings support the use of rubber dam as the superior isolation method [8].

### **Short view on application**

Classic rubber dam sets consist of a 5- or 6- inch square latex or nitrile dam, metallic or plastic clamps and oval or U metallic or plastic frames. Alternatively, some manufacturers provide prefabricated dam-frame sets for easier application or mini-dams for isolating only 1-2 teeth during a restorative procedure. Nitrile dam is indicated for patients with latex allergy. A prefabricated facial paper towel may be used between the dam and patient’s face to avoid the risk of irritation. The set further includes rubber dam punch, clamp forceps, rubber interdental cord and dam template.

Application techniques of the classic rubber dam set may be generally divided into step-by-step and all-in-one approach. In the first approach, dam and clamp are placed separately or jointly, in either way followed by frame placement. In the second approach, the dam, clamp and frame are joined outside the mouth and then placed as a whole set. Either approach has their strong and weak points leaving the choice to the dentist to decide which technique to use. The step-by-step approach offers better visibility of the tooth to be isolated than the all-in-one approach. Conversely, the former approach requires longer manipulation inside the mouth than the latter which takes virtually seconds to place the whole dam-clamp-frame set.

Regardless of the technique, the clamp is placed either on the treated tooth or distally in case the treated tooth requires space for proximal matrix and wedge placement. One tooth is usually isolated during an endodontic procedure whereas several teeth are isolated during a restorative procedure to provide topographic reference points for adequate restoration placement. There are no strict protocols how many teeth should be isolated and it is mostly up to the dentist and his style and preference to decide. What is important, though, is that a tight seal should be obtained and maintained throughout the procedure. Liquid dam or interdental ligatures may be used for this purpose.

### **Conclusion**

Rubber dam isolation should become routine in daily restorative and endodontic practice. For over a decade it has been advocated as the standard of care in endodontic procedures. Scarce clinical research data indicate that rubber dam is a valuable tool for proper isolation in restorative procedures increasing the longevity of adhesively bonded restorations. Mastering application

techniques at undergraduate student level or early in the professional career as part of continuous medical education is the most effective approach to increase the use of rubber dam.

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## ORAL LESIONS–INDICATORS OF HIV INFECTION

**Doc. Dr Ivana Gušić**

Faculty of Medicine, University of Novi Sad

### Abstract

HIV infection is a disease that marked the 1980s and 1990s in medicine. Owing to the introduction of highly effective antiretroviral therapy, HIV is no longer a fatal disease, and is now considered a chronic condition characterized by the virus persistence in the infected host cells with long lifespan. However, the spread of this disease continues. Since the beginning of monitoring HIV infection epidemic in Vojvodina, a record number of infected individuals was noted in 2015. It is of particular concern that a third of the newly diagnosed patients had already developed AIDS, the terminal stage of HIV infection. Oral lesions are often the first clinical sign of immunodeficiency caused by HIV. Their early detection and proper diagnosis can be indicative of HIV infection, resulting in a prompt referral to the relevant health facility.

The aim of this lecture is to, through case reports from clinical practice, draw attention to the oral changes characteristic of HIV infection.

Since 1981, when AIDS was first recognized, HIV virus has taken over 30 million lives (1). According to the Institute of Public Health of Serbia "Dr Milan Jovanovic Batut," from the beginning of the epidemic until the end of November 2015, 3263 HIV-infected individuals were registered in the Republic of Serbia. HIV epidemic is most acute in Belgrade, where the highest number of new infections in the last 25 years was recorded in 2015 (2). Since 1985, when the first cases of HIV infection in the Autonomous Province of Vojvodina were identified, by the end of 2016, 526 residents of our province were diagnosed as HIV-positive. Currently, 390 citizens of AP Vojvodina are aware of their positive HIV status, 27% of whom have developed AIDS symptoms (3). However, it is considered that these data represent only "the tip of the iceberg" and that the number of infected individuals is significantly higher.

Owing to the introduction of highly effective antiretroviral therapy, HIV is no longer a fatal disease. Thus, it is presently considered a chronic disease characterized by the virus persistence in the infected host cells with long lifespan (4). In countries where antiretroviral therapy is available, a significant decrease in HIV-related morbidity and mortality was achieved, resulting in longer life expectancy and thus gradual aging of this patient population.

The main HIV characteristic is severe immunodeficiency that arises primarily due to the progressive loss of T lymphocytes, specifically helper T or CD4 cells (31). The inevitable outcome of untreated HIV infection is a disease progression to AIDS, leading to death in nearly all patients (5). There is no single clinical course of HIV infection. A large number of individuals do not experience significant health issues before reaching the terminal stage of the disease – AIDS. However, there are many non-specific health events that occur more frequently in HIV infected patients. In the period between the virus entry into the host organism and the formation of antibodies, in 50–80% of individuals, some of the symptoms of primary HIV disease emerge, referred to as seroconversion illness (33). The most common symptoms of primary HIV infection include fever, chills, malaise, lymphadenopathy, headache, maculopapular rash—typically on the trunk, joint pain, night sweats and mucosal candidiasis (6). Owing to this non-specific symptomology, only 25% of HIV-positive individuals are diagnosed in this disease stage.

After a period of acute HIV infection, during which there is a drastic change in the CD4 lymphocyte count and HIV viral load, a relative balance between the viral replication rate and the host's immune response is established. This period between the initial infection and the development of AIDS can be very long and is characterized by a complete absence of health

issues or scarcity of clinical symptoms (7). Clinical picture of AIDS is usually preceded by milder symptoms and signs of immune dysfunction, such as constitutional symptoms ("unexplained" fever, weight loss) and mild opportunistic infections. Since they are often asymptomatic, these minimal signs of immune dysfunction are ignored by the patient and / or unrecognized by doctors. For this reason, it is important to be cognizant of the basic clinical elements of spontaneous HIV infection progress, and thus identify the first signs of immune dysfunction in a timely manner. This increases the likelihood of early diagnosis and prompt treatment initiation, resulting in immune reconstitution and prevention of severe HIV disease complications.

Oral lesions are one of the earliest clinical manifestations of HIV infection. They are present in 30–80% of infected individuals and are often the first objective indicators of immunodeficiency (8,9). Occurrence of changes, such as oral candidiasis and hairy leukoplakia, is correlated with the decline in the CD4 T-lymphocyte levels, along with the increase in plasma HIV viral load (10). For this reason, oral lesions are an early indicator of HIV infection and have great diagnostic and prognostic value (10,11).

Given the above, the need for dentists at all levels of the dental healthcare to be trained in early diagnostics of oral lesions related to HIV is evident. It is also necessary to adequately respond to and refer these patients to relevant medical institutions. Comprehensive knowledge of the clinical characteristics of the HIV-related oral changes may aid in timely recognition and early detection of HIV infection. Many of these oral lesions are not related solely to HIV. However, the presence of one or more identifiable changes in the oral cavity mandates that the possibility of HIV infection be considered.

According to the original classification, oral health events are distinguished according to the degree of relatedness with HIV infection (12). The first group consists of the most common lesions that are closely associated with HIV, namely oral candidiasis, hairy leukoplakia, Kaposi's sarcoma, non-Hodgkin's lymphoma, linear erythema gingivitis, necrotizing ulcerative gingivitis and ulceronecrotic periodontitis.

Pseudomembranous type of oropharyngeal candidiasis is one of the most common oral manifestations of HIV infection. Its prevalence among the infected individuals can reach 92% (13). It is characterized by the appearance of whitish pseudomembranes, usually on the buccal mucosa, but can occur anywhere in the oral cavity. As it is rarely accompanied by subjective symptoms, detailed clinical examination is highly important for establishing the diagnosis. This type of oropharyngeal candidiasis is the most prevalent and the easiest to recognize. Other clinical forms, such as an erythematous, candidiasis or angular cheilitis, can be exhibited as limited discrete erythema only, making the diagnosis difficult. Thus, timely recognition of these changes is vital, since they have the same prognostic significance as the easily recognizable pseudomembranous form.

Epstein-Barr virus (EBV) reactivation is associated with very characteristic oral manifestations comprising HIV immunodeficiency response, referred to as hairy leukoplakia. Although this change was initially detected as a clinical entity in the course of HIV infection, it was subsequently described in other acquired immunodeficiency contexts (such as after organ transplantation). These lesions typically emerge on the sides of tongue, but can also occur on the soft palate, buccal mucosa and the mouth floor. Hairy leukoplakia is the second most common oral lesion type in HIV-positive patients.

In Europe, it affects up to 30% of the infected individuals (13). It is usually manifested as vertical whitish thickening on one or both sides of the tongue, which can disappear and reappear spontaneously. The changes are asymptomatic and sometimes very discrete. In these cases, great clinical experience is necessary for their correct identification. However, changes can be widespread, affecting both dorsal and ventral side of the tongue. Hairy leukoplakia has the same

prognostic significance as oropharyngeal candidiasis, irrespective of the extent of the changes; thus, its timely identification is of great importance.

Kaposi sarcoma is the most prevalent opportunistic tumor in HIV-infected population, among homosexuals in particular. Early changes to the oral cavity are characterized by flattened maculas whose color ranges from red, purple to brown. At a later stage, lesions become nodular and take reddish or blueish color. They are asymptomatic and mainly affect gingiva and hard palate. In the case of traumatization, changes can exulcerate and become painful.

HIV infection is associated with increased incidence of extranodal non-Hodgkin's lymphoma, with high-degree of malignant alteration. Oral cavity lesions are relatively common and may include prolonged asymptomatic gum redness, swelling and thickening, which can also appear on other parts of the oral mucosa. Changes become painful if ulceration is also present.

HIV-positive patients are often affected by unusual forms of periodontal disease, such as linear erythema gingivitis, necrotizing ulcerative gingivitis and ulceronecrotic periodontitis. These three diseases, along with oral candidiasis and hairy leukoplakia, have considerable diagnostic and prognostic value in HIV infection. (11,13,14).

Linear erythema gingivitis is a form of gingivitis characteristic of HIV-infected patients. It manifests as a flame-red stripe along the gingival edge. It usually extends toward front teeth, with a tendency for lateral spread. This form of gingivitis is not caused by dental plaque and does not respond to the standard therapeutic measures. Thus, unresponsiveness to treatment can be indicative of HIV infection, aiding the diagnosis.

Necrotizing ulcerative gingivitis and ulceronecrotic periodontitis are more prevalent in HIV-positive patients relative to the general population. These conditions are characterized by a sudden onset of acutely painful gingival inflammation accompanied by rapid destruction of soft tissue and bleeding, along with sharp pain and ulcerated interdental papillae. Ulceronecrotic periodontitis is manifested by rapid and extensive loss of epithelial attachment, whereby soft tissue destruction often leads to bone exposure. Etiopathogenesis of periodontal lesions in HIV-positive individuals is not fully understood. In HIV patients, the risk factors for periodontal disease—in addition to the common ones, such as age, smoking, poor oral hygiene and unhealthy diet—also include reduced CD4 lymphocyte count, elevated HIV viral load and presence of specific opportunistic microorganism species (15).

Oral lesions caused by the human papillomavirus (warts, papillomas and condylomas) as well as herpes simplex virus infections (HSV) are more prevalent in HIV-infected individuals compared to the seronegative population (16). Changes caused by the herpes virus type 1 or 2 manifest as erosions, typically on the palate, gingiva and the dorsal tongue surface. The degree of immunosuppression affects the HSV infection reactivation frequency, as well as the clinical picture severity. In patients with low peripheral CD4<sup>+</sup> lymphocyte count, ulceration is prolonged, resulting in chronic disease. Spontaneous regression of herpes can occur in HIV-positive individuals whose immune reactivity is relatively preserved. This can serve as an indicator of immunosuppression severity. Chronic HSV infection is a criterion for diagnosing AIDS (11).

Introduction of highly effective antiretroviral therapy into HIV treatment has resulted in a significant decline in the prevalence of the characteristic oral manifestations of the disease (17), while other conditions, such as oral warts and salivary gland diseases, have become more pronounced (16). Moreover, the increased lifespan of these patients, in association with other risk factors, has led to a greater incidence of oral cancers. Owing to these changes, the initial classification of oral manifestations of HIV infection has been revised, whereby lesions are presently classified according to etiology (16).

In Serbia, AIDS prevalence is low. However, even though free, anonymous and confidential HIV testing is available, the rate of this diagnosis type in our country is among the lowest in Europe. Consequently, the disease can remain undetected for a long time. Oral lesions are often the first clinical sign of HIV infection. Their timely detection and correct diagnosis can aid in early HIV infection postulation, resulting in prompt referral for further testing.

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# **THE VOLUME AND CONTENT OF DENTAL HEALTH PROTECTION OF A SELECTED DOCTOR**

**Dr. Sanda Koncar**

Pediatric Dentist

A Specialist in Pediatric and Preventive Dentistry

Community Health Centre "Novi Sad"

Summary:

Dental health protection is legitimate, regulated by two basic laws:

Law about health protection and law about health insurance, which creates health policies in these areas, in volume and content of the selected dentist's work.

The aim of this paper is to present the work of the selected dentist within the frame of the current legal regulation, especially within the area of pediatric dentistry for children between the ages of 0 to 3 years.

The selected dentist is in obligation to take full action that is prescribed by law, including organization and measures in the preservation and improvement of health for all sections of the population, examinations that aim towards diagnostics and early treatment of patients on a higher level of health care. Utmost rights of dental health care is given to children between the ages of 0 to 18, respectively to 26 years and to expectant mothers.

In laws and regulations there has been some illogicality, there are no precise guidelines, and certain measures are not available to patients, in terms of content, as well as in terms of volume.

Preventive dental examinations of infants and children is

prescribed within the rule book, but the turnout is minimal, even though parents/guardians are obligated to choose a dentist for their child before it turns one, which is also the European proposal and practice. This stage of early childhood is considered to be the most important for acquiring positive habits.

Health-educational work with parents/guardians is of a priority. The use of effective and preventive measures and funds can significantly contribute to the preservation of oral health, prevent the emergence of diseases and complications, and which provides the highest degree of health care for the child.

Pathology of oral diseases is diverse, and the condition of oral health of the population is worse than in countries of the European Union. Recent research in our country shows a deterioration of health indicators in preschool age. Programming work for children with the aim of providing oral health should start early in infancy and as a small child, in regards to the period of family planning. The selected dentist can expect results within the area of pediatric dentistry only if legal regulation is heading in that direction, too.

**KEY WORDS:** dental care, pediatric dentistry, preventive dentistry, selected dentist

Pediatric dentistry implies early diagnosis and therapy of numerous oral diseases, first of all tooth decay, periodontal disease, traumatic injury, development disorders and others.

Pathology is diverse, and the condition of oral health is worse than in countries of the European Union.

Oral health is a component of general health and well-being of people and as such is of primary importance for the quality of life and function of people.

Good health of the population should be one of the main aims of the country's politics in terms of social protection, and the health of the child must be integral to that policy. The UN Convention on children's rights, highlights care for the special needs of a child and points to its

rights. This document is important for all professionals that work with children, including pediatric dentists. If we make a decision that includes children, it has to be made in response to the child's wellbeing, as well as having to take into account the child's opinion. The selected dentist in the area of children's dental health care has to base his work on the basic knowledge of different sciences, medical and social, that are implemented upon the particular position of the child and young adult that is growing up.

Preventive dentistry has its priority in the earliest development of the child.

The cheapest, most rational, painless and efficient way to preserve health and improve health education, should not only be by spreading information. The dentist through his work in health education should encourage motivation and develop skills for his patients. Since the basic goal of health education is to develop in each individual responsibility for his own health, and for the health of their loved ones, it should be used daily in the selected dentist's work through different types of methods.

Work of the selected dentist implies a dental team (dentist, nurse). With the support of the dentist, the dental nurse should be competent for health-educational work. In this way, she becomes a valuable help to the dentist, and therefore adds more value to her profession. The division of work of dental services depends on the law, the competence and availability of staff, as well as the attitude of the dentist. In addition to legal regulations, the selected dentist in his work must above all respect the modern principles of his profession. He should know that high quality implies high quality treatment for the patient, just like high quality of given services. Qualifications and staff expertise depends on the quality and efficiency of dental services.

The scope and content of work is regulated by the Rules that establishes the right to health protection from compulsory health insurance, but derives from the Law about health insurance (Službeni glasnik RS br. 107/05 i njegove dopune i ispravke) and Law about health protection (Službeni glasnik RS iz 2005. i 2011. godine).

Dental health care experienced great changes in the enactment of these laws.

As an innovation, the health care of the Republic of Serbia introduced the selected dentist and capitation, which measures the performance of the institutions of primary health care, as well as the effects of selected dentists in accordance to the defined criteria of the registration of the identified patients, efficiency and prevention. In the process of changing the method of financing primary health care, the Ministry of Health, RFZO and the Institute of Public Health, brought down Rules on the nomenclature of health services on the primary level of health protection, price list, time and personnel norms and a new way of reporting about given health services. Introducing capitation as a means of financing primary health protection, it has the intention to deliver a more efficient, rational and better health care. Proponents of this segment of the health care reforms argued this project that the selected dentist should be familiar with the social status of the patient's family ( like a family doctor) and be capable of solving 85% cases of health issues in his Health Center. Citizens were given the right to exercise primary health care at the Health Center through the selected dentist which is in the field of pediatric dentistry or specialist in pediatric and preventive dentistry. The largest volume and content in the field of dentistry health care from the Statutory health insurance is provided to children from 0 to 18 years, or up to 26 years (until the end of regular education) and women in connection with pregnancy (pregnant women and new mothers up to 12 months after birth).

In addition to these categories of the insured, and are defined by the other categories of insured who have available dental protection in the full amount or with the participation, but to a lesser content and scope.

The selected dentist is obligated to organize and implement measures on the improvement of oral health of insured persons, find and suppress risk factors for the disease, perform preventive examinations, measures and tasks, including health education, which is predetermined as the right to compulsory health insurance. He performs examinations, as well as diagnosis in established ways and types of treatment, including emergency medical assistance. He directs insured patients to specialist examinations within their institution or if necessary

directs them to institutions of secondary and tertiary health care. He keeps proper medical records, and takes other measures and actions that are regulated by law. In the area of pediatric dentistry, work is partly carried out in clinics, but also in preschool and school buildings.

The selected dentist is obliged to cooperate with other health, social and other institutions and organisations. He is also obliged to implement health care programs ((Službeni glasnik RS br.22/09), to participate in projects in areas of public health, implement campaigns according to the calendar of health that contributes to the promotion of health and disease prevention, to inform the population about the state of oral health, but also to highlight the needs and opportunities for personal and positive behaviors that preserve and enhance oral health. Particular attention is paid to parents/guardians of young children, because they are responsible for creating good early habits for their child. The beginning of prevention in early childhood allows teeth to sprout out healthy and keep the health and surrounding structures.

The national program of preventive dental care was well designed, it contained a wide range of activities aimed at improving the oral health of children, youth and women in connection with pregnancy. In preparation of the program, epidemiological data was collected that indicated bad health indicators, especially in preschool children. Latest data that was published by the Institute for public health of Serbia also indicates on deterioration of health indicators. This deterioration could be brought in connection with existing legislation, that has many illogicality, irregularity and understatements that gives the possibility of different interpretations of certain laws and bylaws, and dentist attitudes themselves sometimes are not compliant with the official protocols in terms of improving health, especially in the preschool population. For patients, there is still a misconception related to oral health in the sense that treated teeth means health. Certain dental services which are standard for successful preventive dentistry are not included in the Regulations, and the existing ones are denied to certain policy holders depending on age and are often not implemented by protocols. Cooperation with preschool and school authorities is not always what it should be. For us there is still a belief that the dental examination should not be before 3-4 years of age, even though there may already be a need for a certain dental treatment, although modern dental practice means that the best time for your first visit to the dentist is about the first year of life.

Pediatric dentistry is preventative, and therapeutic. Health check-ups are mandatory. The first check-up is in the infant period, each next year also foresees a check-up, while the systematic check-up is provided for in the third, seventh and twelfth year of life. Failure to respond to a check-up, as provided for in the Regulations, entails a participation of 35% for services rendered, however without clear and precise instructions of who, when and how much participation?

The first preventive examination involves a procedure that, based on history data obtained from the parent / guardian and check-up, gives the estimation and the identification of risk of occurrence of oral diseases. Preventive measures are defined and actions to eliminate the risk factors. Data is entered into the specially designed patterns that accompany this type of review, and based on their estimated risk for caries risk for orthodontic irregularities. Risk assessment for tooth decay means risk assessment in pregnancy and risk assessment in infants, while adapting to individual preventive programs. The selected dentist is required to inform the parents/ guardians of the situation and to make recommendations about the need for another visit during the first year of life, which through the individual medical and educational work explains the method of oral hygiene at this age, gives recommendations related to the proper diet and fluor prophylaxis and emphasize the need for regular check-ups. The second year, in addition to dental examinations and taking a medical history from the parents / guardians, clinical examinations and assessment of the risk of cavities, orthodontic issues and other oral diseases, anticipates one more visit, in which the selected dentist should explain the importance of those preventive measures like in the first year, with a demonstration of oral hygiene, a selection of appropriate resources and training on proper application, the frequency and the technique of brushing teeth.

In the third year of the child, the first systematic review of data processing is provided. There is determination of the state of the mouth and teeth, condition of the gums and other mucosal, for early identification of all those disorders and diseases and take preventive and therapeutic measures. This examination includes the preparation of the patient, medical history of the parents, extra and intraoral examination of the soft tissue, occlusion and if necessary, the patient is sent to both the auxiliary diagnostic examinations. Advice is given about the need for rehabilitation, as well as on the need to maintain some hygiene and dietary measures and the patient can be scheduled for future work.

The third year is designed for individual medical and educational work or motivation, then prophylactic removal of soft deposits and application of medium concentrated fluoride.

The period from birth to three years is very important for the children's dentists, since it forms its first experiences and has a significant impact on the child's development phase. The positive impact of a child during early childhood experiences through interaction with parents that find the balance that is needed in order to respect his wishes and independence, while not losing confidence if certain situation requires subordination.

At the age of three years the child reaches maturity and dental intervention and enables cooperation during dental treatment. This means that a child sits still for at least 15 minutes to understand relationships and have a sense of time. It also means you can simultaneously focus on two different things, which are open in terms of communication and to the interests of access to new people and events. Communication with parents - it should be such that the parent at this age should actively participate in any planned treatment. The selected dentist must obtain a parent's trust, because then the child feels safer and more protected. Sometimes, in acute situations, it is necessary to implement treatment by "force", but involves the consent of the parents and of course, the registration procedure in the medical records. Preventive dental examinations and other preventive and prophylactic measures at an early age are prescribed by the Law. Ignorance, lack of knowledge and / or overburdened parents causes a small number of infants and young children to be included in these measures. Advocating exclusively dental teams, in terms of implementation of measures and means for prevention of diseases and their complications is not enough to provide every child the highest level of health care, and with that to improve oral health of population. Legislation needs to go in the direction where the dentist will provide all the necessary measures regarding the treatment, primarily prevention but the patient in addition to its rights, should have its obligations within the framework provided by dental care, which should determine the country's good legal solutions.

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# GENERAL ANESTHESIA IN DENTAL INTERVENTION IN CHILDREN

**Anna Uram-Benka, Goran Rakić**

## Abstract

Dental treatment is one of the most common reasons for administering general anesthesia to children. Children's perception of pain is related to cognitive development. General anesthesia should be adapted to the kind and length of intervention, to the physical condition of the patients and to the fact that majority of these interventions are performed under the „one day surgery“ circumstances. The anesthetics initially used and those to maintain anesthesia must be short-active with minimal side-effects. The standard for the airway protection is endotracheal tube. In the postoperative period patients are given analgetics and other symptomatic therapy. The patients can be released no sooner than four hours after dental interventions.

Conclusion – An appropriate preoperative preparation and the selection of the adequate kind of general anesthesia result in a safety dental intervention in children in general anesthesia.

## Introduction

Dental treatment is one of the most common reasons for administering general anaesthesia to children. In children, these procedures are often associated with a significant amount of pain and anxiety, for which pharmacological behaviour management is required.

Children's perception of pain is related to cognitive development. Before the age of 2 yr, a child is generally unable to distinguish between pressure and pain. Between the ages of 2 and 10 yr, a child may be able to understand the sensation of pain and differentiate it from other sensations such as pressure or vibration. Many dental procedures will still require general anesthesia in this age group. Children over the age of 10 yr may therefore be able to cooperate with dental treatment performed under local anesthesia, with or without sedation.

## Indications for general anesthesia

General anesthesia may be required for paediatric dentistry in circumstances where:

- the use of local anesthesia is either contraindicated
- there has been previous failure of local anesthesia or sedation
- the patient is unable to cooperate with the proposed treatment due to immaturity, disability, or language difficulties;
- the patient suffers from a psychological disorder such as severe anxiety
- extensive treatment is required.

General anesthesia for paediatric dentistry should only be administered within a hospital setting. The necessary equipment is the standard for dental intervention as well as for the use of general anesthesia in children (oxygen source gases, anesthesia machine, monitoring, drugs, all necessary equipment for resuscitation etc.).

## Preoperative preparation

Children who require general anaesthesia for dental treatment should receive the same standard of care as those who require general anesthesia for any other procedure. As for all episodes of paediatric anesthesia, the aim should be to ensure that the child is in the best possible physical and psychological condition to undergo the dental procedure. All children who require intervention under general anesthesia should be a healthy 14 days before intervention without antibiotic therapy (except if the disease is requiring). The day before the procedure should be accessed by the anesthesiologist to take history, get information about previous illnesses, operations and allergies. In the case of healthy children and small dental interventions, laboratory tests are not necessary as well as standard preoperative hematological and biochemical

investigations. In case of any comorbidity laboratory analysis should be extended towards the disease, but it is also necessary to do preoperative examination by the physician-specialists. Physical examination, measurement of vital parameters and advice for preoperative hygienic-dietary regime is important. On the day of surgery anesthesiologist also once again review the child and administer premedication.

#### Premedication

Premedication should be administered per orally, intramuscularly or intravenously. Premedication with oral analgetic agents is useful for the treatment of pain associated with paediatric dentistry. Many paediatric dental patients require sedative premedication. Midazolam is the most commonly used benzodiazepine. Atropine should be administered intramuscularly for optimum condition for the dental intervention (antisialagogue effect).

#### Induction and maintenance of anesthesia

Whenever general anesthesia is administered, clinical observation of the patient should be supplemented by core standards of monitoring that allow the physiological state of the patient, the depth of anesthesia, and the function of the anesthetic equipment to be assessed. These standards of monitoring should be uniform irrespective of the duration, location, or mode of general anesthesia. The induction of general anesthesia may occur via the inhalation route typically using sevoflurane, or the i.v. route, using an agent such as propofol with or without opioids and neuromuscular agents (rocuronium or cisatracurium). Airway protection can be by the oral placement of endotracheal tube. The nasal route is preferred by some dental surgeons. After tracheal intubation, a throat pack is usually inserted to protect the airway from soiling. A laryngeal mask airway (LMA) is often used for longer procedures, such as surgical extraction of impacted teeth. Displacement of the LMA may occur after insertion of the throat. Maintenance of anesthesia can be inhalatory or intravenous with oxygenation with air/oxygen, or nitrous-oxide/oxygen.

Uncomplicated dental extractions and other short dental procedures are usually associated with levels of pain that are adequately treated with paracetamol, non-steroidal anti-inflammatory agents (NSAIDs), or both. These may be administered before operation, intraoperatively, or after operation. Anti-emetic agents, such as ondansetron, dexamethasone, may be indicated and should always be considered whenever opioid analgesics are administered.

After completion of the procedure and removal of the throat pack, suction should be applied to the oropharynx. Residual neuromuscular block should be appropriately reversed, and 100% oxygen administered. The patient should then be placed in the left lateral position. The tracheal tube or LMA should be removed with the patient breathing spontaneously either awake or deeply anesthetized and when the patient's respiratory and laryngeal reflexes are returned, so that blood and secretions are less likely to be aspirated into the larynx. In the period immediately after general anesthesia for dental treatment, the child should be managed in an appropriately equipped post-anesthetic care unit by a designated member of staff who has received training in paediatric resuscitation. Supplemental oxygen should be administered until emergence from anesthesia has occurred.

#### Complications associated with general anesthesia for dental treatment

Minor complications of general anesthesia for paediatric dentistry include postoperative headache, nausea, retching, and vomiting, particularly in the presence of swallowed blood. Postoperative cough may occur due to either tracheal intubation or irritation from the throat-pack. Major complications include laryngospasm, bronchospasm, airway obstruction, cardiac arrhythmia and allergic reactions. These complications should be prevented, recognized and treated at the time. Therefore, it is necessary to have adequate equipment, drugs and qualified personnel for the implementation of general anesthesia in children.

## Conclusion

The management of anxiety and pain is a very important aspect of paediatric dentistry and includes the use of general anesthesia. Adequate preoperative assessment, the choice of anesthetic technique, equipment and professional team ensure that these interventions are carried out safely in children.

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# **PRINCIPLES AND RULES FOR COOPERATION OF GENERAL DENTIST AND ENDODONTIC SPECIALISTS**

**Igor Stojanac**

## **Abstract**

In attempting to shed some light on this very intricate referral process, one should not lose sight of the fact that it is ultimately the dental patient needing the root canal treatment who should be the recipient of any improvement that develops in this referral process. General dentists have always, and, most probably, will always provide the great majority of root canal treatments done. Many factors, however, will, from time to time, cause the thoughtful general dentist to refer at least some cases to endodontic specialists. Patients have very little to say in this process; however, we must all realize that they place a great deal of trust in both the general dentist and the endodontist to work together to come to the best resolution of their endodontic problems. The primary concerns of most patients seem to fall into the areas of fear of the treatment and fear of the cost. Costs are driven by expenses, insurance tables, and market factors. Although it cannot be said that endodontic treatment is inexpensive, it can usually be stated that there is good value received for the treatment given. This is particularly true if the end result is a quality job done with long-term retention of the problem tooth. As to the patient's fear concerning pain, it is incumbent on both the generalist and the specialist to develop the skills necessary to render modern endodontic treatment in a pain-free manner. This is within the standard of care, and is something the patients should not only expect but, in fact, demand. The other concerns that patients have are quite standard in the profession. They are, primarily, the desire for pleasant surroundings, pleasant staff, confident doctors, convenient pay arrangements, understanding of the procedure, and a perception of value for time and money spent. Working together, the endodontic specialist and the general dentist should certainly be able to provide these wishes for all patients.

## **Contemporary Endodontic Treatment**

The aim of nonsurgical endodontic treatment is to address pathosis of the pulpal and periradicular tissues. As the average age of the population has increased, the stigma of tooth loss has become less acceptable for most patients than for previous generations. In addition, increasingly complex, sophisticated restorative techniques and involved treatment plans have led to a higher demand for endodontic treatment. Advances in the understanding of endodontic pathosis, aseptic technique, and principles of canal preparation and obturation have also led to significantly increased and predictable healing rates for endodontic treatment—95 percent and higher under ideal conditions according to current literature.

Recent technological advances in endodontic treatment have resulted in the retention of teeth that were previously deemed untreatable. However, technology, instruments and materials are not a replacement for clinical skill and experience, but rather adjuncts that a practitioner can employ to reach a desired goal. With that in mind, it is imperative that a careful sequence of case selection and treatment planning is carried out based on clinical factors and the dentist's own knowledge of his or her abilities and limitations.

## **Treatment Planning**

The first step in treating the patient is planning the case in full. This initially involves a comprehensive medical review to predict any conditions that may require modification of the usual treatment regimens. The identification of medical conditions that may complicate endodontic treatment will help the dentist avoid potential medical emergencies during treatment.

In addition, consideration of complicating patient factors such as anxiety, limited opening or gag reflex will allow the dentist to avoid situations that may compromise treatment outcomes.

Collection of this data makes it possible to avoid misdiagnosing and therefore mistreating a patient—actions that could lead to a loss of the patient’s confidence in the practitioner, the prescribed treatment and ultimately the dental profession. Proper treatment planning not only helps the practitioner avoid procedural shortcomings (e.g., missed canals, excessive removal of dentin, perforations, ledges, separated instruments or over/underfill of the canal space), but also allows the dentist to choose cases based upon his or her experience, skill set and comfort level.

Every clinician must constantly evaluate his or her diagnostic and technical skills. The practitioner then has a legal and ethical obligation to determine, based on the case at hand, whether he or she possesses the skills necessary to predictably manage the patient’s endodontic needs, and assure the delivery of timely and effective care. Practitioners electing to perform endodontic treatment are held to the same standard of care as endodontists. Cases that exceed the comfort level or skill set of the dentist should be referred to a specialist with the requisite skills and experience to manage the patient.

### **Complementary Skills**

According to a recent American Association of Endodontists (AAE) study, in the United States endodontists perform more than a quarter of all root canal treatments each year. While general practitioners perform the majority of root canal treatments, they often rely on the expertise of endodontists for procedures that exceed their training or comfort level. This practice allows general dentists more time for other procedures and enhances their relationship with patients by improving patient satisfaction.

On average, endodontists perform nearly 25 root canal treatments a week, while general practitioners perform less than two. This familiarity with the procedure, combined with endodontists’ advanced training in endodontics, expertise in achieving anesthesia, and adoption of technologies, such as digital imaging and operating microscopes, makes them more adept at handling difficult endodontic cases. For the sake of patients, it’s best for general practitioners to initiate and build relationships with endodontists prior to the need for referrals, so delays in treatment are kept to a minimum. A strong relationship between an endodontist and general practitioner can prevent these situations and best meet the needs of patients in pain.

The office staff of both general practitioners and endodontists should be well acquainted with each other to maintain the open communication that fosters quality patient care. Should any staffing changes occur at either practice, the other office should be notified to prevent delays and miscommunication. This is crucial to the dentist/endodontist relationship, as well as to the final positive outcome for the patient.

In particular, the general dentist’s office should be sure to send the endodontist’s staff all relevant information regarding the patient’s restorative plan, since the timing of the completion of the root canal treatment may vary depending on the dentist’s preferences.

Following treatment, the endodontist’s office should send a follow-up report, including pre- and post-treatment radiographs, to the patient’s general dentist. A prognosis and additional treatment recommendations also should be clearly stated. For example, if one or more of the patient’s root canals is calcified, or if a patient’s canal is blocked and the endodontist believes that apical surgery may be necessary, this should be communicated in the letter. Once the root canal treatment has been completed, the patient’s restorative work should be scheduled as soon as practical. Significant delays in the placement of the restoration can compromise the effectiveness of root canal treatment.

### **AAE Case Difficulty Assessment Form and Guidelines**

The American Association of Endodontists has developed a practical tool that makes case selection more efficient, more consistent and easier to document. The Endodontic Case

Difficulty Assessment Form is intended to assist practitioners with endodontic treatment planning, but can also be used to help with referral decisions and record keeping.

The assessment form identifies three categories of considerations which may affect treatment complexity: patient considerations, diagnostic and treatment considerations, and additional considerations. Within each category, levels of difficulty are assigned based upon potential risk factors. The levels of difficulty are sets of conditions that may not be controllable by the dentist. Each of the risk factors can influence the practitioner's ability to provide care at a consistently predictable level. This may impact the appropriate provision of care and quality assurance. For each level of difficulty, guidelines are given to aid the dentist in determining whether the complexity of the case is appropriate for his or her experience or comfort level.

1. Minimal Difficulty - Achieving a predictable treatment outcome should be attainable by a competent practitioner with limited experience.
2. Moderate Difficulty - Achieving a predictable treatment outcome will be challenging for a competent, experienced practitioner.
3. High Difficulty - A case with high difficulty is one in which the preoperative condition is exceptionally complicated. One way a case may be classified as highly difficult is by exhibiting multiple factors in the "MODERATE DIFFICULTY" category on the assessment form. Therefore, achieving a predictable treatment outcome will be challenging for even the most experienced practitioner with an extensive history of favorable outcomes.

While the examples described thus far have focused on diagnostic and anatomical factors, it is important to realize that there are a number of patient considerations that may complicate treatment. These include medical complications, difficulties with anesthesia, behavioral management issues, limited opening and emergent situations. Additional considerations would include previous endodontic treatment, a history of trauma, and periodontic-endodontic conditions.

For examples of these considerations and how they may affect case difficulty, please refer to the Endodontic Case Difficulty Assessment Form. Dentists should be familiar with the information in the form, and be able to assess each case to determine its level of difficulty.

## **Conclusion**

In today's society, patients are better educated and have higher expectations regarding the dental care they receive. Dental professionals have the technology, methodology and scientific rationale to repair damage to the dentition that was viewed as irreversible only years ago. These advances allow patients to keep their natural dentition, with a few exceptions, for a lifetime. Teeth that have had surgical and nonsurgical endodontic treatment that has not allowed healing can often be disassembled and "re-engineered" to allow healing, preservation and function of the tooth.

Any of the treatment options offered to the patient must have the patient's best interests and health as a primary goal. The treatment must be delivered in a predictable manner by the treating practitioner to optimize the healing potential. Nonsurgical root canal therapy results in one of the highest retention rates of any dental procedure when completed under optimal conditions. As clinicians, we can ensure the highest quality treatment with our ability to treatment plan for the patient in such a way that we honestly assess the difficulty of the case and our personal skill levels, and then determine whether to treat or refer. In the final analysis, when the treatment proceeds without complication and healing occurs, the patient and the dentist benefit.

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# AESTHETICS AND LONGEVITY OF COMPOSITE RESTORATIONS

**Assistant professor Anja Baraba**

## **Abstract**

In case of caries lesion, trauma or tooth loss, it is of utmost importance to restore lost hard dental tissues both aesthetically and functionally. The selection of the restorative materials and the type of restoration depends on many factors. Different materials are available for restoration of hard dental tissues. Modern composite materials enable simple restorative procedure with excellent physico-mechanical properties and aesthetics. Even the lost tooth can be restored in one appointment by fabrication of fiber reinforced composite bridge following minimally invasive approach. In the lecture, clinical cases will be presented and aesthetics and longevity of composite restorations will be discussed.

## **Aesthetics and longevity of composite restorations**

The main advantages of using composites in dental practice are their adhesive bonding to hard dental tissues which enables minimally invasive approach in cavity design, excellent physico-mechanical properties and aesthetics. If composite restorations are done properly, following indications and if all phases of adhesive procedure, layering, finishing and polishing are performed correctly, they can provide excellent longevity and aesthetics. It is therefore understandable that at least half of posterior direct restoration placements rely on composite materials (1). Although dental composites are being continuously developed, these materials typically consist of a methacrylate-based resin matrix, glass or ceramic fillers and a filler-matrix coupling agent (2).

Recently, the evolution of dental composites altered their filler size, introducing nanofilled and nanohybrid composite resin materials on the market. Since the dimensions of these filler particles are below that of visible light, it is impossible for them to either scatter or absorb visible light which enables excellent aesthetic properties of the material and higher filler load is responsible for excellent physic- mechanical properties (3).

Another development in composite resin technology are fiber reinforced composite (FRC) materials. Currently, FRC are used for direct splints, endodontic posts and fixed partial dentures, bridges and crowns. In FRC technology, different types of continuous glass fibers can be used: E-glass fibers (electrical glass), S-glass fibers (strength glass) and R-glass fibers (resistance glass), (4). One specific product consists of unidirectional and silanated E-glass fibers embedded into organic polymer structure. Unpolymerized organic matrix is a mixture of polymethyl methacrylate (PMMA) and [bisphenol A-glycidyl methacrylate](#) (Bis-GMA) creating semi-interpenetrating polymer network (semi-IPN). In semi-IPN, PMMA is a linear polymer phase and Bis-GMA polymerizes into cross-linked phase, without any chemical bond between two phases (5). The advantage of the semi-IPN is the possibility of this structure to be dissolved by fresh monomers from adhesive resin, creating so-called secondary IPN (6). The benefit of the semi-IPN structure for secondary IPN bonding is most valuable when pre-fabricated FRC restorations must be attached to hard dental tissues or be repaired.

One of the indications for the use of fibers are posts placed after endodontic treatment. Placement of intra-radicular post is often required in everyday dental practice due to severely damaged teeth (7). FRC posts are preferred due to their elastic modulus being similar to that of dentin (8, 9). Additionally, in combination with composite resin core and composite cement, FRC posts form a structure called „monoblock“ in which loads and stress distribution are homogenous, ensuring a behaviour similar to that of healthy teeth and decreasing a possibility of

root fracture (10). Individually formed FRC posts are indicated especially for wide, oval and curved root canals.

The replacement of a single tooth in anterior and posterior region is always a challenge. Tooth may be missing due to congenital reasons, consequences of caries lesion or trauma. Different temporary and permanent options are available for replacement of the missing tooth: removable partial dentures, fixed bridges or dental implants. One of the options is fabrication of FRC bridge. Advantages of FRC bridge include bondability, no or minimally invasive preparation of adjacent teeth, possibility of chairside fabrication and repairability (11). Due to non invasive design, conventional treatment options are always available.

For composite materials, volumetric shrinkage and fracture are still considered as major drawbacks (12, 13). One of the modification of composite materials which might overcome these weaknesses is addition of short glass fibers into resin matrix which enables for the material to be used as dentin replacement. Fiber insertion into composite leads to significant increase in physical and mechanical properties, such as flexural strength, flexural modulus, fracture toughness and Vickers hardness (14) and lower polymerization shrinkage.

Restorative dentistry, especially composite technology, is constantly evolving due to innovative treatment solutions, new materials and treatment techniques. The advent of new composite materials and fiber reinforcement, with improvement of aesthetics and physico-mechanical properties, has further increased the possibilities of composite restorations in dental medicine.

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# CONTEMPORARY PRINCIPLES OF THE ROOT CANAL OBTURATION

Doc. Dr Milan Drobac

## Abstract.

Root canal obturation is the final stage of each endodontic treatment. Dental root canal filling materials can be classified into tapered points (cones), sealers (pastes), and their combination. As all materials intended for root canal obturation have their advantages and disadvantages, there is no ideal material and / or technique. In other words, no filling technique can fully compensate for inadequate root canal preparation.

## Introduction.

The main aim of endodontic treatment is pain relief, which can be achieved by removal of the intra- and extra-canal infection and implantation of materials into the root canal that are not harmful to the surrounding tissue [1]. Application of contemporary endodontic treatment procedures can achieve these aims in most cases.

Root canal obturation is the final stage of each endodontic treatment. It has to be three-dimensional and long-lasting in order to prevent propagation of bacteria and their products from the root canal system into the periapical region. Dental root canal filling materials can be classified into tapered points (cones), sealers (pastes), and their combination. Cones are prefabricated points of different dimensions and tapering degrees. Sealers are pastes and cements, which are mixed and set through chemical bonding reactions over time. For achieving three-dimensional obturation, a combination of cone and sealer is recommended [1]. As all materials intended for root canal obturation have their advantages and disadvantages, there is no ideal material and / or technique. Thus, it is essential to keep abreast with the latest scientific developments in this field. Selection of obturation materials and techniques must be part of an overall therapeutic concept. None of the materials and / or techniques used for obturation can compensate for the work involved in the diagnosis, chemo-mechanical canal instrumentation and the providing of asepsis and disinfection of the root canal [2]. Root canal obturation materials must meet the following requirements:

- Technical: no contraction, insoluble in tissue fluids, good adhesion to dentin or material with which it is combined, non-porous, does not absorb water, does not cause tooth discoloration
- Biological: does not affect general health, non-allergenic, nonirritating to the periarticular tissue, sterile, exhibits antimicrobial properties, stimulates the healing process
- Mechanical: radiopacity, appropriate setting time, easy application and removal from the root canal

No presently available material meets all the aforementioned requirements.

## Cones for root canal obturation

Gutta-percha points. Gutta-percha (GP) points are produced naturally from coagulated sap of three types of wood, namely *Palaquium gutta*, *Isonandra gutta* and *Dichopsis gutta*. In addition to this organic component, GP points presently used in dentistry also contain inorganic compounds: zinc-oxide and metal sulfates [3]. Owing to its favorable biological and physical properties, gutta-percha is the most widely used root canal obturation material. However, due to the nonadherence to the root canal dentin and noncompliance with the shape of the prepared canal, GP points are always used in conjunction with a sealer (paste) [4]. In dentistry, gutta-percha  $\alpha$  and  $\beta$  are particularly relevant. The  $\beta$  form is usually used for manufacturing GP cones, as it is less brittle, whereas the  $\alpha$  form is preferred for use in injection techniques owing to its



favorable fluid characteristics. Gutta-percha composition differs significantly across products, resulting in their distinct properties, such as brittleness, stiffness, tensile strength, flow, tension, and thermal behavior [5]. Gutta-percha points of different lengths, diameters and tapering degrees are manufactured. While tapering can be standardized (2%, adhering to ISO 6877), additional dimensions can be obtained, such as when greater tapering and nominal size are required for lateral compression, or variable tapering (4-12%) is used in conjunction with mechanical Ni-Ti instruments. Similarly, gutta-percha points can be used for compaction, whereby tapering corresponds to that of the hand-held compactors.

For root canal obturation, cold gutta-percha can be used in combination with a sealer (paste). Owing to its thermoplastic properties, it can also be used in a heated state, which allows more precise adaptation to the root canal shape. As gutta-percha does not adhere to the root canal walls, it must be used in combination with a sealer. While no toxic reactions to the material have been reported in extant literature, allergic reactions are extremely rare [6]. Gutta-percha cones should be kept in cool and dark conditions to prevent hardening and increased brittleness. It can be removed from the root canal mechanically (by using manually operated and mechanical instruments) and by applying organic solvents (such as eucalyptus oil).

Resilon cones. Resilon is a thermoplastic synthetic copolymer consisting of polycaprolactone and urethane methacrylate [7]. Like gutta-percha, it can be thermo-compacted. It chemically binds to methacrylate sealers via dimethacrylate. In conjunction with a suitable sealer (Epiphany), it is posited to promote formation of a solid "monoblock," even though this is disputed [8]. Furthermore, in a clinical trial, 5.7 times greater therapy failure rate was recorded for teeth with root canals obturated using Resilon cones and Epiphany sealer compared to those in which gutta-percha cones and sealers were used [9]. This evidence indicates that these cones should not be used.

### **Sealers (pastes) for root canal obturation**

In obturation, sealers are used to fill gaps and irregularities in the narrow space between the gutta-percha point and the root canal walls. If sealers are applied without the cone, leakages are significantly increased, as pores are created due to their contraction during bonding. In addition, when a thick layer is applied, this increases their solubility. Hence, they should be used in necessary quantities only. According to their chemical composition, sealers can be classified into those based on zinc-oxide eugenol, calcium hydroxide, glass-ionomer cement, epoxy resin, methacrylic resin, mineral trioxide aggregate (MTA), silicone, and bioceramics [10]. Each of these sealers has some advantages and disadvantages.

Zinc-oxide eugenol (ZOE) sealers have been in use for many years, resulting in considerable clinical experience with this material. Their properties are: moderate sealing, solubility in liquids, long-term cytotoxicity (if formaldehyde is released) and the possibility of sensitization. European Society of Endodontology (ESE) does not approve use of formaldehyde-releasing ZOE sealers [11].

Sealers based on calcium-hydroxide are biologically very good materials. When freshly mixed, they exhibit significant antimicrobial properties and actively support apical healing [12]. In addition, as they release calcium-hydroxide, this can lead to their decomposition. On the other hand, when bonded, filling integrity is maintained, and calcium-hydroxide is no longer released (no further effects are exhibited). Antibacterial activity is initially prominent, and there is a risk of dissolution as a function of time.

Sealers based on glass-ionomers are susceptible to moisture during setting, which affects the leakage in the vicinity of these materials. Creation of pores (porosity) is an additional problem. These materials reinforce the root through chemical binding to the dentin.

Sealers based on epoxy resin have good mechanical properties and provide satisfactory sealing. Allergic reactions are rare, while their antimicrobial properties are pronounced, particularly when in freshly mixed state. Cytotoxicity is moderate to low. These materials have been in use for more than 40 years. They are easy to manipulate.

Sealers based on methacrylic resin represent an attempt to apply an adhesive material used in restorative dentistry to the root canal system. Due to the specificity of this area, use of these materials for the purpose of obturation is not without problems [8,9].

Sealers based on mineral trioxide aggregate (MTA) were first introduced in 1993. as materials for closing the root apex [13]. They aid in the repair of hard tissue at the apex of the root, and in places where the pulp is exposed.

Silicone-based sealers were introduced in 1984. While they produce little leakage and are completely non-toxic, they do not exhibit any antibacterial activity. Limited clinical data is available.

Sealers based on bioceramics exhibit lower porosity, provide good root canal seal and are highly biocompatible. Due to the reaction with the dentin, biomineralization occurs [14].

### **Root canal obturation techniques**

Obturation of the instrumented root canal is the final step of endodontic therapy. The aim of obturation is to prevent entry, growth and reproduction of microorganisms in the empty spaces that resulted from the instrumentation procedure [1]. Filling closes the wound, which will be covered by the healthy tissue toward the periapex. A variety of obturation techniques have been developed, each with its advantages and disadvantages. At present, none achieves ideal canal filling. Obturation with cold and hot gutta-percha is presently most widely utilized.

Cold gutta-percha obturation. This technique consists of inserting one or more GP points in the root canal into which sealer was previously placed. Monocone technique involves placing a single gutta-percha point in the root canal filled with sealer. It is quick and simple, but as the gutta-percha form does not correspond to the shape of the prepared canal, a significant quantity of the sealer remains within [1]. This has resulted in a modification of this technique, referred to as “cone fitted,” whereby the canal is filled with sealer and gutta-percha, the shape of which is aligned with that of the prepared root canal.

Cold lateral compaction is a widespread and effective technique, but it is time-consuming and carries the risk of filling non-homogeneity as well as root fracture [15].

Hot gutta-percha obturation. Heated gutta-percha better adapts to the root canal shape, which results in greater homogeneity, and minimizes the amount of sealer required [15]. Gutta-percha temperature can be raised using heated instruments. Similarly, melted gutta-percha can be injected into the root canal, or it can be heated in a special device on the plastic carrier, which remains as a part of the obturation [1].

### **Conclusion.**

Extant research is insufficient for identifying the most optimal obturation technique in particular conditions (canal anatomy, apical constriction, and the preparation form). Thus, it is preferable that the clinician practitioners one or two of the techniques described herein. It is necessary to highlight that no technique can compensate for inadequate root canal preparation.

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# ANTIMICROBIAL GLASS IONOMER CEMENTS, REALITY OR FICTION

**Aleksandar Dimkov**

## **Biography**

Dr Aleksandar Dimkov, DMD, MSc, PhD, is a teaching assistant with the Department of Pediatric and Preventive Dentistry of “St. Panteleimon” Dental Clinical Center and Faculty of Dental Medicine of the “Ss Cyril and Methodius” University, Skopje, Republic of Macedonia. He is the author or co-author of more than sixty professional and scientific papers. The areas of his scientific research are dental biomaterials and microbiology of dental tissues and oral cavity.

## **Abstract**

The glass-ionomer cements, possessing the positive characteristics of fluorine in the processes of re-mineralization and antimicrobial action, distinguish themselves as the most acceptable restorative materials. A vast number of studies have established that conventional and resin-modified GICs have the ability for slow and sustainable release of fluorides over long time periods. Because fluorine exhibits antimicrobial effects, glass-ionomer cements could be easily recognized to have an additional very significant characteristic - an antimicrobial effect. In addition to the release of fluoride ions, and in order to improve the antimicrobial characteristics, GICs can potentially be used as templates for the release of other active antimicrobial components. The most used antimicrobial agent to be incorporated in glass-ionomer cements in different concentrations and different percental ratios is Chlorhexidine. Unfortunately, reference data on the incorporation of other antimicrobial components in GICs is very scarce. Although some antimicrobial agents have a confirmed effect in the reduction of the cariogenic salivary flora when used in rinses or toothpastes, the results regarding their incorporation in glass-ionomer cements are still scanty. The main aim of this presentation is the answer the question, can we obtain antimicrobial GIC-s and improve their characteristics with other antimicrobial components than chlorhexidine.

**Key words:** glass ionomer cements, antimicrobial agents, cariogenic microorganisms

Because of the relatively frequent occurrence of recurrent caries after a restorative treatment, and because of the huge number of cariogenic microorganisms present in the oral cavity, which present a potential risk-factor regarding the development of new carious lesions, attention has increasingly been directed toward therapeutic antimicrobial effects of restorative materials. In addition to the release of fluoride ions, GICs can potentially be used as templates for the release of other active antimicrobial components. Unfortunately, there is a very low number of data in the literature referring to the incorporation of other antimicrobial components in GICs. Although a part of them have a confirmed effect in the reduction of cariogenic salivary flora when used in rinses or toothpastes, the results regarding their incorporation in glass-ionomer cements are still scarce.

With respect to the fact that contemporary dental science considers dental decay to be a chronically developing infection caused, above all, because of normal commensally oral flora, the microbiological definition defines the dental decay as a localized destruction of dental tissues caused by microorganisms. Antimicrobial agents are chemical compounds or substances that kill microorganisms or inhibit their growth. From a preventive viewpoint there is an enormous number of products, both commercial and professional, which have in their structure one or several different antimicrobial components. As main examples we could cite Fluorine, Chlorhexidine, Cetylpyridinium Chloride, Benzalkonium Chloride, Triclosan, Listerine, and

Xylitol. Cetylpyridinium Chloride (CPC), as an active component of oral antiseptics, has a broad antimicrobial spectrum with a strong bactericidal effect on *gram*<sup>+</sup> pathogens and a fungicidal effect on fungi. Its effectiveness against *gram*<sup>-</sup> pathogens and mycobacterium is questionable. Benzalkonium Chloride (BZK) is the major antimicrobial means in numerous toothpastes and rinses with strong antimicrobial effect against large number of microorganisms.

The main goal of this study was to obtain an antimicrobial glass ionomer cement which will satisfy all characteristics of glass-ionomer cements, but will also act in an antimicrobial manner on the cariogenic flora. The assigned goal was realized with the following biochemical, mechanical and microbiological analysis:

- Incorporating various concentrations of antimicrobial components into commercial glass-ionomer cements;
- Determining the level of release of fluoride and chloride ions from commercial glass-ionomer cements in a medium of deionised water in different time periods using ion selective electrodes (cumulative effect);
- Measuring the quantity of released antimicrobial components from the commercial and from the experimental glass-ionomer cements previously incorporated with different concentrations of antimicrobial agents, using UV visible spectrophotometry;
- Determining the effects of incorporated antimicrobial components on the mechanical characteristics of the commercial glass-ionomer cements through determination of the compressive strength;
- Determining the effects of incorporated antimicrobial components on the physical characteristics of the commercial glass-ionomer cements through measurements of the setting time;
- Determining and comparison of the inhibition zones of glass-ionomer cements incorporated with antimicrobial agents on cariogenic microorganisms (*Streptococcus mutans*, *Lactobacillus species* and *Actinomyces viscosus*);

To accomplish the set goal, we used: conventional commercially available glass-ionomer cements, antimicrobial compounds, factory prepared colonies of microorganisms and bacterial growth mediums. The conventional glass-ionomers were ChemFlex and Fuji IX. The used antimicrobial agents were Cetylpyridinium Chloride and Benzalkonium Chloride. In the microbiological analysis we used *Streptococcus mutans* (ATCC – 25175), *Lactobacillus casei* (ATCC – 4646) and *Actinomyces viscosus* (ATCC – 19246). As bacterial growth mediums we used Brain Heart Infusion broth, ready to use growth medium for lyophilize stocks refreshing, for preparing the bacterial inoculums and for the subcultivation of the species – 96 growth mediums in total; Shaedler agar with addition of sheep blood, ready to use Petri dishes with a diameter of 90 mm. For the agar diffusion test we used 144 hard growth mediums.

The specimens of GICs without antimicrobial agents were prepared by mixing certain amount of powder and liquid on mixing glass plates by means of a metal trowel (according to the manufacturers' instructions for each of the glass-ionomer cements used). The freshly mixed paste was put into 6 mm high metal molds having 4 mm in diameter. The molds had been closed by metal plates on both sides, placed in special clamps and then placed in an incubator at 37°C for one hour (maturation time). After their removal from the incubator, the specimens were taken out from the clamps and molds, and stored individually in separate marked plastic tubes with 5 ml deionized water at a temperature of 22-24°C and at an air humidity of 40-50%. The antimicrobial compounds Benzalkonium Chloride and Cetylpyridinium Chloride were first incorporated into the glass-ionomer cement's polyacrylic acid by mixing, and then the powder was added gradually, to the previously prepared acid and antimicrobial compound mixture, and they were mixed together until complete saturation. The antimicrobial agents were added in strict portions of 1, 2 and 3 % of the weight of the cement. Preceding analyses had determined the concentrations of 1, 2 and 3 % of antimicrobial agents to be equivalent to 0.0022 g, 0.0044 g

and 0.0066 g of GIC ChemFlex, respectively, as well as 0.0032 g 0.0064 g and 0.0128 g of of GIC Fuji IX. For the chemical analysis 300 specimens were prepared in total.

The quantities of released chloride and fluoride ions were determined in a medium of deionised water using specific ion-selective electrodes at various time intervals as follows: immediately, after 15 minutes, after 30 minutes, 45 minutes, and after 1, 2, 3, 4, 24 and 48 hours, and after 4, 5, 6 and 7 days.

The determination of the quantity of the antimicrobial agents was done by a UV-vis Spectrophotometer, set to a detection wavelength of maximal absorption (214 nm) for Benzalkonium Chloride, and 259 nm for Cetylpyridinium Chloride. The measurements were conducted in 9 consequent time intervals: after 15 minutes, after 30 minutes, 45 minutes, and after 1, 2, 3, 4, 24 and after 7 days. During the entire period, the deionized water, where the samples had been stored, was not changed (cumulative effect).

The determination of the setting time was done using a Gilmore needle.

The specimens for the compressive strength determination were prepared in the same way as the specimens for the chemical analysis, described previously. After preparation, the specimens were stored individually in separate marked plastic tubes with 5 ml deionized water at a temperature of 22-24°C for 24 hours. The compressive strength was measured with the Instron Universal Testing Machine, with a cross-head speed of 1 mm/min.

The bacterial strains were inoculated into BHIB, and incubated in the anaerobic atmosphere at 37°C for 48h. In the liquid growth mediums, the density of the inoculums were adjusted equivalent on McFarland 2 standard. In previously marked Shaedler agar, 350 µL bacterial suspension were equally spread, using smear. After inoculation, and after a waiting period of 15 minutes for the agar plate to absorb the bacterial suspension, sterile plastic tubes were used to make wells, 3 mm deep and 3.5 mm wide, into the agar plate. A total of 7 wells were prepared on each dish, 6 along the perimeter and one in the center. The distance between the wells was 30 mm, and the distance between the wells and wall of the dish was 15 mm. On each dish, three specimens having 1, 2 and 3% of CPC, respectively, and another three samples having the corresponding percentages of BZK were applied, along with one control sample in the center. The Petri dishes were left for 30 min at room temperature, and incubated anaerobically at 37°C for 48 hours. The first reading of the inhibitory effect was denoted as the effect at zero time. The sizes of the inhibition zones were calculated by subtracting the diameter of the specimen (4 mm) from the diameters of the zones of inhibition produced around the specimens, which were measured with a special instrument. A total of 252 specimens were prepared.

The releasing of chloride ions from both glass-ionomer cements incorporated with antimicrobial compounds is proportional to the increase in their concentration. GICs without antimicrobial agents release chloride ions, but in lower amounts. Comparing the same concentrations of the antimicrobial agents from GICs, higher chloride release is found out from 1% BZK, and from 2% and 3% – CPC, incorporated in ChemFlex, and all BZK concentrations incorporated in Fuji IX. Glass-ionomer cement Fuji IX in average releases more chloride ions than ChemFlex, while the highest individual release of the same ions among all combinations, are seen from ChemFlex + 3% CPC.

The releasing of fluoride ions from both analyzed glass-ionomer cements incorporated with antimicrobial compounds, is reciprocal to the increase in their concentration, except in ChemFlex + BZK. GICs without incorporated antimicrobial agents, release fluoride ions in higher amounts. Comparing the same concentrations of the antimicrobial agents from GICs, higher fluoride release is found out from 1% and 2% CPC and from 3% BZK incorporated in ChemFlex, and from all BZK concentrations incorporated in Fuji IX. Glass-ionomer cement ChemFlex in average releases more fluoride ions than Fuji IX. Comparing both glass-ionomer cements without antimicrobial agents, in average, Fuji IX releases more chloride but, ChemFlex releases more fluoride ions.

The glass-ionomers continuously released both antimicrobial agents with amounts which were proportional to the periods, and the concentrations respectively, with the exception of Fuji

IX + BZK. Comparing the equal concentrations of the antimicrobial agents, ChemFlex exhibits a higher release of 1% and 2% BZK, and 3% of CPC in average, while Fuji IX demonstrates a higher amount of BZK in all concentrations. Comparing both combinations of glass-ionomer cements/antimicrobial agents, Fuji IX releases more antimicrobial compounds than ChemFlex, in average. GIC Fuji IX for 1% BZK exhibits the highest individual release, while the same cement for 1% CPC exhibits the lowest release of the agents.

The increase in the antimicrobial agents concentration leads to a decrease in the specimens compressive strength, except for the ChemFlex/BZK combinations. The combinations of both GICs with BZK exhibit higher compressive strengths than the combinations with CPC in the average. Fuji IX + BZK gives the highest average value of compressive strength among all combinations, while the weakest compressive strength is seen for the combination of ChemFlex + CPC.

Higher concentrations of the antimicrobial agents cause larger inhibition zones for all three analyzed microorganisms. Glas-ionomer cements without antimicrobial agents produce either very small inhibition zones or none at all. On the basis of the effect of antimicrobial agents on analyzed bacteria, the following can be concluded: ChemFlex/BZK has the best effect on *Streptococcus mutans* and *Actinomyces viscosus*, while Fuji IX/CPC has the worst. ChemFlex/BZK also has the best effect on *Lactobacillus casei*, but in this case the worst combination is ChemFlex/CPC. The antimicrobial compound Benzalkonium Chloride has a stronger effect than Cetylpyridinium Chloride, but GIC ChemFlex has a higher antimicrobial compound release than Fuji IX, that, and in general we can conclude that the combination ChemFlex/BZK has the strongest effect on all cariogenic microorganisms, while the combination Fuji IX/CPC has the weakest one.

At the end, after all conducted analysis and measurements, we can say that creating of antimicrobial glass ionomer cements are not fiction but reality.

## **INDIRECT RESTORATIONS- PRIORITIES OR OPPORTUNITIES IN ERA OF AESTHETIC DENTISTRY**

**Doc. dr Bojana Milekic**

Dental Clinic of Vojvodina, Faculty of Medicine Novi Sad

### **ABSTRACT:**

The aim of this paper was to present the variety of restorative treatments in era of modern dentistry. Determination of proper choices and indications is not always easy. Composite and ceramic dental restorations are possible choices not only in visible region of dentures but also in region of premolars and molars. It's an exciting time in dentistry as technology continues to provide us with more and better options to offer to our patients. The great challenge is to stay up-to-date with this technology and understand the indications and contraindications of each material so that we can consistently provide patients with the best that modern dentistry has to offer.

One of the main principles of the restorative procedures is based on minimally invasive techniques with the aim of preserving as much as possible of healthy dental tissue for potential future restorations, especially in young patients. That is the main reason for choosing indirect restoration as a primary solution. These restorations are aesthetically and functionally acceptable solution in following cases: correction of color, shape and size of the tooth, dental fractures, diastema closure so as for enamel defects caused by attrition, erosion and congenital malformations but also in order to correct bite and occlusion. These are as follows: inlays, onlays, overlays and veneers.

Conclusion: It should be noted that universal and conventional solutions such as composite filling or crowns, especially in cases that have other therapeutic solutions, are not always the best option. Natural look, functionality and "Perfect Smile" are the imperatives nowadays. Indirect composite and ceramic restorations present the perfect alternative to composite fillings and crowns in a way of achieving all requirements of modern restorative dentistry. Indirect restorations are not the question of therapeutic considerations but priority in dental practice that puts dental professional above the level of ordinary dentistry, on the level of the professional virtuoso.

**KEY WORDS:** Inlay, Onlay, Overlay, Ceramic and composite veneers

Modern reconstructive dentistry is considered as bioesthetic discipline nowadays. Availability of contemporary materials so as technical and technological progress in era of aesthetic dentistry, offers clinician many possibilities so as challenges. Development of dental materials so as the improvements of adhesive techniques positively affects application of new composite and ceramic systems (1). Clinicians are more often faced with different treatment choices. On the other hand, rapid development of therapeutic clinical procedures so as restorative dental materials gives opportunities for offering patients wide spectrum of therapeutic modalities. That range of available opportunities can become confusing. Therefore it is important for dentists so as for the patients to be well informed regard this options.

It's an exciting time in dentistry as technology continues to provide us with more and better options to offer to our patients. The great challenge is to stay up-to-date with this technology and understand the indications and contraindications of each material so that we can consistently provide patients with the best that modern dentistry has to offer. One of the main principles of the restorative procedures is based on minimally invasive techniques with the aim of preserving as much as possible of healthy dental tissue for potential future restorations,



especially in young patients. That is the main reason for choosing indirect restoration as a primary solution. These restorations are aesthetically and functionally acceptable solution in following cases: correction of color, shape and size of the tooth, dental fractures, diastema closure so as for enamel defects caused by attrition, erosion and congenital malformations but also in order to correct bite and occlusion. These are as follows: inlays, onlays, overlays and veneers. Commonly used materials for indirect restorations are gold, composite, ceramics (2).

Inlay is dental restoration incorporated in the tooth by intracoronary retention. Contrariwise, Onlay is dental restoration that repairs the region of one or more dental cusps. It repairs huge defects of dental crown by covering large portions of hard dental tissue. The precise differences among these restorations are often hard to define and indications for such restorations were limited in the past. Principles of preparation for composite and ceramic restorations are basically the same. Special consideration should be given to the shallow and narrow cavities, too thin restorations, cases with complex occlusion, parafunctional habits and bruxism so as appropriate conditions for adhesive cementation protocol. Special requirements regard preparations are related to CAD/CAM ceramic Inlays so that axial walls of restoration can be slightly undermined, the edge that separates horizontal from pulp wall of restoration must be rounded and its surface is plane. It is of great importance to calibrate the size and the shape of burs with preparation path (3).

Improvement of adhesive techniques and systems for indirect restorations is focused on elimination of deficiency regard direct composite restorations such as: polymerization contraction, hygroscopic expansion, dimensional stability over time, reduction of marginal cracks and microscopic fractures of hard dental tissue with all its consequences. Development of modern materials for indirect composite veneers is focused on optimal physical characteristics, extraordinary esthetics, great finishing characteristics and flexibility. Materials used for these types of restorations nowadays are last generation composites, hybrid composites, nano composites and composite ceramic materials. Indications for these restorations are expanded. They are characterized with aesthetic qualities, stability of enamel color, natural shine and opalescence.

Both, composite and ceramic veneers, has similar indications and both belongs to the group of aesthetic restorative materials that are bonded to hard dental tissue by adhesive system. With this type of restorations we are able to preserve and prolong the life of patient's hard dental tissue. Indirect composite veneers are more affordable to the patients than ceramic their adaptation is much simpler they are resistant to abrasion and more suitable for young population. All of these are important but not crucial fact when we are choosing the right material for restoration. It should be kept in mind that composites are prone to color change in timeframe, they have lower degree of hardness and high degree of contraction so as overall shorter life expectancy. Therefore, the decision in choosing the right material should be made after individual assessment of oral cavity in each patient i.e. dental status and soft tissue condition, relation of time consumption, price and expected results. When there are fillings present on one or two surfaces spreading on vestibular surface that is the case in which composite veneer is much desirable solution. In the cases where no color changes are required preparation of demarcation is possible at gingival level. On the other hand, if we're changing the color of the tooth with future ceramic restoration it is more desirable to place the marginal demarcation in gingival sulcus.

The lifetime of composite veneers is estimated to period of 3-6 years, while for ceramic veneers this period is slightly longer. Endurance of composite veneers is variable in range of 25-86% in first three years. After the cementation of both, composite and ceramic veneers, both groups of patients are expressing similar satisfaction in first two years, but after this timeframe patients with ceramic veneers are happier with their restorations (1,4).

Respecting protocol in this case is crucial. Preliminary procedure has great significance on success rate of overall procedure. Careful introduction of patient with entire procedure and all details regard future restoration with patient's active collaboration is one of them. It is not ethical

to make decisions for the patient but instead to inform them possibility to choose for themselves. With that in mind it is useful for both, doctor and the patient, to use available digital stimulations of further restorations and patient's look so as photographs and wax models known as wax-up. These features will be useful in creating the silicon key that help us in checking the amount of hard dental tissue that should be removed and for creating a mock-up i.e. the prototype of future restoration made of composite or acrylate as a temporary restoration. Depending on decision on final restoration the adjustments of the preparation are made. The impressions could be taken with elastomers, polysulfides, polyethers and addition silicones- polyvinylsiloxanes. Monophase impression technique is recommended (5,6). When its necessary gingival sulcus should be treated before impression is taken with two different cords. Slim, silk cord is left in the sulcus until the impression is taken while the thicker cord is left in sulcus for 3-5 minutes until it absorbs the fluid. In CAD/CAM procedures the method of optical impression is used. After the preparation teeth are scanned by intraoral camera. Software is creating a virtual model that is used for creating future restoration that is ready for the cementation after few hours. Discussion on the topic of indirect restorations would be incomplete without mentioning CAD/CAM technology that provides aesthetically and technically precise product with minimal time consumption (2,7).

Before cementation of final restoration it is necessary to provide a temporary restoration made of composite or acrylate. It can be made directly in patient's mouth by polymerization with on layer technique or indirectly in dental laboratory. Procedure of cementation of temporary restoration is consisted of etching one small area of the vestibular surface followed by bonding procedure of the same area. That way the strength of bond is strong enough to keep the restoration in its place but also allows it's simple removal (8).

Second appointment is reserved for checking the final restoration without a pressure with assessment of marginal closure, morphology, color and occlusion followed with cementation. All parameter is checked since it is the part of entire treatment. Final restoration is cemented by adhesive protocol with composite cement. Final phase is related to polishing of restoration with rubbers and brushes with or without polishing paste. During polishing one should be very careful not to destroy the morphology of the restoration. Composites are prone to absorb water after polymerization and that is the reason of their color change through the time. This is the reason of final color evaluation few days after cementation. Patients are advised to wear dental splint (9,10).

Conclusion: The main aim of modern dentistry is still the same and is based on providing the best possible treatment for each patient. Sometimes, patients refuse recommended treatment or they insist on procedures that are not the best option in their case. They sometimes even refuse recommended treatment but the most important is that they are well informed about therapeutic possibilities and that they have freedom to choose and make decisions for their treatment. It should be noted that universal and conventional solutions such as composite filling or crowns, especially in cases that have other therapeutic solutions, are not always the best option. Natural look, functionality and "Perfect Smile" are the imperatives nowadays. Indirect composite and ceramic restorations present the perfect alternative to composite fillings and crowns in a way of achieving all requirements of modern restorative dentistry. Indirect restorations are not the question of therapeutic considerations but priority in dental practice that puts dental professional above the level of ordinary dentistry, on the level of the professional virtuoso.

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## **CARIES IN PERMANENT DENTITION- DIAGNOSIS, THERAPY AND PROGNOSIS**

**Sedin Kobaslija**

Clinical approach in treatment of caries in permanent dentition is very challenging including diagnosis, therapy and prognosis of affected teeth. Patient age is additional obstacle that might complicate treatment approach. Therefore, adequate treatment that follows all evidence based measures and techniques for diagnosis, therapy and prognosis of caries presents set of necessary measures to obtain adequate clinical resolution. For optimal treatment is necessary to use contemporary diagnostic methods, adequate materials and techniques, proper psychological approach to the patient, and high educated physician. Only if those elements are included in unique clinical approach, complete treatment of caries lesion in permanent teeth could be obtained with achievement of optimal restauration and adequate clinical outcome for all patients.

## ETIOLOGY, CLINICAL FEATURES AND THE POSSIBILITY OF CONSERVATIVE TREATMENT OF DENTAL EROSION

**Branislava Velicki-Bozejac, Ph.D.**

Dental clinic "Dentaland", Novi Sad

Dental erosion and tooth wear of the teeth are changes that were observed at the beginning of the last century. However, the etiological factors that lead to the formation of dental erosion were determined much later. For the diagnosis of dental erosion and the assessment of its severity, numerous indices of erosive tooth wear are currently available, but their therapy is still a problem itself. In spite of commonly accepted preventive measures that are now more clearly defined and recommended to the patient, clinicians are often concerned whether to select the performance of the composite or prosthetic rehabilitation of erosion. The aim of this lecture is to highlight possible ways of conservative rehabilitation of erosion.

Dental erosion is an irreversible loss of hard dental tissue, often caused by long-term repeated action of acid which dissolves the surface layer of the crystal structure of hydroxyapatite and fluoroapatite, where the aggressive noxa is not of bacterial origin. It was first mentioned in the nineteenth century, but it was as late as in the mid-nineties of the twentieth century that the study of dental erosion expanded considerably. The prevalence of dental erosion varies between 16 and 28%.

In addition to erosion, loss of carious dental hard tissue includes attrition, abrasion and abfraction, the only difference between them being the way they were formed. Abrasion is thus defined as a pathological loss of hard tooth tissue caused by abnormal mechanical process, which include the presence of a real object or of the substance repeatedly taken and present in the oral cavity. Attrition is defined as a physiological loss of dental tissue caused by tooth-to-tooth contact without the presence of foreign substances. Abfraction is a stress generated occlusion, which can result in enamel cracking in the areas where it is the thinnest, in other words – in the cervical parts of the dental crown.

The modern industrial age has changed the way of life and consequently the diet. Hard, healthy types of food have been replaced by soft and acidic ones, resulting in the decrease of abrasive dental changes as well as in a drastic increase of dental erosions.

The etiology of dental erosion involves chronic exposure to external and internal teeth acids. Depending on the origin of the acid, the erosion can be endogenous, exogenous and idiopathic. Endogenous erosion develops as a result of the the presence of gastric hydrochlorid acids in the oral cavity. They are formed due to frequent vomiting (once a week or more), induced mental disorders, such as anorexia and bulimia, or due to the return of gastric contents related to disturbances in the gastrointestinal tract, such as gastroesophageal reflux. The gastric acid has a much lower pH than the critical value of pH that causes the dissolution of enamel, which means that prolonged reflux of hydrochlorid acid in the oral cavity may cause a large loss of tooth structure.

Exogenous erosions are caused by acids which have been introduced into the oral cavity, usually by consumption of acid food and drinks, such as citrus fruits, fruit juices, beverages, and acidic energy beverages. This includes some medicaments, as well as supplements, such as effervescent vitamin C, vitamin C in the chewable tablets, or beverages that contain iron.

Idiopathic erosion occurs when the origin of the acid cannot be precisely determined. In addition to these factors, the formation of dental erosion may be caused by chemical and biological factors, as well as by behavior and habits of the patient.

Chemical factors that influence the erosive potential of food and beverage are the following: pH value and buffering capacity of the product to the tooth surface, the chelation properties of the product and concentrations of calcium, phosphate and fluoride. The acidity of

the oral environment is directly dependent on the degree of presence of acid products, on the elimination rate and the possibility of neutralizing the acids. The basic cause of demineralization of the enamel surface, and consequently – of the formation of the defect is the existence of the critical value of pH in the mouth, which is 5,5 for the enamel. Biological factors that lead to the occurrence of erosion are: flow rate and the composition of saliva, the creation of the dental pellicle, the composition and the anatomy of the teeth, and the position of the teeth (in correlation with the soft tissues and the tongue). Saliva is the most important biological factor in the prevention of dental erosions and it plays an important role in formation of a protective membrane, which reduces the degree of demineralization and enables remineralization of its constituting elements – calcium ions, phosphate and fluoride. Dryness of the mouth can occur as a result of taking certain medications: antihistamines, antiemetics and inhaled drugs for the treatment of asthma.

Habits and behavior of the patient include the following: input method of consuming acidic foods (quick sipping or keeping sips within the mouth), the length of exposure to the acidic effects, the frequency and excessive intake of an erosive agent and improper oral hygiene. The occurrence of erosion (both in eroded and healthy teeth) is affected by brushing teeth with a hard toothbrush (applying strong pressure) and by the use of a toothpaste with abrasive particles.

Dental erosion also occurs among drug addicts (cocaine and ecstasy) who tend to consume large quantities of acidic drinks due to dehydration and hypo salivation. Erosions are often classified as occupational diseases that affect those who test daily wine or people who work in factories, exposed to evaporation of industrial acids. Among athletes, such as professional swimmers, divers and water-polo players, dental erosions result from the presence of chlorine in swimming pools, as well as from low pH values of water.

Dental erosions can affect all tooth surfaces, and usually manifest themselves in the labial surfaces of the upper teeth (incisors and canines), and occlusal surfaces of the first lower molars. Such distribution can be explained, to some extent, by the protective role of saliva that is more efficient in preserving the teeth that are closer to the discharge gate salivary glands (the lower front teeth and upper molars). The first sign of erosive tooth wear can be seen as a change in the optical properties of the enamel – it becomes smooth, silky shiny and glassy. Convex surfaces become less convex and concave are deepening, with transparency and the contouring of enamel-dentin border. As erosion progresses, occlusal surfaces become rounded, crown cusps are getting lower, making current fillings higher, while the incisal edge is getting dentated and worn out. Consequently, the vertical dimension of the teeth is getting lower with a growing hypersensitivity and a large part of the hard tissue volume is getting lost, which in severe cases can progress to the pulp. In the case of the reflux of stomach acid into the esophagus through the mouth, palatal surfaces will be affected initially, followed by the other surfaces of the tooth, so that in severe forms of erosion, the morphology of the tooth crown can totally disappear.

Unlike dental erosion that takes place at the level of tooth enamel and anatomy of the tooth crown, V-defects, always occur at the level of dental cement in the root canal anatomy. Sometimes a combination of dental erosion and wedge defect of the teeth can be diagnosed and the reasons are always multifactorial.

In the initial stages of dental erosion formation, while only the enamel is affected, there are no symptoms of sensitivity. However, with the advanced demineralization of the teeth, which affects the dentin, there is a symptom of dentine hypersensitivity. Dentine hypersensitivity is a common sensation and a common symptom that occurs on the teeth of a large number of people with erosive changes. The only symptom of dentin hypersensitivity is the pain, which is short-lived, glaring, sharp or stabbing and occurs when taking chilled or acidic foods and drinks, but also during tooth brushing.

The diagnosis of dental erosion requires considerable clinical experience and a clinical picture of lesions. In the beginning, there are almost no symptoms. To successfully diagnose dental erosion and stop erosive processes, it is essential to detect the etiological factors, as follows: by taking a detailed medical and dental histories; by recognizing the specific distribution of non-carious

lesions; by assessing erosive potential following the diet for at least four days; by determining the buffer capacity and the amount of saliva; by determining the value of the index BEWE (the basic erosive wear examination); by image analysis, i.e. a photo of the teeth and working models of upper and lower jaws of the patient; by examining the oral hygiene of the patient related to the brushing technique; by examining the use of an oral hygiene product and talking about possible exposure to acids (related to the workplace or playing sports).

In the treatment of dental erosion, the cause of its origin must first be eliminated, which may include: a change in eating habits, in terms of reducing the frequency of consumption of acids; an increase in saliva secretion by using secretion stimulators or salivary substitutes; a stimulation of enamel remineralisation by using supplements with a high concentration of fluoride and calcium; proper oral hygiene by using primary and auxiliary agents as well as the correct brushing technique; regular dental examinations every 6 months for the prevention of diseases, along with efforts made to educate and motivate the patient to adopt preventative measures.

Restorative procedures may be necessary due to: the inability to reduce the progression of lesions by removing the causative factors; aesthetic problem caused by the lesion; dentin hypersensitivity and strengthening the tooth structure and integrity with respect to the depth and bulking of the lesion.

In order to solve dental erosions, possible problems might be related to: the location of the lesions – the vestibular, occlusal or incisal sides; ability to provide a dry working field (if the lesion is supragingival or subgingival); the skill of the clinician; the bond strength of the adhesive systems for non-carious and sclerotic dentin; good pre-treatment of the dentin; lack of space for the optimal material.

Restorative plan should be adapted to the loss of the tooth structure, which, according to the latest guidelines, are divided into: loss of vertical dimension < 0,5 mm and loss of vertical dimension > 0,5 mm.

In restoring dental erosion, the materials of choice that have proven to be effective are: composite materials, glass-ionomer cements, resin-modified glass-ionomer cements, compomers, ready-made composite veneers, ceramic veneers and ceramic inlay.

The essential feature and at the same time, the advantage of a modern therapeutic approach involves minimally invasive adhesive restorative procedures, which can aesthetically reconstruct cervical lesions.

The treatment is necessary at an early stage of erosive loss, to prevent the development of functional and aesthetic problems. A shallow and hypersensitive lesions can be initially treated only by coating and applying varnish and fluoride pastes for desensitization as well as self-etching adhesives. Clinical experience has shown a significant reduction of hypersensitivity after adhesive application and periodic repetition of this procedure.

Liquid and microfills are recommended for cervical lesions, because they have greater flexibility and less stiffness, and are thus easier to adapt to changes in the cervical region caused by loading forces of chewing.

Another material that can be used is glass-ionomer cement (GIC). Surface traditional GIC may be impaired under the influence of acidic foods and beverages, while the resin-modified GIC is much more resistant as well as aesthetically better, thus more commonly used. As compared with the composites, and ceramics, the advantage of GIC is reflected in the release of fluoride ion, and therefore in cases of extremely eroded dentine (if loss of cement extends in the area), the recommended technique is the „sandwich“ technique, in which the GIC replaces the lost dentine. Yet, in the areas of stronger stress, due to relatively poor mechanical and aesthetic properties of GIC, the composite material is recommended as the material of choice. The composite material on the surface of the tooth enables high surface polishing, durability, and increased resistance to erosion and abrasion.

Modern composite materials are much better, and ensure sustainability of teeth exposed to increased chewing forces. Before etching, the edge of the cavity in the enamel level should be

appropriately skewed, since it increases the bonding surface and the aesthetics of the work. What is recommended is prolonged etching of sclerotic dentin, but not skewing the gingival edge which ends in the cement.

Regardless of the high aesthetic quality of composite materials and the skill of the clinician, in larger lesions on vestibular side, particularly on the front teeth, boundaries between fillings and tooth structure can be detected over time resulting from the action of saliva and food in the mouth. This aesthetic disadvantage can be solved by placing the fabricated, pre-performed composite veneers whose advantages are the following: minimal grinding of teeth during the preparation, good protection of the entire vestibular side of the tooth, fast setup and excellent aesthetics. Such cases can also be treated with the use of ceramic veneers, the production of which takes longer and requires greater preparation of dental tissue.

As the teeth are wearing out, the surrounding tissue and alveolar bone are getting adjusted by alveolar compensation. Another problem in solving dental erosions is also a height loss of the tooth crown, because sometimes the teeth remain in occlusal contact, which causes problems in the reconstruction procedure, because there is not enough space for the material. In order to avoid a complete oral rehabilitation (prosthetic rehabilitation), orthodontics is commonly recommended and then - the restoring of the eroded teeth. Aesthetic corrections and filling of stripped enamel surfaces are often necessary after the orthodontic treatment.

Only after applying all available methods of solving the erosions conservatively, should the patient be referred to the prosthetic rehabilitation, or ceramic crowns and bridges. Patient education and practical introduction to the proper oral hygiene techniques and various exogenous and endogenous factors of erosion formation would result in reducing the prevalence of dental erosion. Especially important are the measures that should be taken in working with children and teenagers, in order to prevent premature loss of permanent dentition, and the appearance of other complication of dental system, which would greatly facilitate the restoration of the affected tooth erosion.

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# IMPLANT SUPPORTED CROWNS – REASONS OF CLINICAL FAILURES

Assistant professor Valentina Veselinović

## **Abstract**

*Implant supported crowns are a good alternative to conventional restorations on natural teeth. Beside high-quality osseo-integration, correctly made restoration and the bond between the implant and restoration are factors which contribute to the final value of implantoprosthetic therapy. The expansive development of implant prosthetics has caused the high degree of survival of prosthetic reconstructions supported by implants, with almost ideal results. Although the percentage of failure seems insignificant on the global level, it assumes great importance for the patient and doctor when they find themselves in the scope of this statistical percentage. Enormous striving of professional and scientific public is invested in defining the problems, which participate in the therapy failure, as well as their solving. It is believed that biological characteristics of peri-implant tissue, the depth of peri-implant sulcus and the type of the used cement play a significant role in the development of potential complications. With the aim of preventing the complications, it is necessary to act taking into consideration the following aspects: the control of cement volume, the prevention of cement's penetration into the peri-implant space, the usage of individual abutments with the correctly positioned demarcation and the redesign of the output profile.*

Implant-prosthetic therapy is an unavoidable part of contemporary dental clinical practice. Expansive development of implantology and implantoprosthetics in the last decades has caused the improvement in all segments of this field and the survival rate of implants amounts to impressive 98.6%<sup>1</sup>. Although the percentage of failures seems insignificant on the global level, it has enormous significance from the patient's and doctor's perspective. Great efforts of professional and scientific public are invested in defining the problems, which participate in therapy failure, as well as in surmounting them. A complex field of cements in implantoprosthetics, disregarding the technological advance, improvement of their performances and intense efforts to remove all the problems, which have been distinguished in the long-standing clinical practice, still hides in itself one part of responsibility for the therapy failure. The greatest percentage of failures is connected with mechanical and microbiological factors, which often work together<sup>2</sup>.

The connection between the implant and abutment, as well as the bond between the abutment and restoration are weak points of dental endosseal implants, because it is necessary to keep the continuity in these zones under the mastication forces, and to prevent the exposure to bacterial infiltration. In two-piece implants, notwithstanding the high precision of components, adhering in the motionless state, the appearance of micro-gap has been noticed, when the complex is exposed to masticatory forces, due to which we cannot speak about the sterility of the inner implant complex. The above mentioned fact cannot be attributed to loads which are created within the system components during the exposure to forces. Strain is, therefore, greater when the occlusal load of the restoration is more inadequate and the passivity of the restoration lying smaller. It is believed that it is impossible to achieve complete passivity in restorations which are fixed with screws. On the other hand, restorations tied with cements lie in a more passive way and due to that the creation of strain forces inside the abutment, implant and screw which connects them, is far smaller. Bacterial species from human saliva can infiltrate along the connection of implant components in both bonds, however, bonding with cements showed the lowest value of bacterial colonization<sup>3</sup>.

These facts most probably participate, to a great extent, in the formation and size of the gap which occurs between the components of the system. In the mentioned space, the reservoir of bacteria can be formed, which results in the inflammatory area of soft tissue near the bond<sup>4</sup>. This inadequate adhesion between the implant and abutment can be a risk factor, similar to that in weakly adjusted dental restorations, which can lead to clinical and microbiological changes in peri-implant tissues.

The bond between the abutment and restoration presents the place of risk for the infiltration with bacterial cultures. The value of quality of this bond is directly brought into connection with the type of the used cement, with its mechanical characteristics, first of all with the marginal resistance to melting. Damaging the intact quality of the cement border leads to cement melting and saliva and bacteria flow into the space between the restoration and abutment. On the one hand, the infection, which directly endangers the periodontal soft tissue, while on the other hand, due to cement melting it comes to the loss of retention and restoration stabilization. With the loss of integrity of the cement amortizing layer, the restoration does not lie passively on implant abutments anymore, due to which strains during mastication generate in the components of the implant system. The consequence is the enlargement of the gap between the abutment and implant, its consequential bacterial colonization, and the circle of infection formation inside the system and inflammatory reactions of soft and bone peri-implant tissue continues.

The problem of possible cement excess, which is difficult to remove, can be one of crucial causes of failure of implantoprosthetic therapy. The location of border between the restoration and abutment demarcation has the significant influence on the possibility of controlled removal of the excess cement. In borders which are placed more deeply, detection and removal of the cement surplus are considerably hindered<sup>5</sup>. Clinical and endoscopic signs of peri-implantitis disappear in 74% of tested implants after the removal of excess cement<sup>6</sup>.

However, the success of augmentation of the arisen defects of peri-implant tissues after treating the inflammation has a positive result only in 45% of cases. Regarding the clinical aspect, this means lagging of bone and soft tissues defects which is a suitable place for the development of new re-infection. The above mentioned facts make us conclude that all available means should be aimed at preventing the appearance of complications, and not at treating the consequences.

Although cementing is a routine procedure in conventional prosthetics, at the level of implantoprosthetics, it carries with itself a series of specificities and possible complications. The excess of cement and demarcation located subgingivally are met in conventional prosthetics every day, where they do not cause significant complications. On the other hand, the excess cement that was left during the procedure of cementing the restorations supported by implants presents the cause of one of the most difficult complications, peri-implantitis and it is the etiological factor of failure of implantoprosthetic therapy in as much as 59.6% of cases<sup>7</sup>.

The above mentioned phenomenon can be explained from a number of aspects:

**Biological characteristics of soft tissues around implants** – in contrast to the natural tooth, which possesses a regularly distributed network of periodontal fibers, with horizontally directed fibers incorporated directly into the cement tissue of the tooth root, as well as clearly defined bottom of the periodontal sulcus, in implant we cannot speak about a real connection, but simple adhesion of fibers onto the surface of the implant's neck. The network of collagen fibers of connective tissue is primarily circularly oriented and parallel to the implant's surface, encircling it as a ring. The real insertion of fibers does not exist because there is no cement on the surface of an implant<sup>8,9</sup>. This arrangement and attachment of collagen fibers conditions their separation from the implant's neck, under the pressure of excess cement during cementing, when a free passage is opened for the entrance of cement into deeper parts of peri-implant area.

**The depth of peri-implant sulcus** – the reason for a bigger cement accumulation in the sulcus of the peri-implant tissue in comparison to the sulcus of a natural tooth can be looked for

in the depth of sulcus, as well. During the preparation of a natural tooth for a crown, the demarcation line follows the contours of soft tissues, moving upwards coronally in the area of interdental papillas, so that the demarcation border is equal in depth in relation to the edge of the free gingiva. In contrast, demarcation border in standard abutment is flat and when such abutment is placed on the implant, demarcation is on different levels in relation to the free edge of gingiva. In the highest vestibular and oral parts, the border is at the level or up to 2 mm under the gingival level, whereas, due to the flat design, in approximal parts it can be located at the depth of even 4-7mm, in comparison to the highest point of interdental papilla.

It is clear that the removal of the excess cement around such deeply positioned cement border is almost impossible<sup>10</sup>.

With the aim of controlling the position of the cement border, manufacturing of individual crowns, whose demarcation specifically adjusts and follows the contours of patient's soft tissue, is recommended.

**The type of the used cement** – the gold standard in cementing restorations on implant abutment is the resin composite cement. These contemporary cements provide high quality retention and stabilization of the restoration in function during a long range of years. One of the basic advantages of composite cements in comparison to the other cements in implantoprosthodontics is that their edge is insoluble and their good marginal closing. The incorrect cementing technique can lead to the penetration of this cement into the peri-implant tissue, where it can cause significant complications<sup>11-14</sup>. Thanks to its insoluble quality, composite cement can persist for many years in the peri-implant area, acting as the formation on whose surface it comes to bacterial colonization and inflammatory response of the surrounding tissue. When composite cement finds itself in the peri-implant area, its biocompatibility becomes questionable. A large number of studies have proved cytotoxic influence of this cement on the bone cells and cells of soft tissue in the peri-implant area.

The excess cement under the pressure during cementing can penetrate to the bone level and even adhere to the implant surface, which is topographically modified by mechanical rasping and acid dissolving. When cement once adheres to the implant surface prepared in such a way, it is impossible to remove it without damaging the surface. The damaged surface of the implant is a suitable surface for bacteria adherence and forming of the microbe film, due to which the infection in perspective returns and the problem becomes persistent.

A really significant characteristic of cements used in implantoprosthodontics is their radio-contrast quality<sup>15</sup>. Although composite cements have the best performances regarding mechanical and esthetic features, their radio-contrast quality is questionable. It has been indisputably proved that cements with the zinc oxide content have the biggest radio-contrast quality. During the radio-analysis after cementing, the metal shade of the cement masks the possible remains of the cement in the peri-implant area, especially on the vestibular and oral parts in the peri-implant space.

The mechanism of preventing the cement penetration into the peri-implant area is complex and demands the combination of more different approaches:

1. Control of the cement's volume
2. Mechanical blockade of the cement's penetration apically
3. Usage of individual abutments
4. Redesign of the form of the output profile

**Control of the cement's volume** – Cement's volume check-up is one of the methods of preventing the cement's penetration into the peri-implant tissue. In that sense different techniques are recommended, such as the formation of ventilation opening on the lingual or palatal side of the restoration in order to remove a part of the cement in that way. [39] Numerous methods of extraoral cementing or the combination of extraoral and intraoral cementing have been recommended as well<sup>16-20</sup>.

**Mechanical blockade of the cement's penetration into the peri-implant area** – in order to prevent the penetration of cement apically, a teflon band can be placed around the implant's neck, which prevents the cement's impressing. When the restoration is put onto the bearing, the band is removed together with the excess cement. Placement of the retraction floss, aiming at preventing the cement's penetration apically, is not recommended. There is a real risk of damaging the epithelial attachment. It has been proved that the retraction floss allows the entrance of the cement into the peri-implant tissue.

**Manufacturing of individual crowns** – Aiming at controlling the position of cement border manufacturing of individual crowns is recommended. Thus, the direction of introducing, the output profile and the position of the crown's edge can be adjusted optimally to each clinical situation. The position of the crown's edge is the cement's fissure at the same time. It has to be positioned maximally up to 1 mm under the level of gingiva, so that the complete removal of the excess cement could be enabled. Although the manufacture of individual abutments with cement border placed at the level or up to 1 mm under gingiva, reduces the possibility of cement's penetration into the peri-implant area significantly, scientists have proved that a part of the cement still penetrates the area below demarcation. During which the biggest part of the cement is localized on the approximal sides of the restoration, especially on the distal aspect. This can be connected with the hindered removal of cement from these surfaces, especially having in mind the hindered approach to distal aspects of the restoration. It has been proved indisputably that the remaining cement in the peri-implant tissue presents the etiological factor of peri-implantitis appearance even in 60% of cases<sup>22,23</sup>.

The problem is additionally made more complicated by the fact that composite cements are a gold standard in implantoprosthodontics. Their insoluble quality in tissue liquids leads to a long-standing persistence in peri-implant area, where beside the mechanical influence, they act cytotoxically on the surrounding cells and initiate the inflammatory reaction. In non-esthetic, side borders, localization of demarcation is recommended, that is, cement's border supragingivally. The uncovered demarcation enables the control of the overflow of the cement and its easy removal.

**Redesign of the form of the output profile** – The real problem, beside the localization and demarcation contour, is the design of the form of the output profile. Disproportion between the diameter of the implant and the width of the output profile in premolars and molars, can cause too deeply placed cement crack and inadequate output profile, and in that case the gingival side of crown goes over the shoulder of the implant under the angle of almost 90°. Overflow of the excess cement across the free edge of gingiva is made impossible and the excess cement is, under the pressure of cementing, removed directly into the peri-implant area. The inadequate form of the output profile completely makes it impossible to approach the peri-implant area and to remove the remaining cement.

Even if the output profile is adequately formed and demarcation set shallowly, studies have shown that one part of the cement can pass apically. Redesign of the output profile is necessary, in combination with the modified form of demarcation. Prof dr Emil Svoboda pointed to the influence of the marginal design of abutment, crown, output profile and surrounding gingiva on directing the flow of the excess cement. On the basis of his experiments *in vitro* he suggested "the system of cement control" in order to prevent the remnant of the cement subgingivally<sup>24-29</sup>. Dr Svoboda recommends forming the deflection demarcation of the abutment and crown and crown modification in subgingival part, in order to enable the overflow of the excess cement outside of the gingival area. He called this type of marginal design "reverse margin". He proved that when demarcation, that is cement border, is set into the subgingival area, gingiva can form some kind of sealing around the restoration, which prevents overflow of the cement surplus, thus causing pressing the excess cement deeper into the tissue. He called this unwanted occurrence "gingival effect". According to his recommendations, this arch demarcation on the outer convex edge has one leveled plateau 0.15 mm wide, which presses

gingiva from the crown's surface, thus opening the way for coming out of the cement outside the peri-implant area.

Such improved design helps to direct the excess cement out of the tissue area and it helps the wanted direction of the cement moving, by forming the clear passage between the restoration and gingiva. Conventional abutments and conventional design of the crown often direct the cement into the peri-implant tissue and then enclose the cement surplus between the gingiva and the undermined parts of the restoration. The cement remains enslaved deeply in the tissue area when the restoration is put on its place.

## CONCLUSION

A small percentage of failure of the implantoprosthesis therapy, from the patient's and doctor's perspective, has a lot greater significance. Enormous efforts of the professional and scientific public are invested in defining the problems, which participate in the therapy failure, and their surmounting. A complex field of the fixation of restorations in implantoprosthesis, disregarding the technological advance, improving the cement performances and intensive striving to remove all the problems which have appeared during the long-standing clinical practice, still hides in itself one part of responsibility for the therapy failure. Removing these problems together with defining exact, strict protocols of cementing and the modification of the form of abutment and output profile, would certainly, from their side, contribute significantly to improving the total results of survival of restorations on implants, at the long-term level. The above mentioned efforts lead to the idealization of success of the implantoprosthesis therapy, which is the final aim of all researches in this field of study.

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# MUCOGINGIVAL DISORDERS – ETIOLOGY, SIGNIFICANCE AND TREATMENT OPTIONS

**Prof. dr Milanko Djuric**

## Abstract:

Mucogingival disorders are irregularities in the relationship between gingiva and the surrounding alveolar mucosa. They are typically divided into congenital, developmental and acquired, and include coronally inserted labial or buccal frena, narrow attached gingiva, gingival recession and shallow vestibule. Mucogingival disorders play an important role in periodontal disease etiopathogenesis and are classified as local accessory etiological factors. They are closely related, as they are usually concomitant and cause one another. Thus, a narrow zone of the attached gingiva is usually found in the vicinity of the coronally inserted frena, which are typically also accompanied by receding gums and consequent vestibule depth reduction.

Coronally inserted frenum of the upper or lower lip and buccal frena may have a significant impact on the occurrence of other mucogingival conditions, as well as lead to the formation and deepening of periodontal pockets. Specifically, frena and folds are usually attached at a distance from the gingival margin and interdental papillae tips. If the frenum is attached too coronally, any movement during mastication or speech can lead to muscle tension, pulling the gingival margin away from the tooth surface. This will result in the splitting of the junctional epithelium, allowing penetration of microbes into the deeper periodontal structures and the formation of periodontal pockets. The thus formed pockets can be very deep, requiring treatment following frenum removal. Frenectomy in the upper jaw is usually a stand-alone intervention, while that involving the lower jaw, in addition to frenum removal, usually requires increasing the zone of the attached and keratinized gingiva.



Figure 1. Frenectomy in the upper jaw



Figure 2. Frenectomy in the lower jaw with increasing attached and keratinized gingiva

Attached gingiva is a part of gingiva extending from the coronal end of the junctional epithelium to the mucogingival junction. A sufficiently wide zone of attached gingiva around each tooth is believed to be extremely important for periodontal health maintenance. Attached

gingiva is physiologically of different width in the upper and lower jaw, as well as around individual teeth. Its width varies from 1 to 9 mm, and is the greatest in the vicinity of the upper jaw incisors, while the narrowest gingiva is found around the lower premolars. Prevalent consensus is that there should be at least 2 mm of attached gingiva around each tooth in order to mitigate the adverse effects of tensile forces during mastication. However, it is presently considered that attached gingiva of  $< 2$  mm width may ensure periodontal health, if it is functional. If this is not the case, the narrow attached gingiva has to be enhanced. This is usually achieved by using epithelial grafts harvested from the hard palate because the histological structure of this epithelium corresponds to that of the attached gingiva.



Figure 3. Enhancing attached and keratinized gingiva

Gingival recession is marked by a shift of the gingival margin apically from the cementum-enamel junction. While its causes vary, the inflammation and tissue destruction during periodontitis is certainly the most significant one. Some anatomical abnormalities, such as tooth alignment irregularities (malocclusion), abnormalities in the alveolar bone structure (fenestration and dehiscence) or gingival anomalies can also cause recession. In addition, inadequate brushing technique or an overly firm toothbrush fibers can also lead to recession. Gingival recession is closely associated with altered gingival structure. Namely, if the gingiva is thin, and is characterized by thin epithelium with few connective fibers in the lamina propria, its deterioration can easily occur, accompanied by root denudation. According to the Miller's classification, gingival recession is divided into four classes based on its size and its relation to the mucogingival junction, as well as the degree of soft tissue and bone preservation laterally from the recession. Gingival recession is a functional problem because it leads to sensitivity of the exposed root to mechanical, thermal and chemical stimuli. In addition, if frontal teeth are involved, elongated clinical crowns may pose a significant aesthetic issue for the patient. Several techniques for root coverage are presently in use. The choice of surgical technique for a particular case depends on the recession size as well as the quality and quantity of keratinized tissue apically and laterally from the recession itself. The success of these interventions varies from 60 to 90%. Empirical evidence indicates that connective tissue graft with simultaneous coronal flap positioning yields the best results. In addition to the technique employed, the outcome is significantly affected by the level of the interdental papillae mesially and distally from the recession. If the papillae are intact, i.e., if recession is of Class I or II type, complete success can be attained.



Figure 4. Root coverage

Vestibular depth reduction is almost an inevitable consequence of reducing the attached gingiva width and gingival recession. Shallow vestibule renders oral hygiene maintenance significantly more challenging and promotes dental plaque accumulation due to the lack of space, difficulties in toothbrush manipulation, and the impossibility of placing fibers in an appropriate position. This result in, on the one hand, increased gingival inflammation and further destruction of periodontal tissue, while potentially leading to root decay on the other.



Figure 5. Shallow vestibule and root decay

# MAXILLOFACIAL SURGERY IN FUNCTION OF DENTAL REHABILITATION

**Borislav Markov**

Clinic For Maxillofacial Surgery, Clinical center of Vojvodina, Novi Sad

## Summary:

Basic principles of treatment of diseases in maxillofacial surgery area give an additional aim of adequate functional and esthetic rehabilitation of stomatognathic system in an early stage after the surgical treatment.

The choice of the method of surgical treatment in maxillofacial surgery is very often determined by the possibility of adequate early postoperative rehabilitation. This article will present the cases of surgical dental rehabilitation of patients performed by a maxillofacial surgeon operating a jaw tumor, jaw fracture or a large jaw cyst.

The needs of a modern man include, in addition to the treatment of the primary disease, also the early rehabilitation of all body part functions in order to achieve the right quality of life including the functional and esthetic rehabilitation of the stomatognathic system. In choosing the treatment method by a maxillofacial surgeon it is exceptionally important to know the possibilities of dental rehabilitation and assessment of risks and complications that the modification of standard surgical procedures can bring.

Ameloblastoma is a benign odontogenic tumor of epithelial origin. It is the most common odontogenic tumor and represents around 10% of all odontogenic tumors and around 1% of all maxillofacial area tumors. It is most frequently found in patients age 20-40 years old. This type of tumor is four times more often present in the lower jaw, generally in the mandibular angle and ramus. The tumor appears in two varieties: unicystic and multicystic. No symptoms develop for a long time. Clinical features are characterized by: blowing up the bone both vestibular and oral direction, difficulties wearing dentures, tooth dislocation and mucous membrane ulcerations. There is an appearance of paresthesia or anesthesia of lower alveolar nerve and in an advanced stage pathological fractures occur (1). Radiological evidence is determined by the type (unicystic or multicystic) and is characterized by an unilocular clearly limited illumination or multilocular illuminations, known as „the bubble phenomenon“ caused by the bone trabecules diffused throughout the tumor (2). It is also radiologically present the appearance of root divergence and, even more important, the root resorption. Differential diagnosis can be: jaw cyst, giant cell granuloma, central fibroma, or fibrous dysplasia. The basic characteristics of this tumor are infiltrative growth and tendency to relapse (3).

Given the extreme infiltrative growth and relapse tendency, the therapy of choice is primarily the segmental resection of the jaw, or rarely marginal resection of the jaw. Considering the age of this patients, the decision about the resection type is made only after the biopsy and pathohistological finding (4).

The reconstruction includes free bone graft transplantation, generally from the crista iliaca, or rarely vascular bone grafting. After the 3-6 months long bone graft integration, it is possible to place dental implants into the graft and plan the prosthetic reconstruction. It is also possible to place the dental implants primary after bone grafting. (5).

The patient presented in this article had a lower jaw resection done, after the biopsy and diagnosing an ameloblastoma. Two years later bone grafting was done from the crista iliaca donor region. Three years after that he had 4 dental implants placed into the graft. After the 6 months long period of osseointegration, a hybrid bridge construction was made on the implants, which significantly improved the quality of patients life. Post operative checkups in a year long period show a stationary state of periimplant mucous and bone tissue.

Jaw fractures significantly impair the relations inside the stomatognathic system. The basic therapy aim is reconstructing an adequate occlusion (6). However, in a case of a jaw fracture combined with a traumatic tooth extraction it happens that, besides the wright occlusion, the space between the teeth in one jaw does not allow an adequate prosthetic rehabilitation. Aside from the occlusion reconstruction, in a case like this the most accurate reposition and osteosynthesis is needed.

In this article a patient presented is treated after a mandibular fracture combined with traumatic extraction of all frontal teeth in both jaws. 3 months subsequently to the jaw fracture treatment, the mandibular defect was compensated by a zirconia bridge, and the maxillary defect was resolved by placing 4 dental implants.

A different patient with a triple dislocated mandibular fracture, after the surgical treatment and adequate reposition and osteosynthesis, has been submitted to placing a dental implant with a snap attachment which, combined with a metal post and globe obtained stabilization and retention of lower denture. Two years later canine tooth was extracted and another dental implant with a snap attachment was placed.

Dentogenous jaw cysts are relatively frequent phenomenon a dentist comes in contact with and standard treatment methods include their enucleation and primary sutures in case of small cysts (less than 2 cm). A blood clot that gets formed fills the defect and the fibrous healing and then mineralization go on. In the case of bigger cysts (more than 4 cm) mucoperiosteal suturing leads to inevitable inflammation due to the empty space left after blood clot retraction. There are two methods of treatment after cyst enucleation. First one is defect tamponade with iodine gauze followed by secondary wound healing until the epithelization end or marsupialization (7). For the patient that means prolongating the treatment period and changing the gauze for a few weeks longer than doing the primary sutures on the mucoperiosteal tissue. The golden standard in big defect reconstruction is autogenous bone grafting consisting of both organic and anorganic parts as well as bigger quantity of osteogenically potent cells (9). Considering the fact that the bone graft mobilisation can cause complications like infection, pathological fractures and damage the surrounding nerves, that favours the use of allotransplant or heterotransplant without the osteogenic or osteoinductive, but having the osteoconductive potential reasoned by their structure acting as a substrate for the growth of new blood vessels and connective tissue which later gets mineralised in enchondral osteogenesis. The use of allotransplants or xenotransplants is incomparably more comfortable for the patient along with the mentioned absence of osteogenic potential as a possibility of complications as inflammation (10).

A patient case shows a radicular cyst occupying the entire mandibular ramus starting from the second premolar on one side ending next to second premolar on the other side of the jaw. Enucleation of the cyst was done along with extraction of incisal teeth combined with the preservation of alveolar ridge. The defect was filled with deproteinised bovine bone. Following the period of healing, a fixed prosthetic bridge was made on the existing teeth. Postoperative evaluation and radiological evidence show adequate bone healing.

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# **IMPLANT PLACEMENT IN THE SEVERELY ATROPHIC POSTERIOR MAXILLA AND MANDIBLE**

**Prof. Dr Branislav Bajkin**

Faculty of Medicine Novi Sad, University of Novi Sad, Dental Clinic of Vojvodina

## **Abstract**

After the teeth loss the alveolar bone resorption occur which results in unfavorable conditions for dental implant placement and may require bone augmentation. Posterior regions of upper and lower jaw may require very demanding augmentation procedures due to proximity of maxillary sinus and inferior alveolar nerve. To avoid extensive surgical intervention short dental implants have been increasingly used recently. The advantages of the use of short implants are reduced postoperative recovery period and shorter treatment time.

The aims of this paper are: to review of commonly used augmentation procedures in severely atrophic posterior maxilla and mandible, to present possibilities of dental treatment with short implants, to discuss advantages, disadvantages and success rate of both therapeutic approaches based on the literature review and case presentations.

According to the literature review it can be concluded that both treatment options placement of standard length implants in augmented bone and the use of short implants, give predictable and reliable results regarding implant survival rates. Augmentation procedures are more invasive and require advanced surgical skill and more complex therapeutic approach that, in some cases, may be avoided by using of short implants.

## **Introduction**

After tooth loss dental implants are considered a predictable therapeutic solution regarding high success rate of this surgical procedures with long-lasting results after appropriate prosthetic restoration. One of the main prerequisite for successful implant placement is adequate amount of bone in both the vertical and horizontal dimensions.

Tooth loss consequently leads to resorption of the associated alveolar bone. The bone defects that occur can be divided into vertical, horizontal or combined defects [1]. In maxillary and mandibular posterior regions bone resorption results in unfavorable conditions for implant placement due to proximity of anatomical structures such as maxillary sinus and mandibular canal that should not be injured during the procedure. In these clinical situations, possible therapeutic solutions are standard length implant placement that usually requires bone augmentation procedures or placement of short implants that have been increasingly used.

## **Bone augmentation procedures in the posterior maxilla**

Depending on the type of alveolar resorption in maxillary posterior region and the proximity of maxillary sinus the following augmentation procedures are applicable: sinus lift procedures, bone grafting procedures, guided bone regeneration (GBR), split ridge techniques and distraction osteogenesis.

The lack of vertical bone dimension in maxillary posterior region is a result of alveolar bone resorption and pneumatization of maxillary sinus floor. To overcome this problem different sinus lift techniques are developed. This procedure can be accomplished via a crestal or a lateral approach with simultaneous or delayed implant placement which is directly related to the alveolar bone height. Despite the possible complications the procedure is consider to be very successful with predictable outcomes. According to the available literature implant survival rate

after functional loading of implants for minimum 3 years period was 93,7%-97,2% for lateral window and transalveolar approaches, respectively [2]. In another review article reported implant survival rate 3 years after functional loading was up to 98.3% [3]. However, sinus lift procedure has its complications and disadvantages. The most frequent complications that usually require additional surgical procedures are: membrane perforation, partial or total bone graft loss, postoperative sinusitis and hemorrhage [4]. Duration of the surgical procedure, additional surgical skill requirements, increased morbidity and high treatment costs are considered as main disadvantages. Results of the recent studies suggested that sinus lift procedure with immediate implant placement can be successful done without bone grafting which can lower the cost of the procedure [5,6].

### **Bone augmentation procedures in the posterior mandible**

In posterior mandibular region, depending on the bone resorption type and the proximity of mandibular canal following surgical procedures can be performed to provide adequate bone volume for implant placement: bone grafting procedures, GBR, split ridge techniques, distraction osteogenesis and inferior alveolar nerve transposition.

Vertical ridge augmentation poses a great therapeutic challenge. Some of the above mentioned surgical procedures such as inferior alveolar nerve transposition are rarely used because the procedure is highly demanding and there is a significant risk of nerve damage and permanent loss of nerve sensitivity. [7].

Vertical ridge augmentation and standard implant placement can be treatment option in cases with severe alveolar bone resorption and unfavorable position of mandibular canal. Because of osteogenic, osteoconductive and osteoinductive properties autogenous bone grafts are still considered the gold standard in alveolar bone regeneration [8]. The most common intraoral donor sites for obtaining autogenous bone graft are ascending mandibular ramus and chin area. Autogenous bone can be used in the form of blocks or particles [9,10]. The main disadvantages related to autogenous bone grafting are: surgery at donor site and donor site morbidity, limited amount of bone that can be harvested, unpredictable and high bone resorption and very sensitive procedure. In order to overcome some of these disadvantages combination of autogenous bone and bone substitutes is frequently used [8,11]. Several literature reviews showed that there are no differences in survival rates of implants placed in native bone and those placed in bone regenerated by autogenous bone blocks [12] or regenerated by GBR [13].

### **Short dental implants**

One of the few therapeutic options in the case of reduced alveolar bone height is a placement of short dental implants. These implants are mostly indicated in atrophic posterior regions of upper and lower jaw due to proximity of maxillary sinus and inferior alveolar nerve in order to avoid extensive bone augmentation procedures. There is no consensus about the definition of short implants. Some authors consider short implants with a length of  $\leq 10$  mm [7] while for others short implants are  $\leq 8.5$  mm [14], or  $\leq 7$  mm in length [7,15]. However, in numerous studies short implants were defined as implants with endosseous component  $\leq 8$  mm [4,15-17]. Short implants are alternative to more invasive bone augmentation procedures. The advantages of short implants use are: less invasive and less time consuming surgical procedure, reduces patient morbidity, increased number of sites for implant placement, surgically simpler and cheaper procedure [16]. The studies conducted till now showed that unfavorable crown-to-implant ratio and potential implant overload, possible limitations of greatest concern for clinicians, are not clinically relevant [16].

The introduction of short implants as a therapeutic option was initially controversial. It was considered that standard implants will always have longer survival rate due to better distribution of occlusal loading [14]. Therefore, long-term success of short implants treatment



was questionable in the beginning. Attitudes toward short implants have been changed over the time. Many clinicians insist on placing a greater number of short implants and splinted crowns. Recently published studies [7,14] and the results of literature review [4,15-17] showed that success and survival rate and marginal bone loss are similar between short implants and standard implants placed in augmented bone. Although some studies reported high success rate of short dental implants in posterior regions restored by non-splinted, splinted crowns [18,19], the number of these studies is limited and further researches are necessary.

## Conclusion

According to the literature review it can be concluded that both treatment options placement of standard length implants in augmented bone and the use of short implants, give predictable and reliable results regarding implant survival rates. Augmentation procedures are more invasive and require advanced surgical skill and more complex therapeutic approach that, in some cases, may be avoided by using of short implants.

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# MAXILLARY LATERAL INCISOR AGENESIS TREATMENT OPTIONS

**Doc. Dr Ivan Šarčev**

Faculty of Medicine Novi Sad, University of Novi Sad, Dental Clinic of Vojvodina

## Abstract

Congenitally missing tooth or tooth agenesis describes one of the most frequent developmental anomalies in human dentition. Maxillary lateral incisor agenesis is most common agenesis after the third molar. Early diagnosis of the congenitally missing lateral incisor is important, since it allows guided eruption of the canine for lateral space closure or opening space for later prosthodontic rehabilitation.

## Introduction:

This article considers some of the most important facts about different therapeutic approaches: orthodontic space closure, resin bonded prostheses, full coverage fixed partial denture and focus on single tooth implant therapy. The clinical replacement of congenitally missing maxillary lateral incisor by osseointegrated implants has represented one of the most significant advances in restorative dentistry. The basic parameters related to dental and gingival esthetics in general and to the maxillary anterior segment in particular are well established in the dental literature [1]. In relation to maxillary anterior segments patients generally expect a long lasting functional and esthetic result with high level of predictability.

## Discussion:

The single tooth implant option is considered to be the most conservative approach. A number of surgical and prosthetic factors should be assessed during treatment planning for missing teeth in the anterior maxilla, since it is a high esthetic risk area. The volume and characteristics of the edentulous ridge, gingival biotype, interarch distance, occlusal scheme, implant alternatives concerning the size, number, and location of the implants, and patient expectations are the main issues that need to be addressed. For that there are some rules that every implantologist should consider in order to achieve predictable results in the esthetic zone. This article considers some of the most important facts about implant therapy in esthetic zone. Diagnostic keys like form of periodontium, biotype of periodontium, tooth shape and position of osseous crest are some intimately related to predictable peri-implant esthetics. The different time of implant placement has been a topic of discussion. A patient's gingival biotype is probably the most important aspect of planning implant therapy [2]. A thin gingival biotype has a thin buccal plate. Implant position From a prosthetic and hygienic perspective, the implant should ideally be perfectly centered below the planned implant crown. Formation of the biologic width leads to the circumferential thinning of peri-implant bone which can result in the formation of alveolar bone dehiscences, especially at sites with thin buccal bone plates. These dehiscences lead to soft tissue recessions, which are very difficult to treat and can result in the exposure of implant components [4]. To prevent such esthetic complications, ideally a facial bone thickness of 2 to 3mm should be established buccal to the implant. Therefore, placement of the implant too far facially must be avoided. Based on the current data, shifting the implant position slightly more palatal appears to be ideal solution. This makes it possible to establish an adequate distance from the intact buccal plate in immediate implant placement and makes it easier to regenerate adequate bone plate thickness buccal to the implant in delayed implant placement. Palatally, there is about 2mm insertion tolerance. Violation of this tolerance range could result in palatally overcontoured restorations that can narrow the tongue space, impair phonetics, and make it difficult to establish an adequate emergence profile. The further palatal the implant is placed within the 2mm tolerance range, the deeper the implant must be inserted in the apicocoronal

dimension to achieve an acceptable emergence profile. Because of the anatomy of the alveolar ridge, it is advisable to place the implant axis at a slight buccal tilt relative to the tooth axis. Prosthetic compensation for the tilt should be easy to accomplish if the implant shoulder is correctly positioned. Implant position should be at a distance of 1,5mm from the adjacent teeth mesially and distally. This is the minimal distance although there are some articles that even showed that 2mm would be an improvement. If this minimum distance is lacking it will be necessary either to enlarge the space orthodontically or to employ method of narrow implant placement. Today it is generally accepted that the final implant shoulder sink depth can be determined primarily by the location of the cement enamel junction of the neighboring teeth and by the level of free gingival margin at the vestibular aspect of these same teeth. distance should be 3-4 mm distance from the gingival margin of the future restoration. If there is no teeth previously, a wax- up should create a reference of the future restoration. The buccal part of the implant should be 1-2 mm palatal to the emergence profile of the adjacent teeth. A maxillary front tooth extraction leads to approximately 2mm loss in vertical tissue height. Choosing the right implant proved that the stability between the implant and the abutment is crucial to avoid the micromovements which leads to bone resorption. Presence of papilla between an implant and a teeth depends mainly on the presence of inter proximal bone of the adjacent teeth [5]. If there is a bone defect there will not be papilla. There is also a relation between the presence of the papilla and the distance between the contact point and the bone crest where there will be a probability of complete presence if this distance is 5mm or less (98%) [6].

Clear indications for orthodontic space closure include two types of malocclusions: class I molar relationship with severe crowding in the mandibular anterior segment and class II molar relationship without crowding and dental protrusion in the mandibular anterior segment. Resin bonded prostheses are considered to be the most conservative option, since the adjacent teeth are subject to minimal tooth preparation.

The full coverage fixed partial denture is considered as the least conservative of all tooth supported restorations and its use is quite rare in the treatment of tooth agenesis in the anterior region.

Conclusion: Restorations in the anterior maxilla are clinically demanding because of the complexity of the treatment planning and high patient expectations. Early diagnosis of the congenitally missing lateral incisor is important, since it allows guided eruption of the canine for lateral space closure or opening space for later prosthodontic rehabilitation.

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## **DENTISTRY AND LAW - MEDICO-LEGAL EXPERTISE OF PAIN IN DENTAL TRAUMA**

**Prof. dr Srećko Selaković**

Faculty of Medicine, University of Novi Sad, Clinic of Dentistry of Vojvodina, Novi Sad, Serbia

### **Abstract:**

Objective assessment of pain intensity is one of the vital medical problems in the everyday dental practice. Methodology for assessment of the total pain experienced after tooth and jaw trauma was developed in the Mid-Nineties of the XX century as an original approach. The aim is to introduce a uniform procedure that simplifies medical expertise of pain, and results in the identical conclusions irrespective of the person performing the expertise. Methodologies applied so far implicated more subjective approach to this problem. The described methodology provides an appropriate protocol for obtaining identical results in a repeated procedure. Though somewhat arguable from the point of view of medicine and dentistry, it is highly feasible in a legal practice. It provides a clear legal qualification, excluding any doubts with respect to the competence of medico-legal expertise

**Key words:** pain, intensity, tooth, trauma, expertise

## **HYBRID RESTORATION IN PROSTHODONTICS -STRATEGY FOR A PERFECT RESULT**

**ass. dr Branka Trifković**

Klinika za stomatološku protetiku, Stomatološki fakultet Univerzitet u Beogradu

The main objective in implant therapy is either to avoid complete removable dentures by placement of implant-supported fixed prostheses or to improve the retention and stability of removable complete dentures. The hybrid prosthesis is an acrylic, composite resin or ceramic fixed dental prosthesis supported by implants. The hybrid prosthesis include tooth and gingiva reconstruction. The primary factor that determines the restoration type is the amount of intra-arch space, the speed and stability of implants. In addition, other relevant clinical parameters such as lip support, high maxillary lip line during smiling, a low mandibular lip line during a speech or the patient's greater esthetic demands should be evaluated. There are different tips connections between implant and prosthetic restoration. Most common are: cementation, screw and combination screw - cementation. There lecture present parameters which determine the types of connection between implant and prosthetic restoration.

The first purpose of this lecture is to present the clinical experience and give correct guidance for treating patients with different situation and complication implant therapy.

Second part of lecture present case report about „All on 4,, concept included all strategy for perfect clinical result.

# LONG TERM CLINICAL RESULTS OF APPLYING LASERS IN OROFACIAL REGION

**Radojka Delić**

Private Dental Practice "Delić" Novi Sad

## SUMMARY

Today, in the world, laser is a standard dental procedure with clearly defined indications and it is no longer labeled as experimental medical procedure. Fast advancement of laser technology has led to the introduction of laser treatment in daily dental practice. Laser is the device of the future and at the beginning of its development it was said: "Laser is a solution waiting for a problem to present itself". Its application in science and technology has almost no boundaries. It is impossible to imagine modern telecommunication systems, military industry, and medicine without the use of lasers. In orofacial region for treatments on hard and soft tissues, we use high-energy and low-energy lasers, usually an Er: YAG 2940 $\mu$ m, Nd: YAG 1064 $\mu$ m and diode lasers from 634 $\mu$ m to 980 $\mu$ m wavelength. The focus of this paper is the use of lasers of different wavelengths in the treatment of the most common diseases in soft tissues of the orofacial region, with the photographic records in different observational periods.

## INTRODUCTION

The originator of the idea of stimulated emission of radiation was Albert Einstein, in 1917, who based his work on the interaction of radiation and matter on the concept of the photon, which actually represents a quantum of light energy. Amplification of light by stimulated emission of radiation is a phenomenon that allows operation of the laser device. The acronym of the interaction of radiation with matter gives the name of LASER (Light Amplifications by Stimulated Emission of Radiation). (1)

In 1958, Charles H. Townes with his associates designed the first device that worked on the principle of stimulated emission in the microwave part of the spectrum and named it - MASER. In 1960, Theodore Maiman constructed the first device that worked on the principle of stimulated emission in the visible spectrum and called it - LASER. Two years later, in 1962, Robert Hall constructed the first semiconductor laser. First testing of the effects of non-thermal laser light on the skin of rats was published by Endre Mester with a group of authors in Budapest in 1967. (1.2).

In contrast to the white light, laser light is:

1. Monochromatic (implies the existence of only a single wavelength)
2. Coherent (has the same direction and phase)
3. Directed (the laser beam is focused to a single point of high intensity)

Due to these characteristics, the laser beam can be very precisely controlled and exploited in different purposes. The effect of the laser on the tissue depends on technical characteristics of the laser and physiological, chemical and biological status of the tissue. Technical features include: type of laser, the wavelength of the laser beam, pulse frequency, power and beam density per unit area, the width of the laser beam and the type of mode.

Based on exactly defined biological effects of lasers on tissues, these are therapeutic effects of lasers:



#### 1. Anti-inflammatory, 2. Analgetic, 3. Anti-edematous, 4. Biostimulative

The laser beam in contact with the tissue can be deducted, absorbed and dispersed in the tissue. According to the output power, we can distinguish between high-energy and low-energy lasers.

In the group of high-energy lasers in dentistry today, the most commonly used are Er: YAG (yttrium aluminum garnet erbium) from 2940μm and Er: CrYSGG (erbium chromium yttrium scandium gallium garnet) from 2780μm. Food and Drug Administration in the United States (FDA) approved in 1997 the application of Er: YAG laser for treatments on hard tissues of teeth. (3,4).

Thanks to the absorption of laser light energy in a certain tissue chromophores, light energy is converted to heat which, due to its concentricity and amount, causes heating or ablation of the tissue. Absorption substance which is used for the working medium in the case of laser treatment of dental hard tissues is water, which means that the laser beam is absorbed by water molecules in dental tissue, causing vapor of the molecules of the tissue. The better the absorption of the wavelength of a single laser in the water is, the better the effect achieved by the laser on the hard tissue of the teeth is. In recent years, Er: YAG laser with a wavelength of 2940μm was recognized as the best solution for the processing of hard tissue of teeth. (5)

A very important role of Er: YAG laser is its application in the root canal for the purpose of mechanical processing of the hard wall of the root canal and successful disinfection of the endodontic space. The clinical application of the laser in endodontics started in the late 90s of the previous century, when thin and flexible optical fiber extensions (200μm) for the transmission of the laser beam in the root canal for the purpose of disinfection were developed.

In the last 20 years, Nd: YAG (neodymium yttrium aluminum garnet) of 1064μm wavelength has been used in a wide range of dental applications. Absorption of Nd: YAG laser beam in water is about 10 000 times less than of the Er: YAG laser, and therefore cannot be used for ablation of hard dental tissue. (6,7,8,9,10,).

For diseases of soft tissues of the oral cavity, we use several laser sources, in addition to Er: YAG. However, the most common is Nd: YAG (164μm) and diode lasers of different wavelengths (634μm-980μm).

Nd: YAG (neodymium-ytrium aluminum garante) of 1064μm wavelength is used in a wide range of dental applications on soft tissues. The penetration depth of Nd: YAG laser beam in the soft tissue is optimal for cutting and simultaneous coagulation. Wavelength of Nd: YAG laser is largely absorbed by hemoglobin, melanin, and other organic compounds, and affects the tissue through the photothermal effect. (11.12 ).

In every day practice, in dentistry diode lasers are highly represented in the treatment of diseases of soft tissues of the oral cavity. The main advantage of the diode lasers in relation to the other lasers is reflected in the following features: small size, low weight, high efficiency and if the end-diodes are, at the same time, high reflecting mirrors, we have the low energy excitation of electrons.

The diode laser is commonly used in the protocols for soft tissues of the oral cavity to remove fibroma, hemangioma, mucocoele, for frenectomy, in periodontology, endodontics and for other applications. Studies have shown that the diode laser has an excellent bactericidal effect, and optionally, in combination with periodontal therapy can significantly reduce

inflammation of the periodontium and peri implantitis of the tissue with satisfactory clinical results. (13, 14, 15).

The advantages of the laser on soft tissues are: less painful treatment, reduced need for suturing, faster healing, less scarring, reduced use of drugs and it is greatly accepted by patients.

Low-energy lasers or lasers for soft tissues base their anti-inflammatory effect, faster wound healing and reduction of pain conditions on photobiostimulation operation.

Treatment of low-energy laser (LLLT- low level laser therapy) is the ability of some of the diode lasers, which operate at much lower power than surgical lasers. The advantage of this therapy is that it stimulates natural biological processes. Low energy laser has good results in the treatment of oral mucositis in patients following chemotherapy, which is particularly significant in children patients with cancer, as well as in treating painful conditions of the temporomandibular joint (15).

#### Conclusion:

Slowly but surely the time of classic dentistry is becoming the thing of the past under the impact of modern appliances of new technologies and new principles in operation which are all based on scientific findings and knowledge of how we can quickly and efficiently solve patients' problems. Everyday use of lasers in dentistry is becoming an imperative of contemporary practice; the dentists significantly improve service to their patients. This year marks 57 years since the discovery of lasers on 16 May 1960. The first laser in the world saw the light of day then, or rather, the day witnessed the laser light, the device without which the world as we know it would be unthinkable.

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# TOOTH SHADE MATCHING-GUIDELINES AND RECOMENDATIONS

**Doc. dr Aleksandra Maletin**

University of Novi Sad, Faculty of Medicine

## ABSTRACT

The procedure of choosing a dental shade in restorative dentistry is done by visual and color determination. Visual method means to compare a shade with some known physical standard and basically this is the choice of shade using shade guide. The kind of shade guide, individual ability to choose shades and the conditions under which the choice is made, all influence the reliability and accuracy of the procedure, so it is necessary to introduce instrumental color determination in everyday work. Spectrophotometry as a advanced technology can be used as a instrumental method. Shade matching by using spectrophotometer fulfills all the necessary conditions for the choice of shade required by the physiology of color vision and the science of color surely represents the present and the future of restorative dentistry.

Constant technological advances in the field of dentistry materials and consequent aesthetic improvements of direct and indirect restorations require of us to be trained to make the right choice of shade. However, the appropriate choice of shade for the future restoration is not that simple. One of the main goals of cosmetic dentistry is to achieve morphological, optical and biological form of the restoration which also means to achieve satisfactory reproduction of the shade of the natural teeth [1].

By definition, the shade of teeth is a subjective perception of the quality of light, and colorimetry is a scientific discipline which deals with measuring and specification of shade [2,3]. Even in 1900. Munsell wrote about tri-dimensional properties of colors and parameters like hue, chroma and value or lightness [4].

The procedure of selecting shade in cosmetic dentistry can be done by visual or instrumental color determination. Visual color determination means to compare a shade with some known physical standard which is accepted as such and basically, it means to use color atlas or shade guide in more or less controlled conditions [3,5,6,7]. Instrumental color determination requires devices such as spectrophotometers (Figure 1), tri-stimuli colorimeters (Figure 2), spectroradiometers as well as digital cameras (Figure 3) [3,5,8,9].



Figure 1. Spectrophotometer.



Figure 2. Colorimeter.

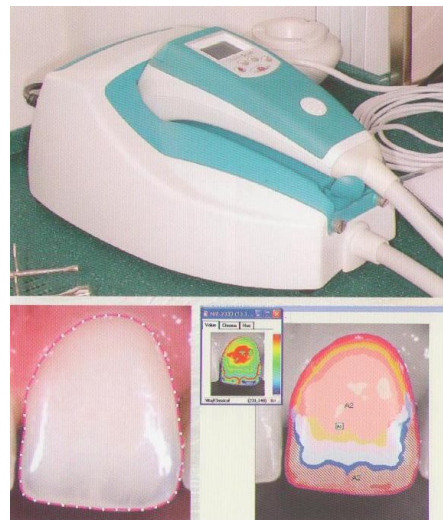


Figure 3. Digital camera.

The most widely accepted and commonly used way to choose color in practice is by applying a shade guide. A shade guide is a collection of samples offered by a manufacturer or he provides the necessary components and specifications for its production. The sample from the shade guide should realistically represent the color which one would get by using the appropriate materials for the restoration [2]. The first shade guide „Tooth Color Indicator“ was created by Clark and it consisted of 60 porcelain color samples. However, it has never appeared on the market since such a huge number of samples caused confusion in color matching. By 1950 there were numerous systems on the market but the appearance of „Vitapan Classical Shade Guide“, originally known as „Vita Lumin Vacuum Shade Guide“ made a significant breakthrough (Figure 4) [10,11].

The first person to point out the necessity to include all three color parameters when choosing color was Hall in 1991. His work represents a base for the development of „Vitapan 3D-Master Shade Guide“ in 1998. „Vitapan 3D-Master“ is the first commercial system for matching and reproduction of color based on the principles of colorimetric classification (Figure 5) [11,12]. With its organization, a wider range of colors and a uniform distribution of color, it shows great advantages over classical shade guides. On the other hand, a person with less clinical experience or insufficient knowledge about color would say that this system is difficult to understand, confusing and the concept lightness-chroma-hue is difficult to apply [10,12].



Figure 4. Vitapan classical shade guide.

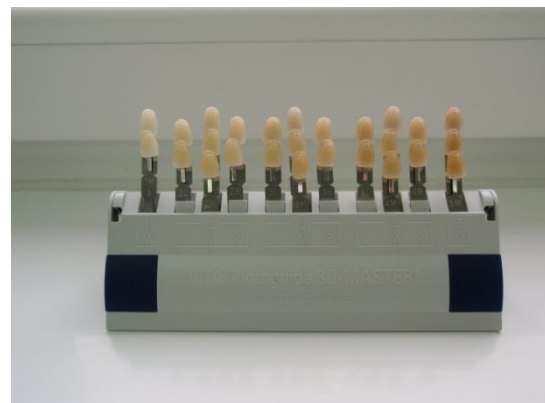


Figure 5. Vitapan 3D-Master shade guide.

Considering that the kind of a shade guide, individual ability to choose shades and the conditions under which the choice is made can all influence the reliability and accuracy of the procedure, it is necessary to introduce instrumental color determination in everyday work [11]. When determining the choice of shade using a shade guide, the conditions like lighting, part of



the day, weather conditions, surrounding, and factors connected with the person choosing the shade (age, work experience, tiredness, emotional state) definitely influence the final result [1,12]. Some chronic diseases as well as long - time use of certain medications can influence the perception of color. [4,8] On the other hand, the results of some clinical studies show that the gender of the person making the choice of shade, eye color or whether the person wears glasses or contact lenses do not influence the choice when using a shade guide [13,14]. Taking all this into consideration, it can be said that the choice of shade using a shade guide is highly subjective.

Spectrophotometer is mostly used to measure surface color. These devices are constructed to measure the ratio of the reflected light from a sample and reflected light from a white reference surface, namely the visible light in the intervals of 5, 10 or 20 nm [8]. Results show spectral reflection as a function of wavelength. Spectrophotometers are important instruments for measuring surface color. They are stable over time, reliable and precise with regards to absolute standards [10]. Shade matching by using spectrophotometer fulfills all the necessary conditions for the choice of shade required by the physiology of color vision and the science of colour and surely represents the present and the future of restorative dentistry (Figure 6-8).



Figure 6-8. Functions of spectrophotometer.



Figure 9. Instrumental shade matching.

How and in what way should a person use a shade guide when choosing a color? Lighting conditions when choosing color should be standardized. The ideal lighting should satisfy the following conditions: it should have a visible spectrum of light, it should be strong enough, diffused and pleasing to the eye. The factors of great importance when choosing color are also the distance between the doctor and the patient, the patient's clothes and make-up and the color of the doctor's uniform. Last but not least, the color of the walls and the furniture in the surgery is significant as well. It is best to make the choice of color on a clear, sunny day, between 11 o'clock in the morning and 2 o'clock in the afternoon. The color matching is always done at the beginning of the patient's visit. The patient's mouth must be at the same level as the doctor's/technician's eyes. The color matching procedure using a shade guide must not last

longer than 5-7 seconds and it is recommended to rest the eyes afterwards by looking at the blue color for about 1 minute (Figure 10-11) [15].

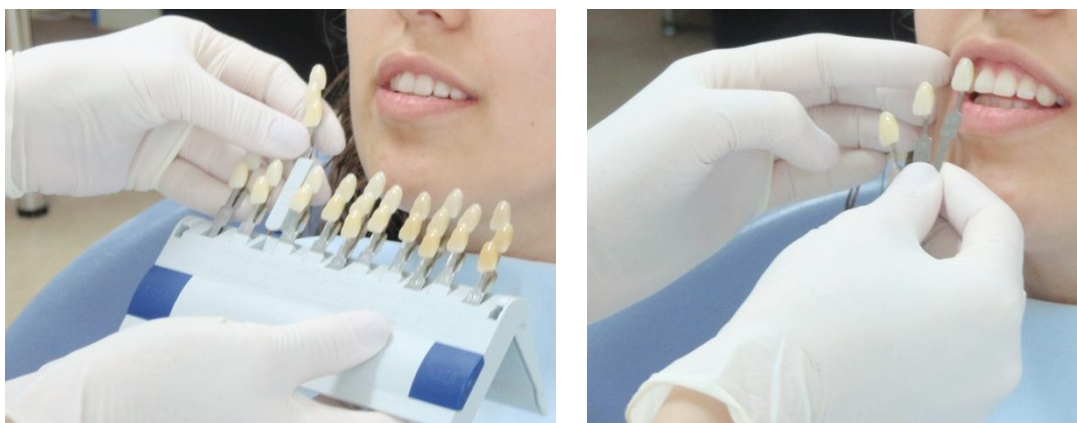


Figure 10-11. Visual shade matching.

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# ABSOLUTE ANCHORAGE WITH ORTHODONTIC MINI IMPLANTS

**Miodrag Popov<sup>1</sup>**, Nenad Nedeljković<sup>2</sup>

<sup>1</sup> Dental office “Helios KA” Novi Sad, Todora Jovanovića Toze 19, Serbia

<sup>2</sup> Clinic of Orthodontics, School of Dental Medicine, University of Belgrade, Rankeova 4, Serbia

## Abstract:

Ensuring adequate anchorage is an essential factor in the planning of orthodontic treatment. Different intraoral and extraoral methods are used to improve anchorage. Orthodontic mini implants and plates are very popular types of skeletal anchorage because of its convenience and minimal invasiveness. By using mini implants as skeletal anchorage many of tooth movements, which had previously seemed almost impossible, become feasible. Also unwanted tooth movements can be reduced to a minimum. Mini implants for reinforcing anchorage are usually placed in the buccal interdental alveolar bone. In the cases of narrow interdental alveolar space and the narrow zone of attached gingiva, placing mini implants can be difficult. Also, mesial or distal movement of the teeth can lead to contact of the root with mini implants. Another region, such as the anterior palate provides better conditions for setting mini implants because of the favorable quantity and quality of bone, the bone is covered with a thin attached gingiva, no danger of the roots damage, while the mini implants are not on the tooth movement path. Based on the clinical and 3 D studies, it has been shown that the anterior palate is reliable place for mini implant implantation. The modern design of the palatal mini-implants with varying abutment allows the orthodontist to use mini implants for different mechanics, which creates special convenience in everyday practice and reduce the number of mini implants to be used. Although skeletal anchorage with mini implants gives advantage in designing system forces and overcomes the problems of patient cooperation, the anatomical limitations of the tooth movement should always be taken into account. Skeletal anchorage with mini implants should be planned based on an assessment of the necessary system forces and anatomic limits of the tooth movement.

**Key words:** mini implant, skeletal anchorage, rapid palatal expansion(RPE), space closure, distalization, mezialisation

## INTRODUCTION

The advent of mini-implant technology continues to broaden the spectrum of what is achievable by orthodontics. The challenges associated with certain types of tooth movement can now be overcome by applying sound biomechanical principles to skeletal anchorage with even more potential for ideal esthetic outcomes. Orthodontic mini-implants have become increasingly popular in recent years because of their versatility, minimal invasiveness, and low cost. Their small size allows them to be inserted in a variety of sites. Currently, the alveolar process is the most preferred insertion site.<sup>1-3</sup> However, due to varying bone quality and the risk of root contact, the survival rate of implants inserted in the alveolar ridge still needs improvement, with current failure rates at approximately 10% to 30%.<sup>4</sup>

The following factors<sup>5-6</sup> seem to be relevant for the premature loss or tipping of a mini-implant:

1. Insufficient bone quality and/or inadequate bone quantity at the insertion site.
2. Mini-implants with a small diameter and/or length.
3. Inappropriate intraosseous design.
4. Root contact at the time of insertion.
5. Manipulation with the fingers or tongue.
6. Insufficient oral hygiene.

7. Application of high forces or moments.
8. Use of a large lever arm. This occurs if the mini-implant is inserted in a region where the gingiva or mucosa is too thick.
9. Insertion in the region of the movable mucosa.
10. Insufficient primary stability.
11. Bone damage at insertion due to high stress or bone overheating. This phenomenon is well known in dental implantology.

Five strategies<sup>3-7</sup> have been proposed to enhance the prospects of successful mini-implant retention:

1. Select the optimal insertion site.
2. Avoid direct root contact with the implant.
3. Avoid placing an implant within the intended path of tooth movement.
4. Use two implants to prevent tipping and rotation.
5. Use implants that have sufficient length and diameter.

The anterior palate is a good insertion site because it allows mini-implants with larger dimensions and greater stability to be placed in a region with high bone quality and thickness, thin overlying soft tissue. Using mini implants in the anterior palate eliminates the risk of root injury and takes mini implants out of the path of tooth movement. Insertion in the anterior palate rather than the alveolar ridge, can reduce the mini-implant failure rate to 2.1%.<sup>7</sup>

The palatal mini-implant has an inner thread on its top. It is made of titanium alloy and due to its self-drilling thread design, insertion can be done without predrilling with a handpiece. On the top of the mini-implant different types of stainless steel abutments can be fixed with a tiny fixing screw. Different types of abutments allow the construction of versatile appliances for a large variety of clinical applications. To improve their stability and to prevent mini-implant tipping, two palatal mini-implants can easily be coupled with the miniplate.<sup>8</sup> The miniplate is a stainless steel plate with a thickness of 1.2 mm. The miniplate can be adapted to the palatal mini-implants by bending the plate body as well as the wire. Small fixing screws are used to fix the miniplate on top of the mini-implants .

## CLINICAL PROCEDURE

The optimum insertion site in the maxilla is located in the anterior palate distally from the third palatal rugae on a line between the premolars. Advantages of this region are a thin soft tissue layer and sufficient bone thickness. Less bone is available in the areas that are more lateral and posterior.<sup>9</sup> The first step is local anesthesia administered directly in the insertion site. If the patient is afraid of a syringe, only topical anesthesia can be used. The second step is predrilling (to 3 mm depth) with a 1.4-mm drill for the 2-mm mini-implants and a 1.7-mm drill for the 2.3-mm mini-implants. This can be done manually using a special handpiece with a 1:1 contra angle. Due to the low speed there is no need for cooling. In very young patients (i.e., less than 12 years of age) predrilling is not necessary due to the low mineralization rate of the bone. Once the sites have been prepared, one or two palatal mini-implants are inserted near the midpalatal suture, again by using the contra-angle screwdriver. Generally, it is advisable to choose mini-implants with a big diameter of 2 or 2.3 mm, because they provide superior stability compared to mini-implants with a smaller diameter.<sup>10</sup> Usually the palatal mini-implants are inserted within a torque range of 10 to 25 Newton centimeters (Ncm).<sup>8</sup> The maximum insertion torque is 35 Ncm for the mini-implants with a diameter of 2 mm.<sup>11</sup> Usually, two mini-implants are inserted in a sagittal line. As an alternative and especially if a rapid palatal expansion with the Hybrid Hyrax is planned, the mini-implants are inserted in a transversal lineup. The distance between the two mini-implants should be at least 4 mm to enable enough space for the supraconstruction (two abutments or miniplate). Additionally, if an impression is planned, there must be enough space for two impression caps. The palatal mini-implants are self-drilling and can be inserted without predrilling. However, there is very high bone density in the anterior palate, especially in older patients. Soft tissue thickness can be measured using a dental probe from anterior to posterior to

identify a region with thin mucosa. This is important in order to achieve a sufficient primary stability and to avoid large lever arms. The soft tissue in the anterior region nearby the first and second rugae is very thick.

Depending on the mechanics, bands with lingual sheaths are fixed to the upper molars. The appliance can be bent either directly or after impression taking in the laboratory. In the latter case, impression caps are placed on top of the mini-implant and a silicone impression is taken. If desired, the impression caps can be secured by dental floss. Subsequently, laboratory analogs are inserted in the impression caps and fixed by wax. At the end, a plaster model is manufactured. The mini-implants are loaded immediately after insertion; in the case of a laboratory procedure, they are loaded a maximum of 1 week after insertion of the mini implants. It is recommended that the appliance be inserted as soon as possible. If there is a long period until the appliance is fixed, the patient has time to jiggle the mini-implants with the tongue or fingers and as a consequence they may become loose.

## CLINICAL APPLICATIONS

Through the use palatal mini implants with exchangeable abutments various mechanics from the anterior palate can be adapted for distalization, mezialisation, RPE (rapid palatal expansion), closure of extraction space, intrusion and extrusion teeth.

The Distalslider is a distalization appliance anchored by one or two mini-implants in the anterior palate, using an .045" stainless steel wire for the sliding mechanism. To improve stability, two mini-implants can be coupled with a miniplate. The distalization force is delivered by compressible springs of either 240g or 500g, which are activated by bilateral locking mechanisms.

In patients with missing maxillary lateral incisors requiring bilateral space closure, a stainless steel wire can be bonded to the lingual surfaces of the maxillary central incisors and welded to the abutment for indirect anchorage (T-bow). As an alternative to the T-bow (indirect anchorage), the Mesialslider can be used as a direct anchorage.

Anterior dental anchorage is often inadequate for rapid maxillary expansion (RPE) because of missing deciduous teeth or premolars with undeveloped roots. In addition, if the premolars have just erupted, heavy forces may result in root damage. In these cases, we use a tooth- and bone-borne rapid maxillary expansion appliance, the Hybrid Hyrax.

## CONCLUSION

The palatal mini-implant systems expands skeletal anchorage options in orthodontic treatment. Insertion and removal are minimally invasive procedures: orthodontists can place the mini implants themselves and load forces immediately, and the mini implants can be removed without anesthesia. Anterior palatal mini-implants offer reliable and stable anchorage in such complex cases, and the versatile palatal implant systems with interchangeable abutments permits the use of multifunctional mechanics. The challenge is to design the appropriate appliance system for each patient.

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# APPLICATION OF PLASMA RICH IN GROWTH FACTORS (PRGF-Endoret) IN EVERYDAY STOMATOLOGICAL PRACTICE

**Marko Matijević**

Department of Dental Medicine, Faculty of Medicine Osijek

## ABSTRACT:

The possibility of disposal after extraction defects has progressed significantly through various therapeutic methods in dental medicine that have developed over the past decade. PRGF-Endoret (Platelet Rich in Growth Factors) is an autologous and biocompatible technological system that allows the patient to obtain plasma rich in growth factors from his/her own blood. The main goal of this protocol is to accelerate regenerative processes (differentiation, chemotactic, angiogenesis, proliferation) and wound healing by releasing growth factors by activating the patient's platelets. This autologous biomaterial possesses powerful bacteriostatic properties, does not contain leukocytes, thus avoiding pro-inflammatory activity. The use of PRGF in dental medicine has excellent therapeutic potential in various clinical applications. Due to its biocompatibility, safety and diversity of use, this method can be used in alveolar preservation after tooth extraction, bone regeneration, soft tissue healing in mucogingival surgery, *maxillary sinus floor augmentation* and implantology. This study presents the results of the use of PRGF in the treatment of post-traumatic wound infection (Alveolitis sicca) and antro-oral communication (Communicatio antrooralis).

**KEY WORDS:** alveolitis sicca, antro-oral communication, PRGF

## INTRODUCTION

For the past 15 years, the application of PRGF Endoret technology developed by Eduardo Anitua is well-known (1). Due to its advantages such as predictability, efficacy and biocompatibility, the PRGF preparation has numerous applications in various fields of medicine: maxillofacial surgery, orthopaedics, otorhinolaryngology, sports medicine, ophthalmology, dermatology, as well as various clinical procedures in oral surgery such as therapy of post-extraction defects, tissue regeneration around the implants, intraocular defects, sinus floor augmentation, ridge expansion and periodontal defect therapy (1). The technology itself consists of separation of erythrocytes, leukocytes and plasma, which are rich in growth factors from patient's venous blood. In order to accelerate the healing of soft tissue and bone tissue in this therapy we only use plasma that is rich in growth factors. For a whole range of benefits such as the speed of the procedure, the relatively small amount of venous blood required for the procedure, one centrifugation phase lasts only eight minute, the separation of leukocytes from the blood, which reduces postoperative pain and discomfort and prevents the local inflammatory reaction of the organism, this technology has a successful application in dentistry. The preparation obtained with this technology is one hundred percent autologous and so far no side effects have been reported in the literature (2).

PRGF Endoret preparation is used in four different forms. In the form of liquid, filtered liquids (collyrium), fibrin scaffold and PRGF clots (3). Liquid is a form that is used for moisturizing the surface of the implant and tissue infiltration in traumatology and dermatology. Filtered fluid is a form used for cultivating cells in the laboratory, including stem cells or in areas such as ophthalmology. The cloth is an ideal framework for progenitor cells. It can be used to close defects and as a basis for autologous transplantation. The fibrin membrane is a condensed base rich in growth factors (4).

PRGF-Endoret stimulates the regeneration of the tissue due to the concentration of a growth factor that is greater than the concentration of the same factor in blood. In addition to the

function of stopping bleeding, platelets play an important role in the proliferation process of cells and tissue implantation.  $\alpha$ -granules found in platelets contain a large number of growth factors that play an important role in revascularization and bone regeneration by inducing mitotic and proliferative effects on endothelial and osteoprogenitor cells (5). Some of the factors that are released and have a synergistic effect are: PDGF (platelet growth factor), TGF- $\beta$  (transforming growth factor), IGF-1 (insulin-like growth factor), EGF (epidermal growth factor), VEGF (vascular- endothelial growth factor) and HGF (hepatocyte growth factor) (6).

#### Preparation of PRGF Endoret

Preparation of the PRGF Endoret requires a basic one-time use surgical kit containing: 1 blood extraction system, 4 blood extraction tubes (9mL), 2 fractionation tubes, 1 plasma transfer device (pipette), 1 syringe and 1 ampoule of (CaCl<sub>2</sub>) activator. Of the additional equipment required is centrifugation device, a Plasmaterm H plasma tempering device at 37° C. The preparation protocol for the preparation is simple and consists of the extraction of venous peripheral blood (36 mL) just prior to the surgical procedure, centrifugation of the blood for 8 minutes and separation of plasma rich in growth factors from erythrocytes and leukocytes. Total plasma volume may vary according to haematocrit, sex, age, and patient habits. With pipetting, the fraction F1 and F2 is extracted from the rest of the blood. The F1 fraction is 2 mL of plasma closer to the surface and the F2 fraction is 2 mL of plasma closer to haematocrit. PRGF should then be activated by the ampoule of CaCl<sub>2</sub> activator. The rule is that 1 cc of plasma goes to 2 CaCl<sub>2</sub> activator units. After activation, the F1 and F2 fractions are placed in a Plasmaterm H device at 37° C, for a period of 25 minutes. After this time in the tempering device, from the current activated F1 and F2 fractions, a fibrin membrane or fibrin clot is derived and that be used in different ways, depending on the indication, independently or in combination with the autologous bone to produce a compact mass. In the treatment of periodontal lesions, we use an inactivated F2 fraction because calcium in the tissue activates growth factors (2).

#### Use of PRGF in dental medicine

Due to its predictability, efficiency and above all biocompatibility, the use of PRGF in dentistry has become a method of choice for different indications such as:

- Alveolar preservation after tooth extraction: 2-3 times faster healing processes, better quality of all newly-created tissues, lower postoperative pain, which significantly affects the patient's quality of life.
- Periodontal surgery: PRGF can have a positive auxiliary effect when used in conjunction with grafting materials in the treatment of intravenous defects. Significant benefit of PRGF is shown in the treatment of gingivae recession in the sense of increasing the width of the keratinized mucous membrane.
- Use of PRGF in implantology: platelet-rich autologous plasma is applied directly to the dental implant surface, which improves the osseointegration and primary implant stability.

PRGF in BRONJ therapy (Bisphosphonate-Related Osteonecrosis of the Jaw): PRGF therapy is a supplement to conservative surgery to improve bone healing. Growth factors in PRGF can accelerate epithelial wound healing, reduce tissue inflammation after surgery, improve regeneration of bone and soft tissues, and stimulate vascularization of the tissue (1-3).

#### Overview of examples from practice

Using PRGF it is possible to increase the growth factor concentration multiple times and thus accelerate and improve the healing process. PRGF facilitates easier absorption of transplanted material, wound healing and epithelialization, reducing the chance of scarring, less pain, otitis and healing of the wound is 2-3 times faster than in the usual process. This material possesses powerful bacteriostatic properties, does not contain leukocytes (Metaloproteinase-pro-

inflammatory cytokine) which avoids pro-inflammatory activity. Due to these characteristics, the use of this method can help resolve the complications that can occur after routine interventions and improve patients' quality of life. One of the most common complications occurring after tooth extraction is dry socket or alveolar osteitis (Alveolitis sicca) resulting from various predisposing factors (7). The complication that may occur after the removal of the teeth is also the communication of the maxillary sinus and mouth cavity (Communicatio antrooralis) which can significantly affect the quality of life and lead to difficult prosthetic restoration (8,9).

With this literature overview we aim to present the advantages of using PRGF in these complications.

In the study, which followed wound healing after removal of both molars in the lower jaw, 15 patients (altogether 30 molars) were included with a clinical picture of pericoronitis removed within a period of two weeks. When removing a molar on one side of the jaw, the wound was treated with PRGF (15 molars), on the other side of the jaw in the same patients the wound was supplied in a classic way (15 molars). Intensity of post-operative pain (VAS scales) was monitored, daily for a week, as well as the wound healing on the third and seventh postoperative days, swelling and the appearance of trismus. The results showed that the median postoperative pain intensity value was significantly higher on the side where the molar was removed without using PRGF compared to the side treated with the PRGF after molar removal. Wound healing on the third and seventh postoperative days showed signs of dehiscence in PRGF treated patients in 13% or wounds, i.e. 20% of wounds, in patients without PRGF use in 27% of wounds, i.e. 40% for wounds. The proportion of cases with the occurrence of swelling treated with PRGF (33.3%) was significantly lower than in cases without PRGF (53.3%). The proportion of patients with the increased opening of the mouth after the procedure without PRGF was considerably higher (46.6%) compared to PRGF (26.6%).

Research monitoring antro-oral communication complication was conducted over a period of two years and included 19 patients. The results of researching the appearance of inflammatory complications and recurrence of antro-oral communication (AOC) with regard to time (within 24 hours, 24 to 48 hours, after 48 hours) from sinus opening to operational closure using PRGF method and the appearance of scarring of vestibular furrow six months after AOC closure operations. The results showed that in nine patients whose surgery was performed within 24 hours, on the ninth postoperative day the pain was present in 33.3% of patients and swelling in 11.1%. Thirty days after operation pain and swelling were not recorded. In six patients who had the operation within 24 to 48 hours, on the ninth day postoperative pain was present in 33.3% of patients and swelling in 33% of patients. Thirty days after operation pain and swelling were not recorded. In the four patients who underwent surgery after 48 hours, on the ninth day after operation the pain was present in 50.0% of patients and swelling in 50.0% of patients. Thirty days after operation pain and swelling were not recorded. There were no cases of AOC recurrences recorded in any patient. Six months after surgery 68.4% of patients had no visible scars, 31.6% of patients had a visible scar that did not impact vestibule. Not a single patient has developed a scar that would impact vestibule.

## Conclusion

This method can serve as a choice in treating post-traumatic complications in daily dental practice and thus improve patients' quality of life. The use of PRGF-Endoret reduces inflammation and pain, accelerates soft tissue epithelisation and promotes bone regeneration.

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# **THE CLINICAL USE OF TERMOVISION IN TESTING VASODILATATION AND VASOCONSTRICTION UNDER INFLUENCE OF DIFFERENT LOCAL ANESTHETICS**

**Asist. dr Igor Đukić**

University in Banjaluka, Medicine faculty, Study programme Stomatology, Department of Oral surgery

## **Abstract:**

In all medicine disciplines also in Stomatology the big priority is given to elimination of pain in all medical intervention. For that purpose in most interventions we use local anesthetics. Nowadays the quest for most potent and safest local anesthetic is still going on. The local anesthesia used in practice in most cases include the vasoconstrictors in different concentrations which offers painless intervention and maximum comfort for the patient and the operator. Vasoconstrictor substances make local vasoconstriction and in the same time lowering of local temperature. Termovision camera is highly sophisticated measurement device which measures radiation of temperature in form of infrared irradiation from surface of measured object. Measured temperature is then transformed in infrared termoprint in form of photography or termovideo. Under the influence vasoconstrictor substances in local tissue becomes lowering of local temperature which we can obtain with termovision camera and in that way determine and evaluate potency and time efficiency of different local anesthetics.

## **Introduction:**

In all medical disciplines as well as in dentistry large focus is given on pain, coupling and elimination of pain for all medical procedures or interventions performed on the patient. The association between pain and dental procedures in our society is deeply rooted, this negative painful experiences greatly discourage patients from dental procedures, restricting freedom to work during the intervention, and diminish the success of therapy.

Local anesthetic solution (LAS) used in dentistry due to specific areas of the body in which they infiltrate the most common anesthetics are combined with one of vasoactive substances. Application of LAS with vasoconstrictor in oral surgery is imperative. The market has a large number of LAS with different concentrations of the vasoconstrictor which is attributable that they cause many complications in administration of local anesthesia. Vasoconstrictor which are added to LAS are adrenaline (epinephrine), a significantly less often noradrenaline (norepinephrine). Vasoconstrictors after infiltration into the local tissue causing the constriction of blood vessels which occurs the limited local tissue ischemia and reduce the local temperature of the tissue.

This change in temperature can be measured very accurately, but also displayed using thermal imagers. Thermal imaging cameras are devices by which it is possible to visualize the ambient temperature. All objects in the environment emit infrared (IR) radiation as a function of their temperature. The higher the temperature is of an object it emits more infrared radiation and vice versa. Using thermal imaging camera is carried out non-contact measurement of temperature of an object so that the camera records the emission of IR radiation that is converted into an image and we call it a thermogram.

Medical thermography represents a non-contact measurement of temperature of the body surface on the basis of highly accurate detection of the infrared radiation. Ordinary thermal imager looks like a typical camcorder and produce images of heat radiation. They are sophisticated cameras which can measure the temperature of any object or surface and the image is displayed as color image that make interpretation of thermal patterns.

The image that shows an infrared camera is called a thermogram or sometimes a thermograph. The medical use of thermal imaging cameras has almost unlimited possibilities. In all clinical conditions which changes body or a temperature of limited area, infrared thermography can be a useful diagnostic tool. So far infrared thermography has found application in the diagnosis of breast cancer, peripheral vascular changes in ischemic heart disease and for monitoring of infectious skin diseases and many other diseases.

Breast Thermography is a potential method for early detection of breast cancer. The method is non-invasive, does not radiate, fast, painless, low cost, no risk and with no contact with the body. This method is effective for women of all ages and for all sizes of breasts, fibrocystic breasts, breasts with dense, pregnant or nursing women. The use of thermal imaging in the diagnosis of breast cancer is based on the assumption that in the tumor area is increased local temperature, and that it can be detected by infrared camera. It is also a very useful tool for monitoring the breasts after surgery. The activity of blood vessels and increase of the local heat indicate the presence of precancerous cells or cancer cells in their early stages of development. Infrared thermography can detect the first sign of cancer formation 8 to 10 years before mammography can detect tumors.

Previous studies of the influence of LAS in the degree of vasodilation and vasoconstriction by infrared cameras have been carried out only with pure anesthetics and are not carried out with LAS which in its composition have different vasoconstrictors in different concentrations.

Impact of LAS on the peripheral circulation using a thermal imager describes and explains Lindorf. In his examination he used only pure forms LAS without the addition of vasoactive substances. He investigated the following anesthetics: 2% procaine, 3% butanilcaine, 2% lidocaine, 4% prilocaine and 3% mepivakin.

Our study was conducted on seven LAS five of which had a various concentrations of vasoactive substances and two pure LAS. As a pure LAS is used 2% lidocaine and 3% mepivacaine. Other LAS which were used contained the different concentrations of the vasoconstrictor substances was: 2% lidocaine with adrenaline 1:80 000, 4% articaine with adrenaline 1: 200 000, 2% lidocaine with adrenaline 1: 200 000, 2% mepivacaine with adrenaline 1: 100 000 and 2% mepivacaine with norepinephrine 1: 100 000.

All temperature changes were measured with a thermal imaging camera. Manufacturer is Guide infrared thermal camera, a model Mobir M8. This is a thermal imaging camera and its design is similar as mobile phone which makes it very easy to use. The experimental animals that were used in the study are male Wistar rats of the same age about 4 months, and weighing approximately 250 grams. All specimens that were used were male. This ensured the maximum uniformity of individuals. As a general anesthetic agent which was used is a combination of two general anesthetic ketamine and xylazine. Fifteen minutes after the introduction in general anesthesia was performed application of LAS and a record of thermal images was done in the following intervals: T0 temperature prior to the application of LAS and 15 minutes after the introduction of general anesthesia, T5 temperature five minutes after the administration of LAS, T15 temperature fifteen minutes after the application of LAS, T30 temperature thirty minutes after the administration of LAS, T60 temperature sixty minutes after the administration of LAS, T90 temperature ninety minutes after the administration of LAS, T120 temperature one hundreds and twenty minutes after the administration LAS.

Measurement and analysis of the results were obtained the data which indicate that of all tested LAS only 2% lidocaine is a vasodilator, which leads to an increase in local temperature, which is most pronounced in the fifth minute after its application. The remaining tested LAS showed that lead to vasoconstriction and consequent reduction of local temperature that was expressed differently, depending on the type of LAS. Highest has been shown in 2% mepivacaine with noradrenaline in the fifth minute after the application and that decrease in local temperature is prolonged in comparison to the other tested anesthetics. The most mild decrease in local temperature are shown in 3% mepivacain and he is a pure anesthetic as well as

2% lidocaine. This local temperature drop was most pronounced in 5 minutes after the application and was significantly less intense and shorter duration relative to other tested LAS with a vasoconstrictor. This indicates that the 3% mepivacaine although it is without a vasoconstrictor in its composition it is a mild vasoconstrictor.

In practice it is known that LAS without the vasoconstrictor are intended for use in risk patients, which are suffering from cardiovascular disease and diabetic subjects. For this purpose, we use 2% lidocaine clean. However, due to the absence of localized vasoconstrictor effect leads to insufficient and short local anesthetic effect and as such is insufficient to perform oral surgical interventions. Testing has shown that a more appropriate for this purpose was a 3% mepivacaine without vasoconstrictor because it showed a mild vasoconstrictor effect and longer duration in action compared to the 2% lidocaine. As the most potent in this regard anesthetic has proven to be 3% mepivacaine in combination with norepinephrine and as such would be most efficient LAS. However, due to the exceptional vasoconstriction LAS produced in this combination, leads to a risk of local tissue ischemia and necrosis resulting as shown in individual instances of certain authors. In our study, there were no such effects. Regardless of today it can not be longer found in a market in regular distribution.

The use of thermal imaging cameras in this study proved to be a very effective tool for monitoring changes in temperature. In medicine, as well as in dentistry there are numerous conditions that lead to changes not only general but also local temperature. Local inflammatory processes lead to changes in local temperatures. They can also affect the general increase in body temperature. Here is reflected the potential use of thermal imaging cameras as a diagnostic tool and a potential for monitoring the disease and the success of therapy. In dentistry, there are numerous conditions that have inflammatory nature and as such usually leads to an increase in local body temperatures of the affected region and that is reflected and the possible use of thermal imaging cameras.

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## MARGINAL ADAPTATION QUALITY OF CONVENTIONAL COMPARED TO BULK-FILL COMPOSITE RESTORATIONS

**Ramić Bojana**, Premović Milica, Vukoje Karolina, Stojanac Igor, Drobac Milan, Petrović Ljubomir

In the last few years, in dental market showed up bulk-fill composite materials which can be placed into the cavity in only one layer depth up to 4mm. The most important properties of this materials are low polymerization shrinkage, high translucency and satisfying physical properties. Marginal adaptation in this *in vitro* research was performed in dentin cavities. Standardized cylindrical cavities dimensions 3x3mm were prepared on buccal and lingual surfaces of extracted human third molars. Composite restorations used in this study were placed and polymerized in the same manner – in one layer depth of 3mm which was polymerized continuously for 40s. It was used SEM analysis of epoxy replica of adhesive interface between composite restoration and dentin. The length of marginal gap was measured in micrometers and showed related to whole length of marginal interface. Results of comparative statistical analysis showed that there were no differences in the quality of marginal adaptation between conventional *Filtek Ultimate Flowable* and two bulk-fill composites *Filtek Bulk Fill Flowable* and *SDR*, which were all light polymerized in the same manner. Conventional composites are proposed to be placed in layers with maximal depth of 2mm. Their placing in depth layer of 3mm caused lagging of insufficiently light polymerized layer at the bottom of the cavity. Also, because of the insufficient polymerization of the total layer of composite restoration, conversion degree is decreased too, compromising its mechanical and biological properties.

## COMPARISON OF SHAPING ABILITY OF DIFFERENT ENDODONTIC ROTARY SYSTEMS ON TRAINING ENDOBLOCKS

**Selma Jakupović<sup>1</sup>**, Alma Konjhodžić<sup>1</sup>, Lajla Hasić-Branković<sup>1</sup>, Samra Korać<sup>1</sup>, Irma Tahmišćija<sup>1</sup>, Aida Džanković<sup>1</sup>, Alma Gavranović-Glamoč<sup>2</sup>

<sup>1</sup>Department of Restorative dentistry and Endodontics Faculty of Dental Medicine Sarajevo

<sup>2</sup>Department of Dental Prosthetics Faculty of Dental Medicine Sarajevo

### Abstract

Endoblocks are designed to simulate root canals of different shapes. The most commonly used type of endoblock simulates canal with an angular curvature of 40°. The education of dentists in the field of rotary endodontics is usually performed on endoblocks.

### Objective of the study:

To investigate whether the use of different rotary systems with a different number of endodontic files in sequence affects the occurrence of a number of procedural mistakes.

### Materials and Methods:

Sixty endoblocks (WDV), 30 instrumented with E3 system Endostar Basic Rotary System (3 –file system) and 30 treated with E5 Endostar (Polident, Co Warsaw, Poland) (5 files) were used in the study. Endoblocks were instrumented by dentists, beginners in rotary endodontics. Analysis of procedural errors was performed by six specialists of restorative dentistry and endodontics. Endoblocks were evaluated for presence or absence of procedural errors (i.e., ledge or perforation, apical transportation, shortening of root canal, and/or instrument separation).

### Results:

Obtained results showed a significantly higher number of procedural errors on endoblocks treated with E5 system.

### Conclusion:

Instrumentation of curved canals using a system with less number of rotary files in sequence results in significantly smaller number of procedural errors.

**Keywords:** Endoblock, Endostar, Rotary Endodontics

This study was part of the project entitled "Testing the Application of IBP Technology for the Development of 3D Tooth Models and Endoblocks" provided by the Federal Ministry of Education and Science (BiH).

## ADHESIVE BRIDGE – ESTHETIC AND FUNCTIONAL SOLUTION IN CHILDREN WITH TOOTH AVULSION (CASE REPORT)

**Mirjana Perin**<sup>1</sup>, Ljubica Pavlović-Trifunović<sup>2</sup>, Anamarija Štrbac<sup>3</sup>, Jelena Galović<sup>4</sup>, Milica Šipovac<sup>5</sup>, Duška Blagojević<sup>5,6</sup>

<sup>1</sup>Community Health Centre Nevesinje

<sup>2,4</sup>Community Health Centre Novi Sad

<sup>3</sup>Community Health Centre Beočin

<sup>5</sup>Dental Clinic of Vojvodina

<sup>6</sup>Faculty of Medicine, University of Novi Sad

### Introduction:

The adhesive bridges are dentures that are used when there is a lack of a single tooth. They generally represent a good functional and aesthetic solution. Adhesive bridge can be made direct (in the mouth) and indirect (in the laboratory).

### Case:

Girl M. R nine years old came in Department for children's dentistry in Dental Clinic of Vojvodina. She was bitten by a dog the previous day on the street. Lacerations of the upper lip and gingiva and avulsion of teeth 31 were diagnosed. Following clinical examination and X-ray diagnosis, the patient is scheduled for two weeks for making an adhesive bridge. In this case the prosthetic compensation was made directly in the mouth. The composite, celluloid crowns, adhesive system and fiber-reinforced resin.

### Conclusion:

This method of preparation and adaptation in the mouth is fast, painless and comfortable for the patient, and this has a great importance in children's dentistry. Adhesive bridges in children at school age, where there are conditions for their product adaptations are the methods of choice in avulsion until the end of growth is finished (after 18 years) when we can access ongoing prosthetic rehabilitation.



# REASONS OF THE FIRST DENTAL VISIT - COMPARATIVE ANALYSIS OF THE TWO SUCCESSIVE FIVE-YEARS PERIODS

**Ljubica Pavlović Trifunović<sup>1</sup>**, Sanja Milkov<sup>1</sup>, Jelena Galović<sup>1</sup>, Anamarija Štrbac<sup>2</sup>, Mirjana Perin<sup>3</sup>, Duška Blagojević<sup>4,5</sup>

<sup>1</sup>The Public Health Care Center Novi Sad, Serbia

<sup>2</sup>The Public Health Care Center Beočin, Serbia

<sup>3</sup>The Public Health Care Center Nevesinje, Republika Srpska

<sup>4</sup> Faculty of Medicine Novi Sad, University of Novi Sad, Serbia

<sup>5</sup> Department of Preventive and Pediatric Dentistry, Dentistry Clinic of Vojvodina, Novi Sad, Serbia

## ABSTRACT

### *Background:*

The first dental visit at child's early age contributes to a better education of parents, and it motivates them to provide a proper diet to their child and maintain child's regular oral hygiene. Also, this visit helps parents to establish habits which will further preserve and improve child's oral health.

### *Aim:*

The aim of this research was to determine the trend of the reason changes for the first dental visit.

### *Design:*

In this research, we used collected data on reasons for the first dental visit. The first observed period, from 2006 to 2010, included 120 children, and the second period, from 2011 to 2015, included 150 children. The data used for analysis were obtained from The Public Health Center Novi Sad, Serbia.

### *Results:*

Analysed data showed that in the first period, from 2006 to 2010, 53,8% of visits were preventive and 46,2% were due to pre-existing problems. However, in the second observed period, from 2011 to 2015, 80,1% of visits were preventive and 19,9% of visits were because of pre-existing problems.

### *Conclusion:*

Based on these results, we can conclude that parents' awareness of the importance of preventive dental examinations of infants and young children increased in the second observed period. In order to increase the number of the first preventive dental examinations even further, it is necessary to provide sustained health education of parents.

## COMPLICATIONS OF UNTREATED LATERAL LUXATION OF CENTRAL INCISOR

**dr Snežana Brcanski**<sup>1</sup>, dr Klara Fekete<sup>1</sup>, dr Mirjana Đorđević<sup>1</sup>, prof. dr Duška Blagojević

<sup>1</sup>. Community Health Center: „Dr Đorđe Lazić“ Sombor

<sup>2</sup>. Dental clinic of Vojvodina, Faculty of Medicine Novi Sad

Introduction: lateral luxation is defined as displacement of the tooth, other than axially.

Case report: male patient, aged 12, came into dental clinic because of „pain and swelling“. In anamnesis we found out that child fell from bicycle one year ago, they did not report it to the dentist because „he had no pain“. Clinical examination was observed and it was noticed inclination of the tooth 21 to the tooth 22, swelling above the tooth 21. RTG analysis presented large periapical inflammation. With endodontic treatment tooth 21 was prepared for the oral surgery treatment.

Conclusion: due to the untimely visit to the dentist there was considerable process which has demanded multidisciplinary treatment. It is necessary to inform patients that they need to visit the dentist after any kind of injury.

## PATIENT NEEDS IN THE DENTAL HEALTH CARE

**Ivan Vukosavljevic**<sup>(1)</sup> Jelena Vukosavljevic<sup>(1)</sup> Marko Jeremic<sup>(2)</sup> Dusan Petrovic<sup>(2)</sup> Ana Vukovic<sup>(3)</sup>

<sup>1</sup>Department of general Practice, Health Care Center, Jagodina

<sup>2</sup>Department of dentistry, Health Care Center, Jagodina

<sup>3</sup>Clinic of preventive and pediatric dentistry, Faculty of Dentistry, Belgrade

### Introduction

The effectiveness of dental care system is conditioned by many factors, such as social status of patients and their interest, economic conditions and organization of the system itself.

### Objective and methods

200 patients, aged 18-70 years, were surveyed by questionnaire in visits to the dentist, in the period January 2016 - January 2017, in a medical institution Health Center in Jagodina. The questionnaire contained questions about the reasons for and significance of the visit to the dentist, frequency of visits, the prices and availability of dental services, the economic factor and payment options.

### Result

In 70% of cases, the toothache caused a dental discomfort, with 26% had lack of teeth. Only 1% reported for preventive reasons, and 3% for aesthetic reasons. Women were more frequent (63%) for aesthetic reasons. 30% of the patients reported to the dentist more than 3 times a year, 3% came up to three times, 15% twice and 40% only once a year. 12% of patients did not visit the dentist once a year. In this case there was no difference in behavior between male and female. Economic status and age were the most common limiting factors.

### Conclusion

Better understanding of the real and potential needs of patients in the dental health care system, as well as greater awareness and better reporting of patients with significantly better economic status and availability would greatly contribute to a healthier dental condition in society.

## PREGNANT WOMEN IN DENTAL CARE SYSTEM

**Jelena Vukosavljevic**<sup>(1)</sup> Ivan Vukosavljevic,<sup>(1)</sup> Marko Jeremic<sup>(2)</sup> Dusan Petrovic<sup>(2)</sup> Ana Vukovic<sup>(3)</sup>

<sup>1</sup>Department of general practice, Health Center Jagodina

<sup>2</sup>Department of dental health care, Health Center Jagodina

<sup>3</sup>Clinic of preventive and pediatric Dentistry, Faculty of Dentistry, Belgrade

### Introduction

Special attention in the system overall health, therefore dental care is given to pregnant women and new mothers.

### Objective and methods

In the context of education and programs, through counseling, at Health Center Jagodina, the team work of gynecologists, dentists and pediatricians are working on the preparation of future mothers. Special attention is paid to raising awareness of the importance preventive visits, regular controls and active role of pregnant women in the acquisition of positive habits, which they passed on to their future children.

### Result

73 pregnant women were followed for one year, January 2016 - January 2017, aged 21-38 years. In addition to regular inspections and conservative rehabilitation, we carried out a questionnaire about their knowledge of the importance of oral health. 25,3% of pregnant women had a need for conservative dental intervention, and 52% had periodontal problems. Over half of the surveyed women (53.7%) did not have adequate knowledge about their oral health and its importance. By age, older pregnant women were better informed about the importance of oral health in relation to young pregnant women.

### Conclusion

Aside the usual therapeutic reasons for visiting dentist, dental caries and periodontal disease, a series of preventive and prophylactic measures should be carried out in pregnant women as future mothers. They must be under a permanent and organized protection and control by the dentist as well as the entire health care system. Raising awareness is one of the first step in the complex system of prevention of caries and periodontal disease.

# FRACTURES OF FRONT TEETH AND CONSERVATIVE APPROACH IN MANAGING

**Marko Jeremic**,<sup>(1)</sup> Dusan Petrovic<sup>(1)</sup> Jelena Vukosavljevic<sup>(2)</sup> Ivan Vukosavljevic,<sup>(2)</sup> Ana Vukovic<sup>(3)</sup>

<sup>1.</sup> Department of dentistry, Health Care Center, Jagodina

<sup>2.</sup> Department of general practise, Health Care Center, Jagodina

<sup>3.</sup> Clinic for preventive and pediatric dentistry, School of dental medicine, Belgrade

## Introduction

Fractures of the front teeth are one of the most common injuries that children's dentist encounters in everyday practice. Evaluation of the overall condition of the patient, age, chronic diseases that may be present, the presence of a certain handicap, etiology, time, type of injury, dentition type, tooth type, compliance with the recommended protocols for treatment are some of the factors that affect the outcome of the rehabilitation.

## Objective and methods

Observation of 53 tooth and periodontal tissues injuries in period of January 2016 - January 2017.

## Result

Injuries of periodontal apparatus were more frequent in the milky dentition (63%) The frequency of injuries of hard tooth tissue increases with age, due to the greater physical activity, sport, better mobility of the patient. Penalty was the most common cause, in patients usually of 8 to 15 years of age, 2 times more common in boys. Other causes that led to the fracture were multiple facial injuries during a fall, a big fillings, endodontically treated teeth, carious lesions and untreated orthodontic irregularities. The clinical picture varied, from cracks in enamel to combined injuries of hard dental tissue with the exposed pulp and the tooth supporting apparatus. Exposure of the pulp, the amount of remaining tooth structure, direction, level and height of fracture lines were also factors that determined the manner and dynamics of care.

## Conclusion

The repair of fractured front teeth can be made with conservative approach, with or without endodontic treatment, with or without surgical approach. Sometimes it is necessary to remove the fractured teeth, and prosthetic restorations.

## LONG-TERM FAVORABLE OUTCOME OF MULTIPLE COMPLEX DENTAL TRAUMATIC INJURIES

**Jelena Galović<sup>1</sup>**, Sanja Milkov<sup>1</sup>, Mirjana Perin<sup>2</sup>, Jelena Nikolić Ivošević<sup>3</sup>, Tatjana Vukojević<sup>1</sup>, Bojan Petrović<sup>4</sup>

<sup>1</sup>Dom zdravlja Novi Sad

<sup>2</sup>Dom zdravlja Nevesinje

<sup>3</sup>Dom zdravlja Subotica

<sup>4</sup>Klinika za stomatologiju Vojvodine Novi Sad

**INTRODUCTION:** Root fracture is characterized by cement, dentin and pulp injuries. It results after the impingement of high force usually upon the upper central incisors with completed (mature) root development.

**CASE REPORT:** 12 years old patient comes to clinic 1 hour after accidental trauma occurred. Clinical examination and X-ray analysis show laceration of upper and lower lip, tooth fracture Class III of right permanent maxillary central incisor and tooth fracture Class IV of left permanent maxillary central incisor with minimum dislocation of the apical fragment. Also, lateral luxation of teeth 11, 21 and 22 is visible. Teeth are sensitive to both vertical and horizontal percussion, electric pulp vitality test is negative. Flexible splint is applied, a vital amputation of tooth 11 is made, antibiotic protection is administered. After 4 weeks splint has been removed, the patient is symptom-free, vitality test is positive and the composite restoration on the tooth 21 is performed. On a follow-up after 1 year, radiograph analysis shows healing of fractured apical fragment with interproximal bone or cement, with no evidence of inflammation of the pulp. On a follow-up after 6 years, all of traumatized teeth are vital, insensitive to percussion, and X-ray reveals apical fragment coalescence with possible bone replacement resorption of the apex.

**CONCLUSION:** In order to facilitate the healing of the fragments, it is necessary to urgently make repositioning and splint immobilization. Degree of dislocation significantly affect prognosis.

## THERAPEUTIC MANAGEMENT OF TEETH WITH MULTIPLE ROOT FRACTURES

**Jelena Nikolić Ivošević**<sup>1</sup>, Jelena Galović<sup>2</sup>, Mirjana Perin<sup>3</sup>, Sanja Milkov<sup>2</sup>, Tatjana Vukojević<sup>2</sup>, Bojan Petrović<sup>4</sup>

<sup>1</sup>Dom zdravlja Subotica

<sup>2</sup>Dom zdravlja Novi Sad

<sup>3</sup>Dom zdravlja Nevesinje

<sup>4</sup>Klinika za stomatologiju Vojvodine Novi Sad

**OBJECTIVE:** The aim was to present the possibility of preserving the biological features of the teeth after complicated horizontal middle third root fractures of the two maxillary central incisors and class II fracture of the maxillary lateral incisor in a 16-year-old girl.

**CASE REPORT:** The girl was sent to the Dentistry Clinic of Vojvodina, after the medical treatment of injury due to accidental fall from roller skates and initial treatment when wire splint immobilization was performed. After clinical examination and X-ray analysis, a horizontal fracture of the middle third of the roots of both central incisors was observed. Vitality of the injured incisors as well as sensitivity to the vertical percussion was preserved. Furthermore, excessive mobility of the teeth was revealed.

A treatment consisted of the replacement of the wire splint immobilization with flexible, fiberglass splint immobilization. A segment of arch was long enough to include the injured teeth and at least *two teeth* on either *side of the injury*.

Root canal treatment was postponed due to the lack of clinical signs or symptoms. Four months splint immobilization was applied with regular checkups. On a follow up, 8 months after the injury, pulp vitality was preserved, pathologic mobility of the injured teeth was no longer observed, patient was symptom free, insensitive to the vertical percussion.

**CONCLUSION:** This case confirms a possibility of preserving the vitality of the pulp after middle third root fractures. However, there is no evidence whether trauma causes only injuries to the hard dental tissue while the pulp tissue remains intact, or injury to the pulp tissue is also involved but later comes to its restitution.

## COMPLICATED CROWN – ROOT FRACTURE OF PERMANENT MAXILLARY CENTRAL INCISOR. CASE REPORT

**Vera Batanjski**<sup>1</sup>, Sanja Vujkov<sup>2</sup>, Jelena Komšić<sup>1</sup>, Isidora Nešković<sup>2</sup>, Dragana Okuka<sup>3</sup>

<sup>1</sup>House of Health “Novi Sad“

<sup>2</sup>Dental Clinic of Vojvodina

<sup>3</sup>Dental Center “Tomanovic” Trebinje

**Introduction.** A complicated crown-root fracture is a type of dental trauma, that involves enamel, dentin, cementum, pulp tissue and extending below the gingival margin. Fractured fragments may be completely separated from the tooth or may be more-less mobile. Occurrence of this type of dental trauma is 0,3-0,5%. Management of complicated crown-root fractures remains a great challenge.

**Case report.** A 9- year old girl, after received immediate treatment by her dentist, was sent to Dental Clinic of Vojvodina with diagnosis of complicated crown–root fracture of permanent maxillary left central incisor. Clinical and radiographic examination, including CBCT, revealed multifragmentary crown fracture of the tooth 21. The fracture line was located bucco-lingually and was extended subgingival, the rest fracture fragments were gently mobile. Medical documentation revealed that immediate treatment included dental pulp extirpation. Initial treatment was consisted of reattachment of the crown fracture fragments with composite resin and endodontic treatment. After periodic clinical and radiographic examination as the tooth was asymptomatic, final obturation of root canal and composite crown restauration were done. Patient has been followed up for 1-year and the treatment results are stable.

**Conclusion.** The purpose of this case report is to describe conservative restorative treatment in a maxillary central incisor with complicated crown-root fracture using adhesive technique and composite resin.



## CLINICAL COMPLICATIONS IN TOOTH FRACTURES II AND III CLASS- THERAPY OPTIONS

**Isidora Nešković**<sup>1</sup>, Igor Stojanac<sup>1</sup>, Sanja Vujkov<sup>1</sup>, Nemanja Nešković<sup>2</sup>, Duška Blagojević<sup>1</sup>

<sup>1</sup> Dentistry clinic of Vojvodina, Medical faculty, University of Novi Sad

<sup>2</sup> Private dental clinic „ Nešković Dent“

### Abstract

**Introduction.** Injuries of hard dental tissue are quite common in children, but often occur with adult patients. Favorable outcome of therapy involves the preservation of the vitality of the pulp and periodontal tissues. Adverse outcome can be characterized by clinical and radiological signs of pathology of the pulp and apical periodontitis which may occur immediately post-injury or post.

**Case report.** A case of a patient aged 26 years. Medical history data were obtained by dental trauma month and a half earlier, which happened in the US when she fell off the bike and hit the teeth of the concrete, immediately after the violation was committed direct pulp capping the tooth 21 and the teeth 11 and 21 are disposed conservative. The patient came to the Dental clinic because of dissatisfaction with the aesthetic of restored teeth and occasional pain. Clinical examination revealed that they fulfill the teeth 11 and 21 is inadequate in terms of discoloration, teeth are moveable about 2 mm in labio-lingual direction. Diagnostic methods were found to be negative both teeth on the assay and vitality, and the X-rays is observed, the fracture line of the fracture-class II on the tooth 11 and III class on the tooth 21. The treatment plan involved a visit to the setting in the first composite splint, then endodontic treatment (processing biomechanical and obturation of the root canal), the installation of composite pegs and composite coronal reconstruction direct extensions.

After obtaining approval for the proposed treatment plan, we started with the removal of old composite upgrades, trepanation and formation of access cavity, after which the treated root canal manually or instruments through the standard procedure, and copious irrigation with a solution of sodium hypochlorite. After shaping and cleaning the root canal is definitely obturated with paste based on epoxy resin and gutta-percha points greater taper using lateral condensation. After two days was carried out post-endodontic restoration of teeth with composite channel peg and direct coronal upgrade nano-hybrid composite.

**Conclusion.** Timely and adequate therapy is of great importance for a favorable outcome of treatment of teeth after trauma. The restoration of endodontically treated tooth with the use of pegs of fiber glass reinforced composites are secure system that resists torsion and axial masticatory forces, which allow the conservative treatment of the teeth after the trauma.

## CONTEMPORARY METHODS FOR CARIES DIAGNOSTICS

**Jelena Komsic**<sup>1</sup>, Sanja Vujkov<sup>2</sup>, Isidora Neskovic<sup>2</sup>, Bojan Petrovic<sup>2</sup>, Duska Blagojevic<sup>2</sup>, Vera Batanjski<sup>1</sup>, Anamarija Strbac<sup>3</sup>

<sup>1</sup> Health Center Novi Sad

<sup>2</sup> Dental Clinic, Medical Faculty, University of Novi Sad

<sup>3</sup> Health Center Beocin

### Summary

The importance of regular, early and more accurate diagnosis of caries is the most important method in the best possible prevention and early detection of dental caries. Diagnostic methods used for the most precise and adequate caries detection are visual inspection and tactile evaluation of the probe, separating teeth, fingerprinting for detection of interproximal caries, radiography, digital radiography and tomography 3D, electronic detector of caries or electronic caries monitor, illumination optical fiber(FOTI), laser fluorescence, air abrasion and testing the vitality of teeth.

In addition to visual inspection, radiographic dental imaging is an essential method of diagnosis of caries and allows the dentist clinically relevant information. Occlusal caries and secondary caries can be detected using X-rays. Digital recording allows high accuracy. Using 3D technology allows the detection of proximal caries. Using FOTI compared with radiographic imaging of teeth is that it does not use radiation. The use of electronic caries monitor and laser fluorescence are important in early detection of initial caries. Air abrasion represents an alternative method of diagnosis of occlusal caries. Methods of testing the vitality of teeth can be obtained corresponding results on the state of the dental pulp. The combination of multiple diagnostic methods gives an adequate treatment plan that allows the clinician to work. Depending on the indication, the patient's condition, age, the possibility of cooperation with the patient in pediatric dentistry, clinician based on experience decide which diagnostic methods will be used.

# MULTIDISCIPLINARY APPROACH IN THE TREATMENT OF COMPLICATED DIAGONAL FRACTURES OF MAXILLARY LATERAL INCISOR

**Tatjana Vukojević**, Mirjana Perin, Ljubica Pavlović-Trifunović, Sanja Milkov, Ivana Gušić, Bojan Petrović

Dom zdravlja Novi Sad  
Dom zdravlja Nevesinje  
Klinika za stomatologiju Vojvodine Novi Sad

**OBJECTIVE:** The aim was to describe a complex therapeutic approach in the treatment of complicated subgingival diagonal crown and root fracture with pulp exposure of the right maxillary lateral incisor in a 13 years old boy.

**CASE REPORT:** A male patient was referred to the Department of Dentistry of Vojvodina after the initial treatment of accidental injury occurred while playing at school. After clinical examination and research of medical records, uncomplicated dental crown fracture Class II of the right maxillary central incisor was diagnosed. Conservative composite restoration was performed during the first visit. Furthermore, complicated subgingival diagonal crown and root fracture of the maxillary right lateral incisor with pulp exposure was observed. Fractured tooth fragment is preserved.

Radiographic analysis revealed a radiopaque shadow from calcium hydroxide paste in the root canal of the radicular fragment of tooth 12 and completed root development. Treatment involved the obturation with gutta-percha points and 12 AH + paste of radicular fragment of the tooth 12, flap surgery in order to expose the fractured tooth surface, and provide reattachment of fractured tooth fragments with fiberglass post and composite resin cement.

**CONCLUSION:** A multidisciplinary minimally invasive treatment approach of complicated dental traumas of front teeth that includes enamel, dentin, cement and pulp tissue injuries, may give satisfactory cosmetic and functional results with the maximum preservation of dental structures.

# MULTIDISCIPLINARNOM PREDPROTETSKOM PRIPREMOM DO ZADOVOLJNOG PACIJENTA

**Branko N. Nikolić**<sup>1</sup>, Ivor Tomek <sup>2</sup>, Sabina Štefanović <sup>3</sup>

<sup>1</sup>Privatnastomatološkaordinacija „Dental House”, Subotica

<sup>2</sup>Privatnastomatološkaordinacija „Dental House“, Subotica

<sup>3</sup>Privatnastomatološkaordinacija „Dental House“, Subotica

## Sažetak

Pacijent starosti 40 godina javio se u stomatološku ordinaciju nezadovoljan izgledom gornjih frontalnih zuba, anamnestički navodeći pad sa motora pre 20 godina i povredu gornjih prednjih zuba.

Kliničkim pregledom ustanovljeno je prisustvo metalokeramičke krunene odgovarajuće boje nazubu 11 i prebojenost kliničkih kruna zuba 12 i 21. Analizom retroalveolarnih snimaka utvrđeno je prisustvo hroničnog periapikalnog procesa na korenovima istih zuba. Indikovana je endodontska (punjenje kanala korenova zuba 12 i 21), hirurška (apikoektomija zuba 12 i 21) i parodontalna (kliničko produženje krunica zuba 12 i 21) predprotetska priprema.

U okviru terapijskog tretmana, nakon uspešne endodontske i hirurške predpripreme, urađeno je produženje kliničkih kruna navedenih zuba. Na taj način je postignuta zadovoljavajuća estetika mekih tkiva iste regije. Mekotkivni menadžment je nastavljen sa privremenim krunicama 6 nedelja. Nakon dobijenih zadovoljavajućih rezultata realizovan je otisak. Urađena je proba metalnih konstrukcija (Adentatec GmbH system NH), probakeramike (Noritake u a3 bojisa a+ pigmentima cervikalno) I nakon glaziranja je definitivno cementiran protetski rad.

Dugovremenska multidisciplinarna predprotetska priprema u trajanju od 4 meseca rezultirala je skladnom estetskom protetskom nadoknadom.

# MAKING OF THE STABILISATION MICHIGAN SPLINT IN A PATIENT WITH CHRONIC PAIN IN TEMPOROMANIBULAR JOINT-CASE REPORT-

**Milica Jeremić Knežević**<sup>1</sup>, Dubravka Marković<sup>1</sup>, Aleksandar Knežević<sup>2</sup>, Daniela Đurović Koprivica<sup>1</sup>, Jovana Laban<sup>3</sup>, Bojana Pivaš<sup>1</sup>, Tatjana Puškar<sup>1</sup>

<sup>1</sup> University of Novi Sad, Faculty of Medicine, Department of Dentistry, Novi Sad

<sup>2</sup> Clinical Centre of Vojvodina, Clinic for Medical Rehabilitation, Novi Sad

<sup>3</sup> Dental Clinic of Vojvodina, Novi Sad

**INTRODUCTION:** Stabilisation Michigan splint is a part of the reversible occlusal therapy along with physical, pharma and psychotherapy. The splint enables temporary change of the existing occlusal relations or the position of the mandible. It is indicated as the initial therapy for patients with symptoms or signs of temporomandibular joint dysfunction (TMD) and orofacial muscles.

The aim of this work is to show the creation of the stabilisation Michigan splint in the upper jaw in a patient with chronic pain of TMJ.

**CASE REPORT:** Female patient, 40 years of age, came to the Dental Clinic of Vojvodina in Novi Sad due to the pain of both TMJs, which lasted for more than a year. The intensity of pain on a Visual Analogue Scale (VAS) was 9. After the anamnesis, clinical examination, magnetic resonance imaging of TMJ, the making of the stabilisation splint was indicated. Molded upper and lower jaws study models were taken in articulator. The upper was taken by using the facebow and the lower by central position registration. The splint was made of heat cure acrylic in order to allow canine guided occlusion, stabilisation of the condyle in the central position of the mandible, raising the vertical dimension of 2-3 mm, as well as the contact cusp-flat plate splint. The patient was wearing the splint during night for 8 hours and 4 hours during the day for 8 weeks, with reocclusion in every two weeks from the moment of obtaining the splint. The patient stated that she felt better and the pain intensity on the VAS was reduced to 2.

**CONCLUSION:** Stabilisation Michigan splint may be effective in the treatment of chronic pain in the area of TMJ

# CERAMIC RESTORATION AND CROWN MINIMAL PROCEDURES IN ESTHETIC REGION

**Branko N. Nikolić**<sup>1</sup>, Sabina Štefanović<sup>2</sup>, Ivor Tomek<sup>3</sup>

<sup>1</sup> Private dental center "Dental House" Subotica

<sup>2</sup> Private dental center "Dental House" Subotica

<sup>3</sup> Private dental center "Dental House" Subotica

## Abstract

Patient, 26 years old, came to the dentistry unhappy with the shape and position of his upper left central incisor, as well as excessively colored and hyperplastic soft tissues of the same region. He mentions color of tooth 21 as an additional problem, but also the color of the entire dentition.

After refusing the proposed orthodontic and implantological pre-prosthetic preparation, we reached a therapeutic compromise in the form of prosthetic restoration which will be realized in the shortest possible time period.

As part of the therapeutic treatment, bleaching was done. By extending the clinical crown of tooth 21, we obtained satisfactory symmetry of the zenith of central maxillary incisors. Composite crown restoration was removed and the pulp post was extracted. Till the next session, the patient was provided with an adhesive ridge with a crown from the teeth set from the denture. After successful revision of the canal filling, due to fractural line which spread subgingivally, we indicated a gold-cast restoration which was rejected by the patient. We opted for a compromise in the form of restoration from zirconium ceramics. Soft tissue management was continued with a temporary crown until we reached a satisfactory aesthetic result. Final tooth restoration was made from ceramics (lithium disilicate ceramics + veneer ceramics).

The patient was functionally and aesthetically rehabilitated and happy when he left the dentistry.

# DENTAL STATUS AND PRESENCE OF PROSTHETIC RESTORATIONS IN RELATION TO SOCIOECONOMIC FACTORS IN ELDERLY WOMEN IN INDIJA

**Jelena Pantelinac**<sup>1,2</sup>, Tatjana Jovanović Ilić<sup>1</sup>, Bojan Petrović<sup>2,3</sup>, Marija Jevtić<sup>2,4</sup>

<sup>1</sup> Dom zdravlja Indija

<sup>2</sup> Univerzitet u Novom Sadu, Medicinski fakultet

<sup>3</sup> Klinika za stomatologiju Vojvodine, Novi Sad

<sup>4</sup> Institut za javno zdravlje Vojvodine, Novi Sad

## Abstract

**The aim** of this study was to evaluate dental and prosthetic status in relation to socio-economic factors of the population in elderly women in the municipality of Indija.

**Materials and methods.** The study included 315 elderly women (age 65-74 years). Criteria study followed the methods proposed in the Manual WHO: Oral health surveys: basic methods. Dental status was assessed using DMFT index and analyzed in relation to socio-economic factors: level of education and monthly income of respondents. Prosthetic status was analyzed based on the presence of mobile and fixed dental restorations.

**Results.** The mean DMFT in the study population of women was 25,3. The lowest value of DMFT was recorded of subjects with high school and university graduates (21,5). The number of extracted teeth in the average was 20,2. The presence of edentoullism in the study population of women was 32,5%. There was a statistically significant difference in the presence of edentoullism in relation to years of education and monthly income. Functional dentition (20 and more teeth) was found in 15,1% of elderly women. The presence of complete dentures was recorded at 49,7%, partial denture at 17,8% and fixed prosthetic restoration at 4,8% of respondents.

**Conclusion.** Socioeconomic factors have a major influence on dental and prosthetic status in elderly women.

# TECHNOLOGY OF ACCURACY MEASUREMENT OF IMPRINTED SURFACES OBTAINED BY CONVENTIONAL IMPRESSION METHODS IN PROSTHODONTICS

**Daniela Djurovic Koprivica**<sup>1</sup>, Milica Jeremic Knezevic<sup>1</sup>, Bojana Milekic<sup>1</sup>, Bojana Pivas<sup>1</sup>, Jovana Laban<sup>1</sup>, Igor Budak<sup>2</sup>, Tatjana Puskar<sup>1</sup>

<sup>1</sup> University of Novi Sad, Medical faculty, Department of dentistry, Hajduk Veljkova 3, Novi Sad

<sup>2</sup> University of Novi Sad, Faculty of technical sciences, Department of metrology, quality, equipment, tools, and ecological engineering aspects, Trg Dositeja Obradovića 6, Novi Sad

## Abstract

The accuracy of prosthetic restorations on natural teeth, especially those made on endosseous implants is extremely important for successful treatment. Lack of passive fit arise mainly as a result of errors during impression or casting definitive working model. Therefore, the measurement accuracy of the imprinted surfaces during prosthetic treatment is extremely popular research topic.

For the accuracy measurement of working models are most commonly used in-vitro tests. The experiment must start making master model that will serve as a control. In order to get the necessary information master model needs to be 3D (three-dimensional) digitized. This involves collecting data on the geometry of the measured object and converting them into digital form. Digitization can be done with contact systems, manual or automatic, using a coordinate measuring machine (CMM) or 3D articulated hands. However, when performing measurement of plaster models and imprinted surfaces of the tooth, implants and surrounding tissues, due to the large surface area and numerous details that are included in the measurement, is often used non-contact optical digitizing systems. These systems use laboratory scanners which surface-scanned informations transform into the virtual model. Then is taking impression of the master model and each obtained replica model digitizes the same way. All data obtained by scanning are converted into STL (Stereolithography) format that contains the necessary measures for further analysis. For the analysis of dimensional tolerances between imprinted surfaces is using overlapping nominal surfaces of master model with realistic surfaces of replica model.

Measurement accuracy of imprinted surfaces greatly contributes to clinical practice in the choice of impression technique, impression material and casting working models for the purpose of making more accurate prosthetic restoration.



# REHABILITATION OF THE EDENTULOUS PATIENT WITH A DIRECT COMPOSITE BRIDGE REINFORCED WITH GLASS FIBERS - STUDY IN VITRO

**Jovana Laban**, Bojana Milekić<sup>1</sup>, Daniela Đurović-Koprivica<sup>1</sup>, Bojana Pivaš<sup>1</sup>, Milica Jeremić-Knežević<sup>1</sup>, Tatjana Puškar<sup>1</sup>

<sup>1</sup> University of Novi Sad, school of medicine-department of dentistry- Hajduk Veljkova 3, Novi Sad, Srbija

## ABSTRACT

Prosthetic therapy for edentulousness in the anterior region is particularly challenging due to impaired function of the orofacial system and because of the disturbed phonetics and esthetics. A need for immediate rehabilitation of edentulous patients after completed prosthetic, surgical, or some other intervention, has resulted in the development of various techniques and methods for direct bridge restoration. Upon completing preprosthetic preparation, immediate rehabilitation of a patient's orofacial system is provided by creating a fiber-reinforced composite bridge with a direct method. Dental restorations may be temporary or relatively permanent, depending on the type of preprosthetic therapy, conditions and arrangement of the remaining teeth. The study aim is to show the technique for making a composite glass fiber-reinforced bridge on the study edentulous model - Kennedy class IV. The direct glass fibre-reinforced composite bridge allows immediate rehabilitation of an edentulous patients with a minimally invasive treatment and relatively low cost. These systems are now considered to be innovative solutions and in certain cases, alternatives to conventional dental restorations. The advantages include fast, easy and simple manufacturing, low cost, potential for immediate rehabilitation and minimally invasive treatment. The disadvantages are a higher degree of adhesion of the dental plaque to the composite in comparison to ceramic materials, poorer mechanical properties compared to conventional dental restorations, the need for patients to sit in the dental chair for an extended time, less possibility to polish the bridge compared to laboratory conditions, and limited possibility of application in the lateral region.

Keywords: composite bridge, fiber-reinforced composites

# ADHERENCE ABILITY OF DENTURE BASE RESINS-IN VIVO STUDY

**Milena Kostić**<sup>1</sup>, Jelena Rajković<sup>2</sup>, Marko Igić<sup>1</sup>, Nikola Gligorijević<sup>1</sup>

<sup>1</sup> University of Niš, Medical Faculty, Clinic of stomatology

<sup>2</sup> University of Niš, Faculty of Sciences and Mathematics, Department for biology and ecology

## **Abstract**

### **Introduction.**

The acrylic polymers are mainly used in dentistry for making (hot polymerized) and relining dentures (cold polymerized). To be considered biocompatible, it is necessary that material owns adequate structural design to minimize reactions with tissue and agents from the environment. Uneven surface of the acrylic material represents a predilection site for accumulation of plaque, pigment and the residue of oral tissue. After polymerization acrylates show a certain degree of surface roughness and porosity, as, above all, is conditioned by the kind of polymerization.

**The aim** of this study was to investigate the adherence of various acrylic polymers after intramuscular implantation. The study is based on the premise that the type and method of polymerization of acrylic impact on the surrounding tissue adhesion to the material.

### **Material and Methods.**

The structure of three cold cured and two hot cured acrylic samples was analyzed after a four-week intramuscular implantation into m. gastrocnemius in relation to control by scanning electron microscope. Changes in the structure of the implanted resin material, the measurement of their porosity and the adherence to surrounding tissues, and the presence of cells within the sample structure were observed.

### **Results.**

Cold polymerized acrylic resins after intramuscular implantation showed significant adherence to the surrounding tissue. In contrast, the structural design of hot polymerized acrylic resins compared to control was not changed, which confirms their greater biocompatibility.

### **Conclusion.**

Due to the inhomogeneity of the external and internal structures of cold polymerized acrylic resins, impeccable hygiene of padded dentures is imperative. Bearing in mind the better physical, mechanical and biological characteristics, permanent relining dentures by hot polymer resins is proposed.

***09.06.2017. Poster  
presentations***

# IN VITRO ANALYZING OF CYTOTOXIC EFFECTS OF THE MATERIALS USED IN THE REGENERATIVE AND RECONSTRUCTIVE DENTAL MEDICINE

**Bojana Pivaš**<sup>1</sup>, Vesna Kojić<sup>2</sup>, Jovana Laban<sup>1</sup>, Daniela Đurović-Koprivica<sup>1</sup>, Bojana Milekić<sup>1</sup>, Milica Jeremić-Knežević<sup>1</sup>, Tatjana Puškar<sup>1</sup>

<sup>1</sup>Faculty of Medicine Novi Sad, Department for dental medicine, Hajduk Veljkova 3, Novi Sad

<sup>2</sup>Oncology Institute of Vojvodina, Put dr Goldmana 4, Sremska Kamenica

Biocompatibility is a very important characteristic of the materials for use in dental medicine. Any material that is planned to be embedded in the human body must be tested to confirm the safety of administration. Installing bone deputy does not mean necessarily successful bone regeneration.

Cytological testing method was provided to analyze the influence of the bone implantaciog material (Bio-Oss) in cytologically metabolism, proliferation and division. Biocompatibility of implanted materials can be determined in vitro, analizing what is the adhesion of fibroblasts on the implanted material, thus achieving the prediction and reconstruction and remodeling of the bone defects.

Key words: biocompatibility, cytotoxicity

### 3D TECHNOLOGY IN MONOBLOCK MANUFACTURING

**Kristina Vicko**<sup>1</sup>, Tatjana Puškar<sup>1</sup>, Željko Santoši<sup>2</sup>, Igor Budak<sup>2</sup>, Dominic Eggbeer<sup>3</sup>

<sup>1</sup> Medical Faculty, University of Novi Sad

<sup>2</sup> Faculty of Technical Sciences, University of Novi Sad

<sup>3</sup> Metropolitan University, Cardiff, UK

#### **Abstract**

The purpose of this study was to apply the latest developments in additive manufacturing using 3D digitalization and 3D printing, and to compare it with the process of conventional manufacturing of a monoblock appliance. A close range photogrammetry was used for the 3D scanning of plaster models with a constructional bite.

A monoblock with all the elements was designed on the basis of 3D digitized plaster models in the software FreeForm Plus (v2016, *Geomagic, 3D Systems, USA*) using a haptic arm. Printing was done with *MarkForged Mark Two 3D* printer in nylon (polyamide). The material thickness of the layered printing was 0.1 mm. Printing of the monoblock lasted about 4 hours, while the supportive structures were removed in less than one minute.

The development of 3D technology has facilitated the designing of mobile appliances, which leads to a very rapid process of production, but for an intraoral use of appliances it is necessary to improve the properties of nylon or it is required to use another appropriate material for 3D printing.

# THE USE OF CAD/CAM TECHNOLOGY IN THERAPY - A CASE REPORT

**Škrbić D**<sup>1</sup>, Petronijević B<sup>1</sup>, Drobac M<sup>1</sup>

<sup>1</sup> Faculty of Medicine, Department of dentistry, University of Novi Sad, Serbia

## **Introduction:**

CAD/CAM in dentistry is an acronym of English words for computer aided design/computer aided manufacturing, where we use special ceramic blocks to make inlays, onlays, crowns and bridges.

## **Case description:**

Patient, 22 years old, needs a treatment off the upper right canine. Dental examination indicated the palatal position of the teeth. Endodontic treatment is done and then a fiber stiff is installed with adjusted his position. Prosthetic rehabilitation is done by making a ceramic crown using CAD/CAM technology.

The process of making restorations using the CAD/CAM technology is carried out in three phases:

1. Intraoral camera is used to make accurate 3D digital optical prints.
2. Computer design in CAD segment
3. Computer manufacturing of fixed restorations using the milling process from the ceramic blocks in the CAM segment.

## **Conclusion:**

Advantage of CAD/CAM technology in dentistry for the patient are saving time because of just one visit, high aesthetics and biocompatibility. Dentist has a simplified procedure of making fixed restorations, increased accuracy and productivity.

# EVALUATION OF FIT OF FIXED DENTAL RESTORATIONS

**Mila Kovacevic**<sup>1</sup>, Branislava Petronijevic<sup>1</sup>, Radovan Hudak<sup>2</sup>

<sup>1</sup> Dental Clinic of Vojvodina, Faculty of Medicine, University of Novi Sad, Serbia

<sup>2</sup> Department of Biomedical Engineering and Measurement, Faculty of Mechanical Engineering, Technical University of Kosice, Slovakia

## **Abstract**

The long-term success of dental restoration largely depends on good adaptation to abutment tooth. Adaptation is evaluated by measuring marginal and internal gaps. The marginal gap is the perpendicular distance from the internal surface of the restoration to the finish line of the preparation. The internal gap is the perpendicular distance from the internal surface of the restoration to the axial wall of the preparation. Inadequate fit could lead to plaque retention, microleakage and cement dissolution, which may result in carious lesions and periodontal disease.

One of the methods for evaluation of fit involves direct microscopic examination of the marginal area, and measuring distance from the edge of the restoration to finish line of the prepared tooth. Main disadvantages of this method are difficulty of identifying reference points to measure, and possibility of projection errors. In other technique, cemented specimens are cross-sectioned, and the marginal area is then examined under a microscope. It implies destruction of the specimens, and provides only a limited number of measurements. Method with creating a silicone replica of the gap between the crown and the tooth, and microscopy of the marginal area, avoids specimen destruction, but also provides small number of marginal gap measurements.

In the current literature, the x-ray microtomography (micro-CT) is considered to be the best technique for investigating quality of fit. This innovative method is nondestructive, allows great number of measurement sites and easy recognition and measuring of marginal and internal gaps.

## DIGITAL IMPRESSION

**Nebojša Šinka**, Branislava Petronijević, Nikola Milić

Medical Faculty, Department of Dentistry, University of Novi Sad, Novi Sad, Srbija

Advances in computerization, optics, miniaturization, and laser technologies have enabled the capture of dental impressions. Three-dimensional (3D) digitizing scanners have been in use in dentistry for more than 20 years and continue to be developed and improved for obtaining excellent and precise virtual impressions.

Digital impression techniques are advertised as an alternative to conventional impressioning. The field of digital impressions is quickly growing, as evidenced by the number of new scanner systems with more features and benefits. One of the leading systems are: IDENTICA BLUE (Interdent), IDENTICA HYBRID (Interdent), Lava C.O.S. (3M ESPE), CEREC (Sirona), and iTero (Straumann)

The technologies that have made the use of 3D digital scanners an integral part of many industries for decades have been improved and refined for application in dentistry. Since the introduction of the first dental impressioning digital scanner in the 1980's, development engineers at a number of companies have enhanced the technologies and created in-office scanners that are increasingly user-friendly and are used to produce precisely fitting dental restorations. These systems are capable of capturing 3D virtual images of prepared or unprepared teeth, dental implants, edentulous ridges, or intraoral landmarks or defects, from which restorations may be directly fabricated (CAD/CAM systems) or which can be used to create accurate master models on which the restorations can be made in a dental laboratory (dedicated impression scanning systems).

### Conclusion:

All 3D digital impressioning systems have the potential to produce restorations with improved marginal fit over that of traditional elastomeric impressions, based on the fact that the master cast is created from digital data obtained from the tooth preparation itself, rather than from a second- or third-generation impression or model. The success of the CEREC and similar systems over the past 21 years has convinced many dentists worldwide to engage in new technologies.

As a dentist, you have so many technologies to choose from, technologies that are designed to improve patient care while making you more efficient at the same time.

The possibilities continue to grow as technology continues to improve.

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## APPLICATION OF HELBO THERAPY IN INFECTION CONTROL

**Dr Ivan Drobniak**<sup>1</sup>, Dr Anja Sekulić<sup>1</sup>, Dr Milan Kresoja<sup>1</sup> Dr Dražen Kuprešanin<sup>1</sup>, Dr Tijana Delić<sup>1</sup>, Prof.dr Siniša Mirković<sup>1</sup>

<sup>1</sup> Department of Dentistry, Department of Oral Surgery

### INTRODUCTION:

Periapical lesions are pathological changes that occur at the tips of roots of non-vital teeth. These changes can be divided into periapical GRANULUM, radicular cyst, periapical scars and other lesions. With certain of the periapical granulomas may be an epithelial cell proliferation due to the effects of the infected contents and in the further occurrence of radicular cysts. Surgical treatment in most cases is a completely successful procedure that removes periapical lesions, and disposed closes root canal.

### CASE Report:

This case shows female patient at age of 36, occurring in private practice doing prosthetic care partial loss of teeth in the upper jaw. Based on OPT footage we found the presence of residual cyst in region 22 and 23, a medical history confirmed that the tooth 22 underwent resection of the root five years ago. During the surgical treatment of residual lesions we used modern HELBO THERAPY infection control, in order to achieve maximum decontamination bone defect.

### CONCLUSION:

The use HELBO therapy is one of the most modern methods of infection control. Treatment propositions are based on marking the bacterial wall using a laser-sensitive molecules which penetrate through the biofilm by means of HELBO blue photo-sensor. The success of using the aforementioned therapies confirm studies in the field of maxillofacial and oral surgery.

## FOLLICULAR CYSTS IN THE PREMOLAR REGION

**Dr Dražen Kuprešanin**, dr Tijana Delić, dr Milan Kresoja, dr Anja Sekulić, dr Ivan Drobnjak, dr Jelena Pušibrk, Doc. dr Ivan Šarčev, Prof. dr Siniša Mirković

University of Novi Sad  
Medical Faculty  
Department of Dentistry of Vojvodina

### Abstract

Follicular cysts are developmental lesions of odontogenic origin. They develop around the formed crown of not erupted tooth, or accumulation of the fluid between the reduced enamel epithelium and enamel surface or between the layers of reduced enamel epithelium. Histological wall of follicular cysts is built from 2-3 lines cube cells, but the epithelium is non keratinizing type. Connective tissue layer shows no signs of inflammation. The diagnosis of these cysts are usually made by routine radiographic examination like a clearly unilocular illuminating limited zone surrounding bone by peripheral condensation with a shadow of the crown of not erupted teeth in the lumen. Cystic sac can take a central, lateral or circumferential position relative to the crown of the tooth. The basic principle of treatment is the complete enucleation of the cystic sac with not erupted tooth. The mandibular *second premolar* is one of the *most frequently impacted* teeth. Often represent potentially region of follicular cysts. This paper presents a patient aged 11 years sent by a orthodontic specialist. After anamnesis, clinical examination and *ortopantomographic X-ray*, the diagnosis was semi impacted tooth 35 and the presence of cystic sac around the tooth 35. After the consent of the patient, the surgical extraction of the tooth 35 was done and complete removal of cystic sac

## CBCT 3D DIAGNOSTIC OF IMPACTED TEETH

**dr Jelena Pušibrk Višnjički**, dr Milan Kresoja, dr Anja Sekulić, dr Aleksandar Drobnjak,  
dr Tijana Delić, dr Dražen Kuprešanin, Prof.dr Siniša Mirković

Dental clinic of Vojvodina  
Medical School  
University of Novi Sad

### Abstract

#### INTRODUCTION:

Impacted teeth are teeth that have been retained in the dentition, fully or partially, due to different causes (lack of space, the obstacle-cyst, odontoma, scar soft tissue, improper position of the embryo teeth, fibrotic thickening of mucoperiost, bone sclerosis, reduced anteroposterior growth of the mandibula and within generalized syndromes).

Diagnosis of impacted teeth includes detailed anamnesis, clinical examination and precisely radiographic diagnostic.

Radiographic diagnostic of dentoalveolar structures includes a variety of imaging techniques, of which the most frequently used are: retroalveolar technique, orthopantomographic technique, axial techniques, CBCT 3D.

#### CASE REPORT:

A case of a patient 55 age old woman, which comes because of pain in the lower jaw on the left side. After 3D CBCT imaging of the lower jaw in the region of teeth 35-38, it was diagnosed the impacted tooth 38, bucco-lingual inclination, which was cause of the pain. With previous permit of the patient, impacted tooth was surgically removed.

**CONCLUSION:** Cone beam 3D dental radiography enables highly precise, trodimensional image of anatomical structures of craniofacial complex. It presents precise position of the teeth and nearness of the vital structures (mandibular nerve, vein and artery, walls of the maxillary sinus, cortical border...), necessary for proper diagnosis and planning of therapy.

Diagnostic value of 3D CBCT imaging techniques represent the gold standard in oral surgery and in the most dental field and branches.

Technology of the conical radiation enabled the three-dimensional visualization of anatomic structures with significantly reduced dose of radiation compared to conventional CT devices and represent contemporary approach to the diagnostic in oral surgery.

# DENTAL CARE OF PATIENTS WITH ALLERGIC REACTIONS TO LOCAL ANESTHETICS

**Milena Grba**<sup>1</sup>, Jelena Ralić<sup>2</sup>, Branislav Bajkin<sup>3</sup>

<sup>1</sup> Private dental practice “Dr Milena”, Novi Sad

<sup>2</sup> Private dental practice “Dr Milena”, Novi Sad

<sup>3</sup> Faculty of medicine, Novi Sad, Dental clinic of Vojvodina

## Summary

### Introduction:

Allergic diseases occur as a result of increased, adverse immune response to generally harmless antigens from the environment. The oral cavity is exposed to many potential irritants and allergens. Allergic reactions may be manifested, from mild to severe forms followed by anaphylactic reactions.

Possible allergic reactions to: local anesthetics, antibiotics, analgesics, allergy to latex and various dental materials.

### Allergic reactions to local anesthetics:

Allergic reactions to local anesthetics of the amide type are rare, but still possible. It is estimated that the incidence of allergic reactions to local anesthetics is 0.5%. Most of the patients who show signs of an allergic reaction to a local anesthetic solution are actually allergic to the preservative. The symptoms that accompany allergic reaction include: urticaria (hives), swelling, rash, xerostomia, pain, burning sensation, chest discomfort, bad breath, rhinorrhea, conjunctivitis.

### Treatment protocol:

Dental treatment of these patients begins with gathering data on manifestations of previous allergic reaction and applied local anesthetic. If possible, apply provocative dose before the procedure in order to determine the patient's allergy status. The treatment is performed after the intravenous access is ensured and premedication with corticosteroids and antihistamines done. Select a local anesthetic which should be pure, without added vasoconstrictor. Injection of local anesthetic begins with application of few drops, and then continues with slow injection of the remaining quantity with required prior aspiration. The presence of anti-shock therapy and written instructions in the workplace is regulated by law.

### Conclusion:

One of the most common emergency situations in dental practice is an acute allergic reaction. Taking into account the full gravity of the situation it is necessary for the dentist to be informed of the patient care protocol for patients who are prone to allergic reactions or have previously confirmed allergic reaction to local anesthetics.

## LATERAL SINUS LIFT AND IMPLANT INCORPORATION

**Dr Milan Kresoja**, dr Jelena Pušibrk, dr Anja Sekulić, dr Ivan Drobnjak, dr Tijana Delić,  
dr Drazen Kuprešanin, Prof. dr Siniša Mirković

Dentistry Clinic of Vojvodina, Medical faculty, University of Novi Sad

Alveolar ridge increase with sinus floor elevation is essential for implant incorporation and it is considered to be very effective therapy option. There are many techniques which are used for vertical augmentation of maxillary sinus mucosa. One of them is well known as very good and very practical and it is use of concentrated growth factors, which can be used alone or in mixture with bone graft. Growth factors are proteins which are responsible for a complex process of wound reparation. They have a major role in cell migration, proliferation and angiogenesis of a tissue regeneration stage. In this work it is shown the case of a 52 year old patient, who has come to oral implantology department on Dentistry Clinic of Vojvodina, for prosthetic sanitation of terminal edentulousness in maxilla on the left side. With patient approval, the first intervention included lateral sinus lift, bone augmentation using concentrated growth factors (CGF) mixed with alloplastic material (Straumann BoneCeramic) and augmented region prevention with Straumann Membragel. After four months, in second intervention, two conventional implants have been incorporated (Straumann) with dimensions of 10 mm in length and 4,1 mm in diameter. Fibrin block rich with concentrated growth factors (CGF) use represents one of the most contemporary methods which are used at bone regeneration. This is very simple method, without any toxic, allergic and other dangers and it is very economic.

## **FIBROMA REMOVAL USING DIODE LASER – CASE REPORT**

**Tijana Delić**, Danka Delić Mačvanin, Dražen Kuprešanin, Nemanja Nešković, Ivan Šarčev

University of Novi Sad, Medical Faculty, Department of Dentistry of Vojvodina

### **Abstract**

Fibroma is a benign tumor of the connective tissue, which has a tendency to very slow growth. Fibromas are commonly found at the oral cavity and in most cases are the result of chronic irritation. Their removal may be surgical or by using laser. This paper presents case of fibroma localized on the inner side of the cheek in the region of teeth 37. Clinical examination shows defined lesion, lighter in color than the surrounding tissue, and the dimension which is not bigger than 20 mm in diameter. Its removal is performed with a diode laser Master - KaVo, wavelength 980 nm, output power of 8 watts, in direct contact with the tissue. The removal of fibroma with the diode laser is a safe, quick procedure, without blood and suturing with minimum postoperative discomfort. Comparing with conventional methods, laser surgery requires less time, more precise cuts, reduced the contraction of scar tissue and faster healing.

**Key words: fibroma, diode laser**

# PRINCIPLES OF ORAL SURGERY FOR PREVENTION OF BISPHOSPHONATE-RELATED OSTEONECROSIS OF THE JAW

**Velibor Trgovcic**<sup>1</sup>, Nikola Mitrovic<sup>2</sup>, Branislav Bajkin<sup>3</sup>

<sup>1</sup>Private Dental Practice Smile Time, Novi Sad

<sup>2</sup> Private Dental Practice I-DENT, Belgrade

<sup>3</sup> Faculty of Medicine Novi Sad, Clinic for dentistry of Vojvodina

## **Abstract**

Bisphosphonates are medicaments commonly used to treat postmenopausal osteoporosis, Paget disease, hypercalcemia caused by malignancy, bone metastasis and multiple myeloma.

Bisphosphonates can be applied orally and intravenously.

Bisphosphonate-related osteonecrosis of the jaw (BRONJ) is defined as bone exposure of the jaw that lasts for more than 8 weeks in patients who conducted bisphosphonate therapy.

The two largest risk factors for BRONJ are i.v. bisphosphonate exposure and dentoalveolar procedures.

**Prevention and Therapy:** The most common recommendation is conduct all oral surgery procedures before the start of bisphosphonate therapy. If treatment with bisphosphonates has already started, the best prevention is to avoid surgery if possible. When dentoalveolar surgery is necessary, it is recommended to use antimicrobial mouth rinse and antibiotics before the surgery. During the procedure surgery should be atraumatic, the edges of the wound should be smoothed, extraction sockets filled with scaffold-like autologous PRGF and wound should be sutured.

Unlike osteomyelitis and osteoradionecrosis where oral surgery should not be conducted, in BRONJ oral surgery therapy can be administered. This is done in patients who experience pain due to exposed and necrotic bone, who have infection or pathologic fracture, oral antral/oral nasal communication, extraoral fistula or osteolysis extending to the inferior border of the mandible or the sinus floor.

**Conclusion:** Increasing number of reports between BRONJ and bisphosphonate therapy incline that dentists should familiarize themselves with this disease, with preventive and therapeutic measures that can improve the treatment of related patients.

# DENTAL TREATMENT OF THE PATIENTS WITH A DIAGNOSE OF PORPHYRIA

**Drazena Cigic Mladenovic.**<sup>1</sup>Branislav Bajkin <sup>2</sup>

Medical Faculty of Novi Sad<sup>1</sup>

Medical Faculty of Novi Sad,Dentistry Clinic of Vojvodina<sup>2</sup>

## **Abstract**

### **Introduction:**

Porphyrias are inherited disorders caused by enzyme defects in a biosynthetic pathway of heme that is complex and is governed by a sequence of enzymes. A defect in any of these enzymes results in accumulation of the preceding intermediaries and produces one form or another of the porphyrias. The porphyrias can be classified by the main site of the defect as hepatic and erythropoietic.

### **Discussion:**

The symptoms of porphyrias appear as attacks due to the toxicity of high concentration of porphyrins on nervous system and skin. Drugs may trigger an acute attack of porphyria in many ways, most of which depend on an increased demand for heme production or a failure of heme inhibition feedback as the final common pathway. It might be expected that the cytochrome-mediated metabolism and high lipid solubility of many anaesthetics would make many of them porphyrogenic. Nevertheless, most porphyrics can be anaesthetized with relative safety provided that appropriate precautions are taken.

### **Conclusion:**

Dentists have to be familiar with the guidelines for treatment of porphyric patients because many drugs such as local anaesthetics, antibiotics and analgesic agents may induce an acute attack of porphyria.

**Key words: porphyria, drugs.**



## PERIPHERAL OSTEOMA OF THE MAXILLA – A CASE REPORT

**Nebojša Ničić**<sup>1</sup>, Ivana Gušić<sup>2,3</sup>, Tanja Veljović<sup>2</sup>, Jelena Mirnić<sup>2</sup>, Milanko Đurić<sup>3</sup>

<sup>1</sup>Royal Dental, Private Dental Practice, Novi Sad

<sup>2</sup>Faculty of Medicine, University of Novi Sad

<sup>3</sup>Dentistry Clinic of Vojvodina, Novi Sad

Abstract:

Introduction:

Osteomas are benign tumors composed of matured bone tissue, that can develop on the surface (peripheral osteoma), or inside bones (central osteoma), as well as in internal organs and soft tissue (extraseketal osteoma). Histological classification differentiates among compact or ivory (dense, compact bone), cancellous (soft, spongy bone), and mixed-type osteomas. Osteoma are characterized by slow, asymptomatic growth which can lead to a significant bone deformation.

Peripheral osteoma of jawbones (maxilla) are rare. Excluding maxillary sinus wall, upper jawbone is an unusual location for formation of this type of lesions. Medical literature gives description for only a few cases of maxillary osteoma outside jawbone sinus.

Aim:

Aim of this report was to give a clinical, radiological and patohistological feature of a rear case of peripheral cancellous osteoma on the alveolar ridge of the maxilla.

Case Report:

A 13 years old boy, was referred to the Department of Periodontology and Oral Medicine of Clinic for Dentistry of Vojvodina with main complaining of painless swelling in region of upper right premolars. Clearly limited, elliptical mass, bone-hard on palpation was spreading from mesial surface of first upper right premolar to the first molar. Mass was covering the whole buccal surfaces of the upper right premolars and was spreading up to the mucogingival juncton in an apical direction. Radiological finding indicated a surgical removal of the mass that underwent without further complications and recurrence in the follow up period of 8 months. Patohistological analysis confirmed diagnosis of cancellous peripheral osteoma.

Conclusion:

Osteomas are rarely localized on the alveolar ridge of jawbones, and should be carefully diagnosed and differentiated from other neoplasms and changes like sclerosing chronic osteomyelitis, exostosis malformations and myositis ossification that can take similar morphological appearance as osteoma.

## **PLACE AND A ROLE OF PREPROSTHETIC PROCEDURES IN FUNCTIONAL-ESTHETIC REHABILITATION OF THE PATIENTS**

**dr Anja Sekulić**, dr Milan Kresoja, dr Jelena Pušibrk, dr Ivan Drobnjak, dr Tijana Delić, dr Dražen Kuprešanin, prof dr Siniša Mirković

Medical faculty Novi Sad, University of Novi Sad, Dentistry clinic of Vojvodina, Oral surgery department

### **INTRODUCTION:**

Enormous number of patients make their edentulousness up with mobile prosthetics. Preprosthetic surgery contains all those interventions which are responsible for successful prosthetics rehabilitation. The great part of patients do not demand any kind of surgical interventions before prosthetics care. However, at 2-4% of the patients it is not possible to work on without oral surgery before doing the prosthetics. Preprosthetic surgery includes many procedures starting with decayed teeth extractions, parodontopathic teeth extractions, extractions of impacted and half-impacted teeth, sharp bone edges extractions ending up to more complicated procedure like implant incorporation.

### **CASE REPORT:**

In this work it will be presented the case of a 32 year old patient who has come with a desire for functional-esthetic rehabilitation in oral cavity. After OPT analysis and detail examination it was decided that it will be made numerous extractions of decayed teeth and teeth roots as well as curettages of periapical lesions that exist. After tissue reparation and wounds healing, upper total prosthetics and lower partial prosthetics has been made.

### **CONCLUSION:**

All preprosthetic surgery interventions have one aim and it is to make edentulousness alveolar ridges better for total and partial prosthetics. Those interventions are done to make better interalveolar relation and to provide adequate depth of the fornix.

## MAXILLAR TUBER FRACTURE – CASE REPORT

**Nešković Nemanja**<sup>1</sup>, Nešković Isidora<sup>2</sup>, Delić Tijana<sup>3</sup>, Kuprešanin Dražen<sup>4</sup>, Šarčev Ivan<sup>2</sup>

<sup>1</sup> Dental clinic „Nešković Dent“

<sup>2</sup> Dental Clinic of Vojvodina, Medical Faculty University of Novi Sad

<sup>3</sup> Specialistic dental clinic „Delić“

<sup>4</sup> Dental clinic „dr Drobac“

### ABSTRACT :

Maxillar tuber fracture is one of the most serious complications during the extraction of teeth. It usually occurs while second and third molars has been extracted, as well as faliure of recognizion different anatomical root variation.

### CASE REPORT :

This case report shows a 37 years old patient, who wants to extract upper left third molar. According to the anamnesis, clinical examination and analysis of OPG image, it was found a great caries lesion ,vertical percussion sensitivity, and buccal inclination of mentioned tooth. After the proposed therapy and obtained the consent of the patient, the therapist started with extraction. During the extraction, maxillar tuber fracture occured, and it came out together with upper left third molar. Maxillar sinus wasn't perforated during the procedure. The wound has been surgicaly sutured, and antibiotics were ordered.

The aim is to present one of the most serious complications of tooth extraction, a timely manner diagnosis and adequate surgical treatment.

### CONCLUSION:

If maxillar tuber fracture occure, it is necessary to dyagnose complication during the intervention, tell the patient everythig about the complication , and take adequate treatment measures.

# ORAL SURGERY PROCEDURES IN PATIENTS TAKING NOVEL ORAL ANTICOAGULANTS

**Nikola Mitrović**<sup>1</sup>, Velibor Trgovčić<sup>2</sup>, Branislav Bajkin<sup>3</sup>

<sup>1</sup> Private Dental Practice “I-DENT”, Beograd

<sup>2</sup> Private Dental Practice “Smile Time”, Novi Sad

<sup>3</sup> Faculty of Medicine – University of Novi Sad, Clinic for dentistry of Vojvodina

## **Abstract:**

### **Novel oral anticoagulants.**

This group of drugs includes direct thrombin inhibitor (dabigatranetexilate) and direct factor Xa inhibitors (rivaroxaban, apixaban, edoxaban). They are recently in clinical use for patients who require chronic anticoagulation therapy. Indications include prophylaxis of thromboembolic complications associated with atrial fibrillation and prophylaxis of venous thromboembolism after orthopedic surgical procedures.

### **Advantages relative to the vitamin K antagonists.**

They have predictable pharmacokinetics which enable stable effects in fixed doses without the need for following their anticoagulant response in routine tests. They interact less with other drugs and food. They have a relatively rapid onset and reach peak concentration in few hours. Because of short half-life elimination, after discontinuation, the interval without anticoagulant therapy is significantly shorter compared to coumarin derivatives.

### **Dental procedures in patients who use novel oral anticoagulants.**

During oral surgery procedures there is a risk of intensified and prolonged bleeding. The risk of bleeding depends on the complexity of the procedure, concomitant comorbidity or taking drugs which additionally increases the risk of bleeding as well as the degree of renal impairment. Based on a literature review it is not possible to find a sufficient number of works on the basis of which would be made firm conclusions regarding the safety performances of tooth extraction. However, prevailing attitude is when we perform minor oral surgery procedures, there is no need for discontinuation of therapy. Also, it is necessary to perform minimally invasive procedure, and take local hemostatic measures.

### **Conclusion.**

Bearing in mind that the novel oral anticoagulants are recently in clinical use, it is necessary to be familiar about the mechanism of their action and the risk of postextraction bleeding.

# **CORONALLY ADVANCED FLAP IN THE MANAGEMENT OF MULTIPLE GINGIVAL RECESSION**

**Marijan Milojević<sup>1</sup>, Ivana Gušić<sup>2,3</sup>, Tanja Veljović<sup>2</sup>, Jelena Mirnić<sup>2</sup>, Milanko Đurić<sup>2,3</sup>**

<sup>1</sup> Private Dental Practice "Profi-dent", Novi Sad

<sup>2</sup> University of Novi Sad, Faculty of Medicine Novi Sad

<sup>3</sup> Dental Clinic of Vojvodina, Novi Sad

## **INTRODUCTION:**

Treatment of multiple gingival recession is one of the most complex problems in mucogingival surgery. In therapy of these defects different surgical techniques can be used. Most common procedure in term of the complete coverage of the root is the use of a connective tissue graft (CTG) in combination with the displaced flaps. However, taking a large amount of soft tissue from the palate leads to considerable discomfort to the patient. In addition, a large CTG obstructs vascular exchange between flap and the receiving region. Both of these factors limit the use of CTG in treatment of multiple recessions. In the same time, the use of CTG can result in overweight newly created tissue modified color. On the other hand, coronally advanced flap (CAF) is a technique in which the root coverage obtains tissue which is in color texture and thickness identical to the lost one. However, the therapy results of these methods are less predictable comparing to use of a CTG.

## **OBJECTIVE:**

The aim of this report was to present the case of multiple recessions which were treated with CAF with the use of CTG on the tooth root with the most noticeable defect.

## **CASE REPORT:**

Multiple recessions class I and II by Miller in the region of teeth 21-25, in 22 years old patient, were treated with CAF without releasing vertical incisions. In the area of the root tooth 23 CTG was used. At the regular check-ups after a week and a month, full coverage of roots teeth 13-15 was registered while the recession of the incisors was partially covered.

## **CONCLUSION:**

Coronally advanced flap is technique that can be successfully used in coverage of exposed root only when apical to the recession there is sufficient width and thickness of keratinized tissue. Otherwise the flap should be combined with CTG.

# THE BENEFITS OF USING 3D SCANNER AND COMPUTER IN ORTHODONTIC DIAGNOSIS

**Ivana Demko Rihter**<sup>1,2</sup>, Ivana Grubor<sup>1,3</sup>, Jovana Selaković<sup>1,4</sup>, Predrag Vučinić<sup>1</sup>, Đorđe Petrović<sup>1</sup>, Stojan Ivić<sup>1</sup>

<sup>1</sup>. Department of Dentistry, Faculty of Medicine, University of Novi Sad, Serbia;

<sup>2</sup>. Orthodontic Dental Practice "ORTIS" Novi Sad, Serbia;

<sup>3</sup>. Health Center Novi Sad, Serbia;

<sup>4</sup>. Dental Practice "Oluški – Ilić" Novi Sad, Serbia.

## Summary

**Introduction:** In the last 20 years, Computer diagnostic and treatment planning in orthodontics was developing. But, with the recent advancement of technology, it's possible their application in clinical practice.

**Aim:** The aim of our study was to investigate the benefits of using 3D Scanner and Computer in orthodontic diagnosis.

**Materials and Methods:** The study was conducted at the Clinic of Dentistry in Vojvodina, Department of Orthodontics and in the laboratory of dental techniques. In this study were used 3D scanner "i3D Scan" and computer software for orthodontic diagnosis "ONYX". We analyzed 20 study models with mixed and permanent dentition. We compared computer gnathometric results for the Schwartz analysis with manually measured gnathometric results at the plaster study models. And we checked the accuracy of this two methods by repeated measurements.

**Conclusions:** The use of 3D scanner and computer in orthodontic diagnosis significantly improves the precision and contribute more quickly and more easily work in everyday clinical practice.

# **FAVORABLE THERAPEUTIC EFFECTS OF THE RAPID MAXILLARY EXPANSION IN PATIENTS WITH BREATHING INTERRUPTIONS DURING SLEEP – Case report**

**Jovana Selaković**<sup>1,2</sup>, Pavle Elor<sup>1,3</sup>, Marija Arnaudova<sup>1,4</sup>, Stojan Ivić<sup>1</sup>, Đorđe Petrović<sup>1</sup>, Predrag Vučinić<sup>1</sup>

<sup>1</sup>. Dental Clinic of Vojvodina Novi Sad, Department of Dentistry, Faculty of Medicine, University of Novi Sad;

<sup>2</sup>. Specialist Dental Practice "Oluški - Ilić" Novi Sad;

<sup>3</sup>. Dental Practice "Filipović" Sremska Mitrovica;

<sup>4</sup>. Specialist Dental Practice "Orto lik" Ohrid.

## **Abstract**

**INTRODUCTION:** Rapid maxillary expansion is an orthodontic treatment for transversal constriction of upper dental arch and high-arched palate, which makes expansion of upper jaw and facilitates mobility of air through the nasal passages.

**OBJECTIVE:** To demonstrate that rapid expansion of the palate has a positive effect on improving respiration during sleep in a patient diagnosed with syndrome of obstructive sleep apnea (OSA).

**MATERIALS AND METHODS:** Treatment is carried out at the Department of Dentistry of Vojvodina, in department of orthodontics, and creation of orthodontic appliance for rapid expansion of the palate in dental laboratory. The appliance consists of orthodontic bands positioned on upper first permanent molars, carriers which rest on palatal surface of upper premolar and screw for expansion of palate. After setting this fixed orthodontic appliance, instructions were given to the patient to turn the screw twice a day in the period of one month. The orthodontic appliance is left as retentive six months after rapid expansion of the palate was finished.

**CONCLUSION:** A month after start of the treatment, patient noticed facilitated respiration and absence of apnea during night.

# THE TREATMENT OF OROANTRAL COMMUNICATION AFTER CYSTECTOMY

**Tihomir Magazin**, Slobodan Nikolić, Mihajlo Magazin

Stomatološka ordinacija >CANINUS<

## INTRODUCTION:

Very common cause of oroantral communication is pathological processes at apex of premolars and molars that distort the surrounding anatomical structures. If indicated, extraction of tooth must be followed with a appropriate bone remodeling.

## THE GOAL:

Successful treatment of oroantral communication prevents possible future complications in terms of chronic sinusitis as well as functional disturbances in feeding and respiration.

## THE METHODOLOGY :

Radicular cyst in the left region of the first molars of the upper jaw because of its size endangered the surrounding bone structure and floor of maxillary sinus. Tooth extraction with cystectomy produces considerable bone defect which requires bone augmentation. After peeling of cyst, bone edges of the ridge were treated and bone substitute is augmented (Beta-tricalciumphosphate with bovine collagen). The defect was closed with transpositional flap with prior release of the periosteum to obtain his resilience. Sutures were removed twelfth day with the previous daily inspection and checking whether there is communication.

## RESULTS AND CONCLUSION:

All control examinations that were carried out in the next six months, the duration of resorption of bone substitute, showed that there is no oroantral communication. Besides correctly selected lobe an important role plays augmentation of bone substitute.



