Dental Clinic of Vojvodina

Medical Faculty of Novi Sad

THE FIRST INTERNATIONAL SCIENTIFIC CONFERENCE DENTISTRY 2016 NOVI SAD

PROCEEDINGS

NOVI SAD, 17-th – 19-th May 2016.

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Message from the President of the Scientific Committee

On behalf of the Organizing and Programme Committee, I'm pleased to welcome you at the First International Scientific Conference Dentistry 2016 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 achivments in different fields of dentistry, dental engeneering and technology.

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

We did our best to make this scientific event a great meeting, wishing it to be both infomrative and enjoyable.

President of the Scientific Committee

Assist. prof. Tatjana Puškar

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CONTENTS

Section A:

INVITED LECTURES

PROCEEDINGS

Section B:

BOOK OF ABSTRACTS

Section C:
ORAL PRESENTATIONS

INVITED LECTURES PROCEEDINGS

INFLUENCE OF HEAD POSITION ON POSITION AND SIZE OF JAW AND GROWTH OF FACE SKELETON

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Abstract

Introduction / Aim. Given the existence of anatomical connections between head, neck and stomatognathic system, it can be presumed that head position in relation to the cervical spine, could be brought into connection with the morphology of the face and jaw, the position and the mutual relationship of the maxilla and mandible, their length and inclination, facial prognathism and retrognatism and numerous other indicators that are of interest for orthodontists. The aim of this study is to examine the connection of craniocervical angulation and characteristics of craniofacial morphology such as sagittal position and length of the jaw as well as to determine how the size of the craniocervical angle influences the type of face growth.

Methods. The study included a total of 90 subjects (30 for I, II and II skeletal class) aged 8-14 years, who were examined at the Department of Dentistry, Medical Faculty in Novi Sad. For each subject the profiled lateral cephalometric was made at standard conditions in terms of recording and cephalometric analysis was performed using the computer program "Onyx Ceph." Five angular (NS / OPT, CVT/EVT, SNA, SNB and ANB) and 4 linear (A'-Snp, Gn-Go, N-Me and S-Go) measures were analyzed. All obtained data were statistically analyzed.

Results. The highest average value of the craniocervical angle was found in patients at whom had previously been diagnosed skeletal Class II malocclusion. The angle of maxillary prognathism is in positive correlation with the craniocervical angle in patients with I and II, and in negative in patients with class III. The angle of mandibular prognathism is in positive correlation with the craniocervical angle in patients with class I and III, but in the negative in patients with class II. With the analysis of the total of the test sample, regardless of class, we obtain the result that the ANS angle is in the positive correlation with the NS / OPT angle, which means that increasement of the NS / OPT angle favors the development of class II. In subjects with class II a statistically significant positive correlation of craniocervical angle and length of the upper jaw exists , and also significant, but negative correlation of craniocervical angle and length of the lower jaw. When the values of the craniocervical angle are below

normal in most of the subjects face grows with rotation forward and when the values of the craniocervical angle are above normal, the face grows mainly with rotation backwards.

Conclusion. The increased extension of the head in relation to the cervical spine can be a factor that contributes to the formation of malocclusion II class and creates conditions for the growth of face with rotation backwards.

Introduction

Body posture is so individual that a person can be recognized at a distance by the way he or she is walking, running or standing. This is in fact the biological characteristic of human beings that was created through evolution, and includes the static and dynamic behavior of the body in space and the relation with the environment. When we say proper posture we indicate the habit of natural upright stance or man's pose while walking. In such a position, profile of the stomach forms a natural physiological curvature of the spine with cervical lordosis, thoracic kyphosis and lumbar lordosis. Proper posture includes an appropriate position of the head, where the forehead is parallel to the frontal plane, and direction of view is parallel to the horizontal plane.

Due to the existence of anatomical connections between head, neck and stomatognathic system, it can be assumed that the head position in relation to the cervical spine, could be brought into connection with the morphology of the face and jaw, the position and the mutual relationship of the maxilla and mandible, their length and inclination, facial prognathism and retrognatism and numerous other indicators that are of interest for orthodontists. It is assumed that one of the factors that influence the growth of facial skeleton, may be the position of the head. Namely, when the head is being extended in relation to the cervical spine, that leads to stretching of facial skin and muscle attachment on the facial skeleton. This stretching causes an increase in the force that has effect on the skeletal structure and may limit the growth of the maxilla and mandible forward, and focus it more backwards.

In orthodontic literature there are many studies that have examined the connection between the position of the head with skeletal and dental form[1-15]. Head position is estimated by the craniocervical angle that is formed by the basic anterior cranial base (NSL), and tangent odontoid processus (OPT) which passes through the lower and last point on the body of the second cervical vertebra[2]. The first study on the position of the head was posted by Solow B. and A. Tallgren in 1976 year[3]. On cephalometric radiographs of 120 subjects aged 20-30 years, they analyzed variables which define craniofacial morphology and variables that define

the position of the head. The results showed that the extension of the head in relation to the cervical spine, apropos increased craniocervical angle, is associated with large front and rear small facial height, reduced sagittal craniofacial dimensions, the large inclination of the mandible relative to the anterior cranial base and nasal flat, facial retrognatism, large angle of the cranial base and reduced nasopharyngeal space. In flexion of the head (reduced craniocervical angle) reduced front and increased rear facial height are located, as well as increased sagittal craniofacial dimensions, reduced inclination of the mandible, facial prognathism, decreased angle of the cranial base and increased nasopharyngeal space.

The results of a prospective study that were published by Solow and B. Siersbæk N. 1992.[4] showed that the value of the craniocervical angle measured 2-4 years before the pubertal growth may indicate the future growth of the face. Craniocervical angle greater than 113˚ recorded at that time, will cause a predominantly vertical facial growth, while the craniocervical angle of less than 79˚ will cause a horizontal, forward oriented growth of face.

By examining the position of the head in children with I, II and III skeletal class, average age of 9.5 years, D'Attilio M. et al. 2005[5]. found that children with skeletal class III show a significantly lower angle of cervical lordosis than children from I and II class. In children with skeletal class II they found significantly higher extension of the head compared with skeletal class I and III. A significant difference between these three classes exists in inclination of the maxillary and mandibular plane relative to the cervical spine.

The size and position of the mandible are the characteristics that are strongly linked with the position of the head and neck[5].

Aim of the research

- Analyze the position of the head, defined by the size of the craniocervical angle in examinees with different skeletal jaw relation;
-Analyze the curvature of the cervical spine defined by the size of the angle of cervical lordosis, in examinees with different skeletal jaw relation;
- Examine the sagittal jaw position depending on the position of the head;
- Examine the sagittal dimension of viscerocranium, or jaws length, depending on the position of the head;
-examine connection of craniocervical angle and type of face growth;

Material and methods

The study included a total of 90 subjects (30 for each class) aged 8-14 years, who were examined at the Department of Dentistry, Medical Faculty in Novi Sad.

All patients were previously informed of the procedure for inclusion in clinical examination and have not switched without consent.

The selection of the tested sample was carried out according to the following criteria:

- That they have not been previously treated orthodontic;
- Sagittal skeletal relationship in I, II and III class;
- absence of congenital disorders of craniofacial complex, diseases of muscles and temporomandibular joint;
- absence of upper airway obstruction;

Sagittal skeletal relationship is determined on the basis of the value of ANB angle.

For each examinee profiled lateral cephalometric is made at standard conditions of recording and cephalometric analysis was done using the computer program "Onyx Ceph."

Five angles were analyzed:

NS/OPT – craniocervical angle; head position in relation to the second cervical vertebra, intersection of NS with OPT (OPT – odontoid process tangent through cv2ip point);

CVT/EVT – angle of cervical lordosis;

SNA – angle of maxillary prognathism;

SNB - angle of mandibular prognathism;

ANB – indicating sagittal relation of maxilla and mandible to each other;

Four linear measures were analyzed:

A' – Snp - lenght of maxilla;

Gn – Go - lenght of mandible;

N– Me - anterior facial height;

S – Go - posterior facial height;

On the basis of percentage relation of the posterior and anterior facial height, the type of face growth is determined. If the posterior face height is 62% - 65% of the height of the anterior, then the face of growing equally forwards and downwards. If the posterior facial height is more than 65% of the anterior, then the face is growing with rotation forward, and if the posterior face height is less than 62% of the anterior, face is growing with rotation backwards.

After completion of analysis, the obtained data were statistically analyzed. Of descriptive statistics methods , the methods of data sorting were used in work (grouping and tabulation), the arithmetic mean, standard deviation, standard error of the estimated average and coefficient of variation.

Of the differential statistical methods in work were used:

1. Parametric tests for large and small independent samples:
   - ANOVA (analysis of variance)
   - Student's t test for large independent samples;
2. Non-parametric tests for large and small independent samples:
   - Pearson $\chi 2$ test;
   - Fisher's test of point probability of the null hypothesis;
   - Mann-Whitney test;
   - Kruskal Wallis test.

For measuring form and degree of dependence, the correlation and regression analysis were used: linear regression, correlation coefficient, coefficient of determination and importance of the difference in slopes of the regression lines.

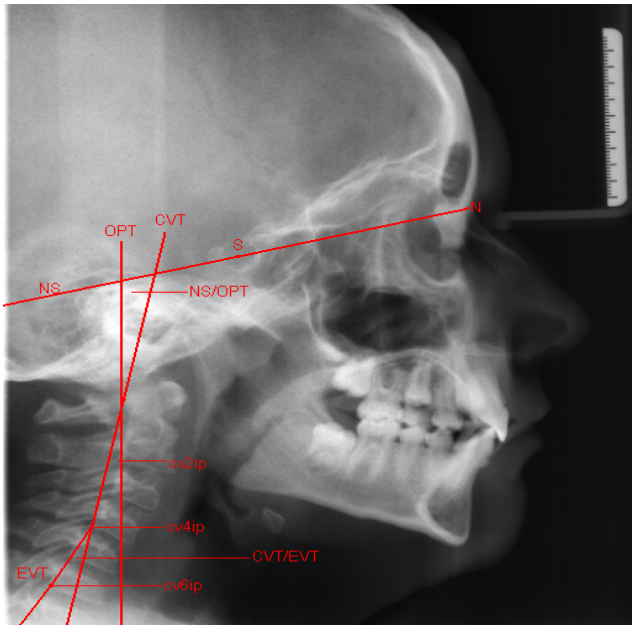

Figure 1. Points, lines and angles used to assess the craniocervical angulation: N - Nasion; S – Sella; cv2ip – most inferior and posterior point on the second cervical vertebra corpus; cv4ip – most inferior and posterior point on the fourth cervical vertebra corpus; cv6ip – most inferior and posterior point on the sixth cervical vertebra corpus; OPT– odontoid process tangent through cv2ip point; CVT – odontoid process tangent through cv4ip point; EVT – the line through cv4ip and cv6ip; NS –the anterior cranial base plane; NS/OPT– craniocervical angle; CVT/EVT – the cervical lordosis angle.

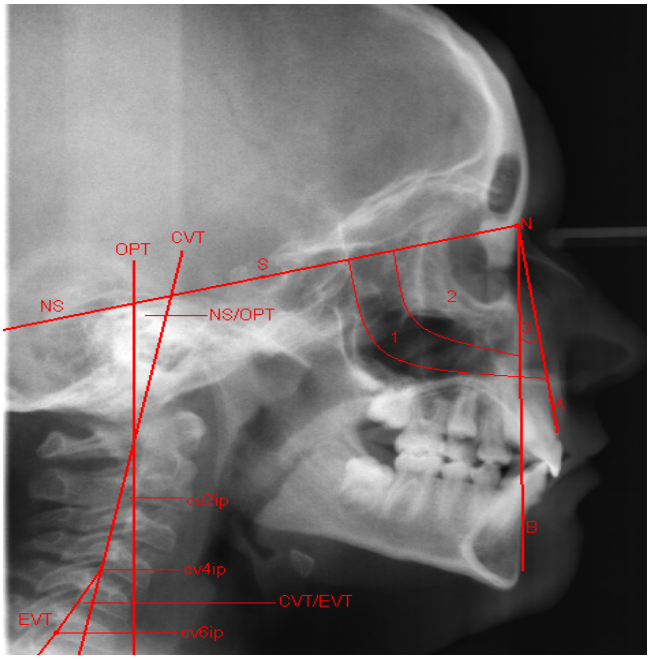

Figure 2. The angles used to assess the relationship of head posture and sagittal position of jaws: NS/OPT – craniocervical angle; CVT/EVT- angle of cervical lordosis; 1- angle SNA; 2 angle SNB; 3 – angle ANB .

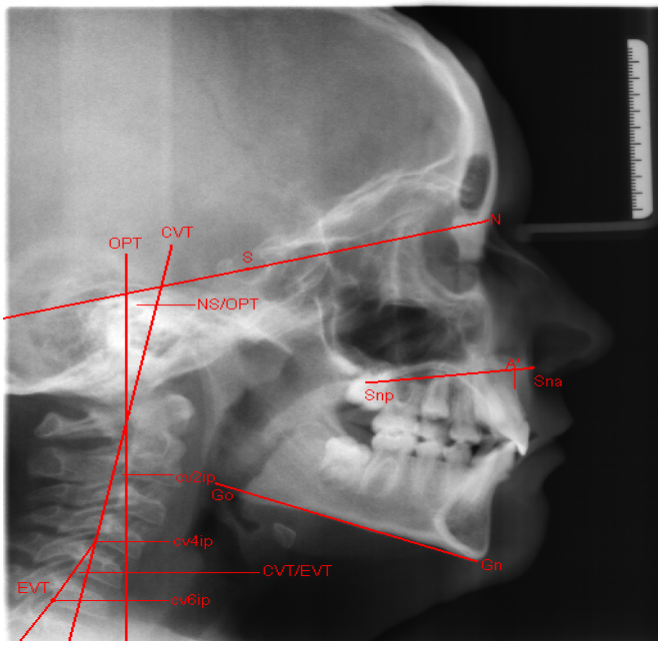

Figure 3.The angular and linear parameters used to assess the relationship of head posture and lenght of jaws : NS/OPT – craniocervical angle; CVT/EVT – angle of cervical lordosis; A'-SnP - lenght of maxilla; Gn-Go – lenght of mandible.

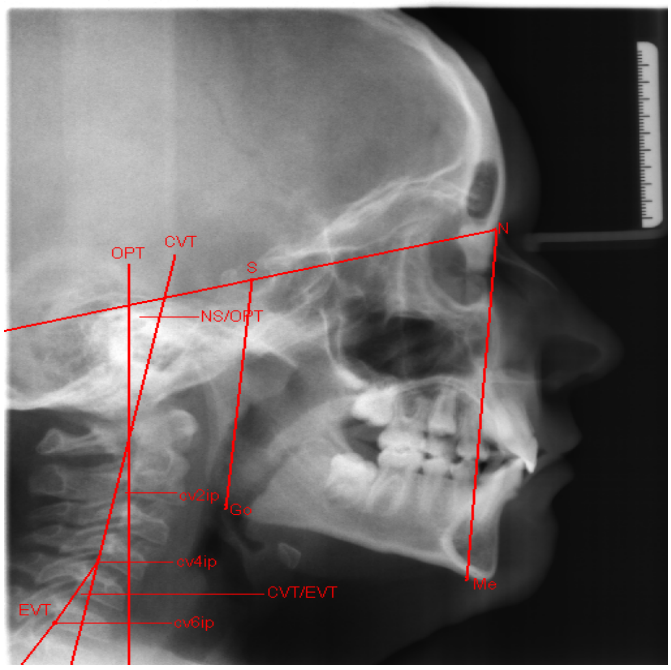

Figure 4. The angular and linear parameters used to assess the relationship of head posture and facial height: NS/OPT – craniocervical angle; CVT/EVT – angle of cervical lordosis; N-Me – anterior facial height; S-Go – posterior facial height.

Results

The results of a comparative analysis of the value of the craniocervical angle NS / OPT, in examinees in relation to the skeletal class are shown in Table 1.

Table 1 . Craniocervical angle values as compared to skeletal class

	Skeletal class			total
	I	II	III	
N	30	30	30	90
Min	77,00	79,20	72,20	72,20
Max	115,20	126,30	120,00	126,30
Mean	94,06	100,80	94,59	96,49
SD	1,81	11,10	1,80	10,64
ANOVA	**F=3,97; *p<0,05***			
t – test (I i II)	***t=-2,48***		***p<0,05***	
t – test (I i III)	***t=-0,21***		***p>0,05***	
t – test (II i III)	***t=2,29***		***p<0,05***	

By testing the significance of differences based on ANOVA test it is found that the difference in the value of the craniocervical angle between the analyzed groups, is statistically significant ($F = 3.97$; $p < 0.05$), and with their mutual comparison there have been results that showed that there is statistically

significant difference between examinees with I and II (t = 2.48; p <0.05), and among examinees with class II and III (t = 2.29; p <0.05). There was no statistically significant difference between the average value of the craniocervical angle in examinees with I and III skeletal class. (Table 1.)

Table 2. shows the results of the analysis of the angle of cervical lordosis (CVT / EVT), as an indicator of the curvature of the cervical spine in the sagittal plane.

Table 2. The angle of cervical lordosis values as compared to skeletal

	Skeletal class			Total
	I	II	III	
N	30	30	30	90
Min	8,40	5,30	4,90	4,90
Max	39,80	46,80	31,50	49,80
mean	19,64	18,43	16,54	18,20
SD	7,68	8,95	7,90	8,20
ANOVA	**F=1,09; *p>0,05***			
t- test (I i II)	***t=0,56***		***p>0,05***	
t– test (I i III)	***t=1,27***		***p>0,05***	
t – test (II i III)	***t=0,87***		***p>0,05***	

It is noted that the average value of this angle in examinees with class III is slightly lower than in examinees with class I and II. However, by testing the significance of differences it has not been established that this difference is statistically significant.

The results of a comparative analysis of the value of the angle of maxillary prognathism SNA, in examinees in relation to the skeletal class are shown in Table 3.

Table 3. SNA angle values as compared to skeletal class

	Skeletal class			Total
	I	II	III	
N	30	30	30	90
Min	74,50	78,00	67,00	67,00
Max	85,30	85,90	86,00	86,00
mean	78,96	82,70	78,38	79,68
SD	0,54	0,37	0,72	0,36
ANOVA	**F=9,88; *p<0,001***			
t- test (I i II)	***t=-4,15***		***p<0,001***	
t – test (I i III)	***t=0,34***		***p>0,05***	
t – test (II i III)	***t=4,09***		***p<0,001***	

ANOVA test results show that there is a statistically significant difference in average values of SNA angle (F = 9.88; p <0.001) between the analyzed groups of examinees, and their mutual comparison led to the conclusion that there is a statistically significant difference between examinees with class I and II (t = 4.15; p <0.01), and between examinees with class II and III (t = 4.09; p <0.01)

Having established that there is a statistically significant difference in the values of the angle of mandibular prognathism (SNB) between skeletal class (F = 15.82; p <0.001), with their comparison the statistically significant difference in the value of the angle between examinees with I and III is established (t = - 4.16; p <0.01), as well as between subjects with class II and III (t = - 4.90; p <0.01). (Table 4).

Table 4. SNB angle values as compared to skeletal class

	Skeletal class			Total
	I	II	III	
n	30	30	30	90
Min	71,90	73,10	71,00	71,00
Max	82,00	79,00	87,00	87,00
Mean	75,98	75,87	79,56	77,13
SD	0,52	0,31	0,69	0,35
ANOVA	**F=15,82; *p<0,001***			
t – test (I i II)	***t=0,18***		***p>0,05***	
t – test (I i III)	***t=-4,16***		***p<0,001***	
t– test (II i III)	***t=-4,90***		***p<0,001***	

The results of correlational analysis between the craniocervical angle and parameters of the jaws position are shown in Table 5. Analyzing the form and degree of dependence of the angle of maxillary prognathism SNA in relation to the craniocervical angle NS /OPT, it was found that the forms of dependence are linear. In patients with I and II class a positive correlation between the angle of NS / OPT and SNA angle was found (r = 0.103; r = 0.112), however, the degree of this dependence is not statistically significant. In a class III negative correlation was established, but it is also statistically insignificant correlation between these two angles (r = -0.002). The coefficient of determination for all three classes is very low (less than 0.1) which indicates that the impact of variability NS/OPT angle on the value of SNA angle is very small percentage. In particular less than 10% of the variability angle SNA can be explained by variability angles NS / OPT, and more than 90% effect on the value of the angle SNA can be attributed to other factors.

Between the angles NS / OPT and HNB a linear form of dependence has alslo been established. In examinees with Class I and III a positive correlation between these two angles was found which is not statisticaly significant (r = 0.044; r = 0.179 p> 0.05). In subjects with class II, negative correlation was found, which was also not statistically significant (r = -0.005; p> 0.05) (Table 5).

The coefficient of determination for all three classes is, as in the case of the angle of maxillary prognathism very low (less than 0.1) which indicates that a very small impact craniocervical angle NS / OPT has on the value and variability of the angle of mandibular prognathism SNB.

Table 5.Correlation craniocervicl angle – parameters of jaws position

	correlation(r) probability(p)	NS/OPT			
		I	II	III	total
SNA	R	0,103	0,112	-0,002	0,123
	P	n.s.	n.s.	n.s.	n.s.
SNB	R	0,044	-0,005	0,179	-0,066
	P	n.s.	n.s.	n.s.	n.s.
ANB	R	0,311	0,156	0,075	0,177
	P	0,05	n.s.	n.s.	0,05

n.s. – not significant

By analyzing the shape and degree of dependence of the ANB angle in relation to the angle of NS/OPT (Table 5.) it was found that forms of dependency are linear, and that in examinees with class I, the dependence degree is statistically significant ($r = 0.311$, $p < 0.05$). The coefficient of determination is $R^2 = 0.2018$, which indicates that 20% of the variability of ANB angle can be explained by the variability of NS / OPT angle , and that 80% is attributed to other factors. The degree of dependence is not statistically significant in patients with class II and III ($r = 0.156$; $r = -0.075$ $p > 0.05$), which means that the variability of craniocervical angulation angle has little influence on the variability of ANB angle (R^2 less than 0.1 or 10%).)

If we look at the overall pattern that consists of examinees with I, II and III class, we see that the angle NS/OPT is in positive correlation with angles SNA and ANB, and in negative correlation with the angle of SNB (table 5.). This would practically mean that the increase of the angle NS / OPT leads to an increase in SNA angle and reduce in the SNB angle, which leads to an increase in ANB angle. In addition to the established relatively small degree of dependence of angles SNA and SNB in relation to NS/OPT angle, this kind of dependence conducives to the formation of malocclusion II class.

Table 6.Values of maxillary lenght as compared to skeletal class

	Skeletal class			Total
	I	II	III	
N	30	30	30	90
Min	36,40	35,80	32,90	32,90
Max	51,50	51,10	50,30	51,50
Mean	43,75	46,67	42,86	43,43
SD	0,65	0,61	0,75	0,39
ANOVA	**F=3,53; *p>0,05***			
t – test (I i II)	***t=0,08***		***p>0,05***	
t – test (I i III)	***t=0,89***		***p>0,05***	
t – test (II i III)	*t=2,84*		***P<0,05***	

The table 6. shows the results of the descriptive analysis of the value of the length of the upper jaw in all three groups of examinees. Results show that the highest average value of the length of the upper jaw was found in subjects with skeletal class II, and the lowest in subjects with class III. There is a significant difference of the average values of the length of the upper

jaw between II and III class (t = 2.84; p <0.05). Length of the upper jaw in first class is not significantly different in relation to the II and III class.

Based on the comparative analysis of the value of the lower jaw lenght (Table 7.) it is seen that highest average value of this parameter is identified in class III, and that this value is significantly different from the average value of this parameter in class II (t = -2.83 ; p <0.01). The values of the length of the mandible in class I and III are not significantly different.

Table 7. Values of mandible lenght as compared to skeletal class

	Skeletal class			Total
	I	II	III	
N	30	30	30	90
Min	53,90	58,20	60,30	53,90
Max	84,20	77,00	87,50	87,50
Mean	67,57	65,08	70,14	67,93
SD	1,22	0,83	1,17	0,65
ANOVA	**F=3,58; *p<0,05***			
t - test (I i II)	***t=1,01***		***p>0,05***	
t- test (I i III)	***t=-1,52***		***p>0,05***	
t - test (II i III)	***t=-2,83***		***p<0,01***	

The results of correlational analysis between the craniocervical angle and length of the upper and lower jaw are shown on table 8.

Table 8. Correlation craaniocervical angle – lenghts of jaws

	correlation(r) probability(p)	NS/OPT			
		I	II	III	total
A'-Snp	r	0,028	**0,318**	-0,020	-0,057
	p	n.s.	0,05	n.s.	n.s.
Gn-Go	r	-0,107	**-0,220**	0,006	-0,105
	p	n.s.	0,05	n.s.	n.s.

The results of correlational analysis show that the craniocervical angle in I class is in positive correlation with the length of the upper and in negative correlation with the length of

the lower jaw, but this correlation has no statistical significance (r = 0.028 for the length of the upper and r = -0.107 for the length of the lower jaw).

In examinees with class II we found a statistically significant positive correlation of craniocervical angle and length of the upper jaw (r = 0.318; p <0.05). and also a significant negative correlation of craniocervical angle and length of the lower jaw (r = -0.220; p <0.05).

In class III a negative correlation of craniocervical angle and length of the upper jaw was found and the positive correlation of craniocervical angle and length of the lower jaw (Table 8.)

Norming values of craniocervical angle was also done in analysis. It was established whether this parameter is distributed according to the normal law of probability, calculated probable error of the middle value, on the basis of which this parameter is classified into three classes: normal, above normal and below normal . Based on calculated normal values on skeletal class I, the number, ie the percentage of subjects with II and III skeletal class for which this parameter is within limits, above or below normal (table 9.) is found.

Table 9. The craniocervical angle norming

			NSOPT		
			below normal	Normal	above normal
class	I	angle in°	angle<90,52	90,52≤angle≤97,60	angle >97,60
	II	number	5	8	17
		%	16,7%	26,7%	56,7%
	III	number	8	12	10
		%	26,7%	40,0%	33,3%

Table 10. shows the percentages of the presence of types of facial growth, compared to the value of the craniocervical angle below normal, at the normal and above normal.

When the value of the craniocervical angle is below normal in most of the sxaminees(56.5%), the face grows with rotation forward. In 34.7% of the examinees, face grows equally forward and down, and at 8.6% with rotation backward.

When the value of the craniocervical angle is normal, in 48.5% of examinees, the face grows equally, in 28.5 % with rotation forward, and in 22.8 % with rotation backward .

Backward rotation type of growth corresponds in 50% of cases to the values of craniocervical angle above the normal, while in 31.2% of the examinees we can find equall growth, and in 18.7% growth with rotation forward.

Table 10. The percentage distribution of types of face growth in relatin to the values of the craniocervical angle

		below normal (N = 23)	Normal (N = 35)	above normal (N = 32)
growth	Forward	13 (56,5%)	10 (28,5%)	8 (18,7%)
	Equall	8 (34,7%)	17 (48,5%)	10 (31,2%)
	Backward	2 (8,6%)	8 (22,8%)	16 (50,0%)

Discussion

With the analysis of linear and angular parameters on the profile cephalometric radiographs of persons with malocclusions of I, II and III class, the association of craniofacial morphology and head position is established. In those with class I malocclusion average value of the craniocervical angle is 94,06˚, which is in line with the results of previous studies 6 in which it was found that the value of the craniocervical angle in children aged 7 - 13 years, without craniofacial anomalies, diseases of muscles and joints and obstruction of the upper airways 94,6˚. A statistically significant difference in the value of this angle between the examinees with I and II, and II and III class is established.

In patients with class II the highest value the craniocervical angle (100,8˚) is established, while the values for I and III class are similar. This corresponds to the findings of D'Attilio M. et al.[5], who found that children with average age of 9.5 years, with Class II malocclusion , show significantly greater craniocervical angle compared with children of the same age at which Class I and III are established . Also Carpuso et al.[7] ,find correlation of skeletal class II and increased craniocervical angle. Arntsen and Sonnesen[8] also found increased extension of the head in relation to the cervical spine in patients with malocclusion II class. Gonzalez and Manns[9] i Festa et al.[10] found the same results. In contrast Hedayat et al.[11] did not find a significant difference in position between the heads of persons with I and II class.

Obtained results are in contradiction with findings that were found by Hugarah J. and Harkiness E.[12] who found that the distal occlusion is associated with flexion of the head, but they disagree with the results of Solow and Sonnesen[6] who found that patients with mutual distal relation of molars have craniocervical angles NS/ OPT and NS/ CVT, 3 - 4˚ less than patients without this malocclusion. Correlation analysis showed that the sagittal position of the maxilla is in positive correlation with the craniocervical angle in patients with I and II, and in the negative in patients with class III. Although it is proved that this influence of craniocervical angle on the level of the maxillary prognathism very small (less than 10%) this kind of correlation can contribute to increase of the angle of maxillary prognathism in the class II, and its reduction in the III class, and therefore to the deterioration of basic anomalies. Marcotte M. 1981[13]. finds a high correlation between the sagittal position of the maxilla with the position of the head.

When it comes to the angle of mandibular prognathism SNB, it is in positive correlated with the craniocervical angle in patients with class I and III, but in the negative in patients with class II. This can also be a mechanism that can lead to a deterioration of basic anomalies by increasing the angle of mandibular prognathism in class III, and its reduction in class II. Marcotte M.[13] finds a negative correlation between flexion of the head, or reduced craniocervical angle and mandibular prognathism.

Craniocervical angle achieves a much greater impact on ANB angle rather than individually on angles whose difference is ANB angle. This is a result of various influences on the angle of the maxillary and mandibular prognathism. With the analysis of the total of the test sample, regardless of class, the result that the angle of ANS is in a positive correlation with the NS / OPT is obtained. This in turn means that increasing of the NS / OPT angle favors the formation of class II, which is characterized by the increased value of ANB angle.

A statistically significant positive correlation of craniocervical angle and length of the upper jaw is discovered, which disagrees with the findings of the study published by the Festa F. et al.[10] and which associates maxillary length only with the length of the anterior cranial base.

The lowest average value of the length of the mandible was found in patients with class II. Given the fact that in this class of malocclusion, the largest craniocervical angle was also found, finding which relfers to the length of the mandible is in line with previous findings[14] that persons with the extension of the head in relation to the cervical spine, have reduced length of the mandible.

In subjects with class II we found a statistically significant positive correlation of craniocervical angle and length of the upper jaw, and also a significant but negative correlation of craniocervical angle and length of the lower jaw.

The results of correlational analysis of craniocervical angle and length of the maxilla and mandible in class II, with a previously established positive correlation of craniocervical angle and angle SNA, and negative correlation of craniocervical and SNB angle indicate that the craniocervical angle may be one, but certainly not the only factor in the pathogenesis of class II malocclusion.

When the value of the craniocervical angle is below normal, in most of the patients face grows with the rotation forward and when the value of the craniocervical angle is above normal, the face grows mainly with the rotation backwards. Solow B. Siersbæk N.[4] finds that great values of craniocervical angle that are measured 2 -4 years before the pubertal growth cause vertical, and low-values horizontal facial growth.

The results are consistent with the results of another study of the same authors[15] who found reduced craniocervical angle in cases when face grows with rotation forward, and increased in cases when face grows with rotation backwards.

Conclusion

The greatest value of the craniocervical angle, apropos the largest extension of the head in relation to the cervical spine have persons with malocclusion II class.

High values of craniocervical angle in persons with class II, thanks to their effect in terms of increasing of the angle of maxillary prognathism and reducing of the angle of mandibular prognathism, may be contributing factor that worsens the basic anomaly II class.

The positive correlation between the size of the craniocervical angle and length of the upper jaw, and a significant negative correlation between the size of the craniocervical angle and length of the lower jaw can also contribute to the formation of malocclusion II class.

Increased extension of the head in relation to the cervical spine creates conditions for the growth of face with rotation backwards.

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MB2: MYTH OR REALITY

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Abstract

The goal of endodontic root canal treatment is to remove the content of the canal, infected layer of dentine and to form canal space for an adequate three-dimensional obturation. Shaping and cleaning of the canal space is significantly improved by using engine-driven nickel-titanium instruments with full rotation, high flexibility and elasticity. Special advantage of engine-driven Ni-Ti instruments of full rotation is possibility to use for shaping of complicated root canal systems like as it is first molar. First maxillar molars are in literature described as the biggest teeth in the upper jaw, with completely separated three roots, one palatal and two buccal, and total of four canals. However, anatomy of the root canal system of maxillary first molar is more complex and variable, especially in the mesiobuccal root. Results and literature data are not uniform in terms of number of canals, especially in the MB root. It is interesting that data about the number of two or more canals in this root vary significantly: of only 18,6% or 25% to 93,5% or 95,5%. The more complex anatomy of root canal system, the percentage of unsuccessful endodontic treatment is higher. According to the literature data the pulp chamber and orifices of the canals are usually described on the basis of photographs and schemes of intact tooth crown and ideal external and internal anatomy of the tooth. However, in the clinical situation the original tooth anatomy is often modified by caries, large fillings, occlusal trauma and dystrophic changes. Based on the study of the internal anatomy of over 500 extracted teeth, *Krasner & Rankow* are set the rules that are good clinical guide of the internal anatomy of pulp chamber, independently of the external anatomy of the tooth crown.

Introduction

The goal of endodontic root canal treatment is to remove the content of the canal, infected layer of dentine and to form canal space for an adequate three-dimensional obturation. Appropriate instrumentation of the canal system involves its shaping as well as preserving initial morphology and copious irrigation with mild antiseptic solutions. Shaping of the root canal system can be performed by using different techniques, including those with engine-driven instruments. The aim of shaping of the root canal space is to facilitate cleaning

and to form favorable space for definitive obturation in apical, lateral and coronal direction. The principle of the crown-down technique is that the coronal aspect of the root canal is widened and cleaned before the apical part that is for shaping the most challenging third in the root canal. This technique provides a basement for development of engine-driven shaping with full-rotation instruments. Shaping and cleaning of the canal space is significantly improved by using engine-driven nickel-titanium instruments with full rotation, high flexibility and elasticity. Working errors, occurrence of ledges and transportation are minimized and conical shape of prepared canal follows initial morphology of the dental root canal [1]. Also, significantly is decreased time for shaping the canal space, while predictability of the endodontic treatment is increased. After many years of successful use of *Pro Taper Universal* engine-driven endodontic instruments of full rotation, on the dental market is launched the new one of the manufacturer *Dentsply/Maillefer Ballaigues, Switzerland*. *ProTaper Next* is a set of instruments of full rotation with unique design, rectangular cross-section and off-centered rotation which gives the file a asymmetric, "swaggering" motions during rotation in the root canal. The file is made of *M-Wire* Ni-Ti alloy. Unlike progressive conicity of *ProTaper Universal* files, *ProTaper Next* files have a decreasing percentage taper from the tip to the shank in order to increase the flexibility of the part of the file that has lower effect on widening of the root canal. The tip of *ProTaper Next* file is smooth-passive. The distance between the blades (density), as well as angle between the blade and longitudinal axis of the instrument, are changeable along the active part of the instrument.

Results and discussion

The main disadvantage of engine-driven Ni-Ti instruments of full rotation is separation (fracture) during treatment without any visible signs of previous deformation, unlike stainless-steal instruments. Separation or fracture of instrument appears as a consequence of torsion and cyclic fatigue. Torsion appears as a result of friction between interface of instrument and wall of the root canal. Torsional stress can be decreased by decreasing the contact area between instrument and wall of the root canal, applying crown-down technique, irrigation and lubrication of the canal space. It is important to emphasize that the engine-driven *ProTaper Next* instruments is always used with handpiece and endo-micromotor (*X-Smart Plus*) that can dose torsion stress in instrument in the root canal. Cyclic fatigue appears during rotation of Ni-Ti instruments in narrowed and curved canals. In the area of the curve molecules of outer part of the instruments are in condition of tension, while

molecules of the inner part are in condition of compression. By rotation, zone of strain and compression changes that leads to fatigue of Ni-Ti alloy and the separation of the instrument without any macroscopic visible signs of damage [2]. An adequate training course of the clinician for the use of engine-driven Ni-Ti instruments, with maximum observance of the working protocol as well as careful records of use and sterilization every instrument from set, it can be significantly decreased appearance of separation of the instruments in root canal system.

Special advantage of engine-driven Ni-Ti instruments of full rotation is possibility to use for shaping of complicated root canal systems like as it is first molar. First maxillar molars are in literature described as the biggest teeth in the upper jaw, with completely separated three roots, one palatal and two buccal, and total of four canals [3]. The palatal root is the most massive, mainly straight and round in the cross section, with one spacious canal. Distobuccal root usually has one canal and slightly pronounced mesial curvature. Mesiobuccal root (MB) has oval shape, greater bucco-palatal diameter, with slightly pronounced distal curvature and in most cases with two root canals. However, anatomy of the root canal system of maxillary first molar is more complex and variable, especially in the mesiobuccal root. Results and literature data are not uniform in terms of number of canals, especially in the MB root. It is interesting that data about the number of two or more canals in this root vary significantly: of only 18,6% or 25% [4] to 93,5% [5] or 95,5% [6,7]. In endodontics, generally is accepted that one of the primary reasons of unsuccessful endodontic therapy is the impossibility to identify and treat all root canals. The more complex anatomy of root canal system, the percentage of unsuccessful endodontic treatment is higher. According to the literature data the pulp chamber and orifices of the canals are usually described on the basis of photographs and schemes of intact tooth crown and ideal external and internal anatomy of the tooth. However, in the clinical situation the original tooth anatomy is often modified by caries, large fillings, occlusal trauma and dystrophic changes. Based on the study of the internal anatomy of over 500 extracted teeth, *Krasner & Rankow* [8] are set the rules that are good clinical guide of the internal anatomy of pulp chamber, independently of the external anatomy of the tooth crown.

In order to prevent the failure of endodontic therapy, except the knowledge of the external and internal anatomy of the tooth, good quality pre-operative radiographic findings are important and adequate access cavity that will allow unrestricted approach to orifices of root canals. For demanding process of identification of root canal orifices, especially in the case of a complex canal system such as the first maxillary molar with four root canals,

adequate choice of instruments is required. First of all, the operating endodontic microscope and/or operational magnifier with adequate lighting are required, for achieving adequate overview and lighting of working field. Significant help in the detection of canal orifices can provide ultrasound with specific extensions designed to remove layers of dentin that do not allow unrestricted access to the root canal orifices at the bottom of the pulp chamber [9]. If the root canal is shaped by *ProTaper Next* instruments, definitive canal obturation is possible to achive by monocone technique (*single-cone, cone-fit*), as well as other techniques. This technique is suitable for narrow and curved root canals, such as MB2, while in the case of more massive canals the cold lateral compaction is recommended. The advantages of *cone-fit* technique are simplicity, easy to handle, less time-consuming as well as economically advantageous.

The contemporary concept of endodontic therapy would not be complete without adequate reconstruction of endodontically treated teeth. Reconstruction is based on application of composite fillings for compensation of lost dental tissue and optimum distribution of loads. SEM investigations are confirmed micromechanical nature of the adhesive bond between composite and dentin crowns and/or roots of teeth. Defining the mechanical properties of the dentin, especially root dentin, is important for pragmatic and theoretical point of view. Namely, if we take into account the diversity of the dentin structure, and implement mathematical modeling of known mechanical properties of dentine with the help of a model of viscoelasticity, it can be predicted behavior of the dentin in situations with different loads [10]. When choosing materials and methods for reconstruction of endodontically treated teeth it should be taken into account the mechanical properties of materials and remaining tooth structure, the specificity of the adhesive bond between composite resins and dentin of the tooth [11,12]. The maximum possible compliance of mechanical properties of dentin and composite fillings contributes not only to correct distribution of force, but also to protection of the remaining canal filling of endodontically treated teeth.

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POSSIBILITIES AND LIMITATIONS OF NON-PHARMACOLOGICAL APPROACH IN NON COOPERATIVE PATIENTS

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Abstract

With a presumption that all patients, without exception, have a right to equal standards of health and care routine behaviour management is the approach of choice in the treatment of uncooperative and anxious patients. Unfortunately, behaviour management in some patients has certain limitations and difficulties. Behavioural ratings play a special role in general dentistry as they may provide an aid to classify behaviour and cooperation of child patients. They thereby identify children at an early stage making it possible to prevent further development of behavioural or anxiety problems. In this context ratings should have clear definitions of behavior. Behavioral rating scales have been the most commonly used indices of children's responses to dentistry. An example is the widely used Frankl Scale, in which the child's reaction to dental treatment is rated on a four-point scale ranging from definitely negative to definitely positive. Such scales potentially provide standard tools which might enhance the comparability of findings from diverse pedodontic research

Introduction

With a presumption that all patients, without exception, have a right to equal standards of health and care routine behaviour management is the approach of choice in the treatment of uncooperative and anxious patients. Unfortunately, behaviour management in some patients has certain limitations and difficulties. Tolerance of dental treatment varies between groups of healthy children with or without ID but it is acknowledged that there are some groups of children with disabilities that do tolerate it. General anaesthesia is often the last option in the overall behaviour shaping continuum, with the intention of facilitating the goals of communication, cooperation, and delivery of quality oral health care, as well as the prevention of oral diseases in the uncooperative patient.

Results and discussion

Table. FRANKL BEHAVIORAL RATING SCALE
1 - - Definitely negative. Refusual of treatment, forceful crying, fearfulness, or any other overt evidence of extreme negativism.
2 - Negative. Reluctance to accept treatment, uncooperative, some evidence of negative attitude but not pronounced (sullen, withdrawn).
3 + Positive. Acceptance of treatment, cautions behavior at times, willingness to comply with the dentist, at times with reservation, but patient follows the dentist`s directions cooperatively.
4 + + Definitely positive. Good rapport with the dentist, interest in the dental procedures, laughter and enjoyment.

Behavioural ratings play a special role in general dentistry as they may provide an aid to classify behaviour and cooperation of child patients. They thereby identify children at an early stage making it possible to prevent further development of behavioural or anxiety problems. In this context ratings should have clear definitions of behaviour and should Pain and negative experiences from dental treatment are considered major reasons for anxiety and lack of cooperation. Both dental fear and anxiety and non cooperative behaviour problems are widespread and seem to decrease with age. The aetiology is not yet fully understood, but several risk factors can be identified. Pain, discomfort and feeling of lack of control are central to the problem and it is important that dentists should address these issues when treating children and adolescents. Behavioral rating scales have been the most commonly used indices of children's responses to dentistry. An example is the widely used Frankl Scale, in which the child's reaction to dental treatment is rated on a four-point scale ranging from definitely negative to definitely positive. The advantage of rating scales include ease of administration and conceptualization. The rater uses the trait as an organizing concept which allows him or her to select relevant cues and to superimpose a dimension on the subject's behavior.

In a field sorely lacking well-standardized behavioral assessment tools, the emergence of behavior rating scales with documented reliability, validity, and measurement properties is noteworthy. Such scales potentially provide standard tools which might enhance the comparability of findings from diverse pedodontic research

Table2. Guidelines for restraining and holding children still.
Restraining and holding still should be used only as a last resort.
Make an agreement with the parents or guardians beforehand about the methods to be used.
Ensure parental presence and involvement if they wish to be present and involved.
Only minimal force should be used` use age-appropiate methods like splinting or wrapping.
Take into account the legal implications when carrying out restraining or holding still.
Ensure there are sufficient staff available to assist in restraining or holding still.
Have a debriefing session with the child and, where appropriate, with staff and parents as soon as possible after the event.

The ASA score is a subjective assessment of a patient's overall health that is based on five classes (I to V).
I Patient is a completely healthy fit patient.
II Patient has mild systemic disease.
III Patient has severe systemic disease that is not incapacitating.
IV Patient has incapacitating disease that is a constant threat to life.
V A moribund patient who is not expected to live 24 hour with or without surgery.
E. Emergency surgery, E is placed after the Roman numeral.

Table. Rating scales for anxiety and uncooperative behavior
Anxiety rating scale
0. Relaxed, smiling, willing and able to converse.
1. Uneasy, concerned. During stressful procedure may protest briefly and quietly to indicate discomfort. Hands remain down or partially raised to signal discomfort. Child willing and able to interpret experience as requested. Tense focial expression, may have tears in eyes.
2. Child appears scared. Tone of voice, questions and answers reflect anxiety .During stressful procedure, verbal protest, (quiet) crying, hands tense and raised, (not interfering much – may touch dentist`s hand or instrument, but not pull at it). Child interprets situation with reasonable accuracy and continues to work to cope with his/ her anxiety.
3. Shows reluctance to enter situation, difficulty in correctly assessing situational threat.

Pronounced verbal protest, crying. Using hands to try to stop procedure. Protest out of proportion to threat. Copes with situation with great reluctance.
4. Anxiety interferes with ability to assess situation. General crying not related to treatment. More prominent body movement. Child can be reached through verbal communication, and eventually with reluctance and great effort he or she begins the work of coping with the threat.
5. Child out of contact with the reality of the threat. General loud crying, unable to listen to verbal communication, makes no effort to cope with threat. Actively involved in escape behavior. Physical restraint required.
Behavior rating scale
0. Total cooperation, best possible working conditions, no crying or physical protest.
1. Mild, soft verbal protest or (quiet) crying as a signal of discomfort, but does not obstruct progress. Appropriate behavior for procedure, i.e., slight start at injection ``ow`` during drilling if hurting, etc.
2. Protest more prominent. Both crying and hand signals. May move head around making it hard to administer treatment. Protest more distracting and troublesome. However, child still complies with request to cooperative.
3. Protest presents real problem to dentist. Complies with demands reluctantly, requiring extra effort by dentist. Body movement.
4. Protest disrupts procedure, requires that all of the dentist`s attention be directed forward the child`s behavior. Compliance eventually achieved after considerable effort by dentist, but without much actual physical restraint. (May require holding child`s hands or the like to start). More prominent body movement.
5. General protest, no compliance or cooperation. Physical restraint is required.

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CUSTOM MADE GRAFT

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Abstract

An autologous bone (bone derived from the patient himself) is considered the "golden standard" in the treatment of bone defects and partial atrophic alveolar ridge. However, large defects and bone losses are difficult to restore in this manner, because the extraction of large amounts of autologous tissue can cause donor-side problems. Alternatively, data from a computerized tomographic (CT) scan can be used to shape a precise 3D homologous bone block using a computer-aided design – computer-aided manufacturing (CAD-CAM) system.

Application of 3D CBCT images, computer-aided systems and software in manufacturing custom bone grafts represents the most recent method of guided bone regeneration. This method substantially reduces the time of recovery and carries minimum risk of postoperative complications, yet the results fully satisfy the requirements of both the patient and the therapist.

Introduction

Atrophic alveolar ridge in the posterior part of mandible present a huge clinical problem in prosthetic rehabilitation.[1-7] In this situation fixed implant supported prosthesis is an ideal therapeutic solution. Extremely losses in height and width of the residual alveolar bone complicate the placement of an implant of adequate length and appropriate subsequent prosthetic rehabilitation.[2] Cases when the configuration of the residual bone does not provide adequate basis to contain particulate grafting material, require a strong rigid graft .[8] For all these reasons, when there are defects in the posterior mandible, which exceed 3 mm in either width, height or both, a bone block graft is recommended.[9, 10] An autologous bone (bone derived from the patient himself) is considered the "golden standard" in the treatment of bone defects and partial atrophic alveolar ridge. It exhibits excellent bio-absorption capabilities and is never rejected by the body. However, large defects and bone losses are difficult to restore in this manner, because the extraction of large amounts of autologous tissue can cause donor-side problems. Alternatively, data from a computerized tomographic (CT) scan can be used to shape a precise 3D homologous bone block using a computer-aided design – computer-aided

manufacturing (CAD-CAM) system. This kind of procedure allow using the bone block directly from its sterile packaging to the receiving site without additional shaping.[1]

Matherial and methods

3D design of a graft model: Generating of 3D model of the jaw is the first step in the graft modelling procedure. The procedure is performed according to Cone Beam CT images (CBCT) provided in DICOM format that enable further generation of the 3D model of patient's lower jaw (Figur 1.). This procedure is essential since the 3D model of lower jaw is the basis for graft modelling. The procedure also enables visual and functional inspection of the 3D graft model. 3D model of patient's lower jaw generated based on CBCT scans made with 3D-DOCTOR software is presented in Figure 2. After generating the 3D model of lower jaw, input parameters such as shape and size of the graft and its position in the jaw were defined. Finalized 3D model of the graft was saved in STL (stereolitography) file format that enables an easy manipulation and data exchange between software programs. In the next step, the 3D graft model was fitted together with the 3D model of the lower jaw and implant models using OnDemand3D computer software. During this stage, geometric characteristics of the graft were analyzed as well as its position in the jaw in relation to the implants. After satisfying all virtual aesthetic and functional requirements, the graft model was manufactured along with the jaw by applying the RP (Rapid Prototyping) technology. 3D printing of the graft and jaw enabled oral surgeons to "hold the result", i.e. the solid object in their hands and to analyse the physical model (Figure 3.). This step represented the last inspection prior to final fabrication, which enabled identification and elimination of some potential problems that were not visible in the virtual 3D model. After completing the required modifications and corrections of 3D model, the final version of the graft was sent for fabrication using CNC (Computer Numerical Control)milling machine-tool.

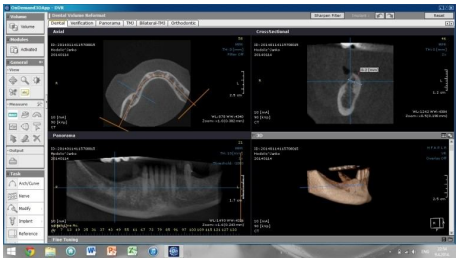

Figure 1. 3D CBCT

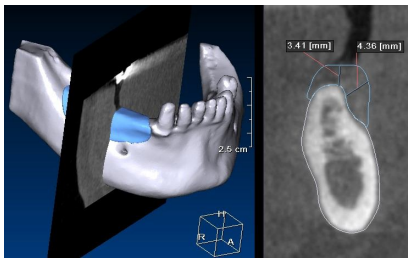

Figure 2. Virtual planning of the graft

Figure 3.Physical models of the lower jaw generated by RP technology

Surgical procedure: After the custom bone graft has been delivered in an original sterile package, the surgical procedure was performed (Figure 4.). Under block anaesthesia of the n.alveolaris inferior, the full-thickness mucoperiosteal flap was lifted to expose the residual alveolar ridge. Using a 1-mm steel micro-driller, perforations in the mandibular cortex were made to enhance the blood supply to the graft. Bone graft was carefully positioned and fixed using two 12 mm titanium screws (Figure 5.). With an aim of preventing the proliferation of fibrous tissue and infection, the graft was covered with two bio-absorbable collagen membranes that are essential for a successful augmentation procedure. To eliminate the tension force and reduce the pressure onto the bone graft, periosteal releasing incision was made at the base of the flap and surgical region was closed with non-resorptive surgical suture 5-0 applying horizontal mattress stitch technique.

Figure 4. Intraoral image of the patient Figure 5. Final position of the graft

Discussion

The deficit of the residual bone required to provide optimal conditions for an ideal placement of dental implant is common problem in daily clinical practice. In such instances, adequate bone regeneration can provide the structural support. Increasing interest in the bone itself relies on the fact that bone regeneration preceding surgical treatment is inevitable in some 10-20% of patients indicated for dental implantation therapy.Development and application of "artificial" custom (individual) grafts, which are characterized by relatively simple preparation, good predictability of the outcome and "comfort" for the patient himself, has been gaining increased attention. This kind of treatment facilitates diagnostic and surgical procedures, reducing time and improving the precision in adapting the graft, which is critical to its integration with the surrounding bone.[14]

Conclusion

In our everyday clinical practice, we face relatively large number of patients indicated for implant-prosthetic treatment. The loss of single or multiple teeth is such patients results in substantial deficit of the residual alveolar ridge. Such situations require the augmentation of lost bony structures in order to provide optimal conditions for dental implant placement and subsequent prosthetic rehabilitation. Application of 3D CBCT images, computer-aided systems and software in manufacturing custom bone grafts represents the most recent method of guided bone regeneration. This method substantially reduces the time of recovery and carries minimum risk of postoperative complications, yet the results fully satisfy the requirements of both the patient and the therapist. The results presented in this article confirm the importance and effectiveness of computer-aided systems for 3D digitization, design and fabrication of custom bone grafts.

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RARE DISEASES IN MAXILLOFACIAL REGIONS

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Abstract

Eagle's syndrome is a group of symptoms that are characterized by recurring pain in the region of the pharynx and the face, most often in the retromandibular region. Symptoms occur as a result of an elongated styloid process or ossificated stylohyoid ligament. It was first described in the literature in 1937 by Watt W. Eagle who connected the length of styloid process with atypical facial neuralgia.

Introduction

Styloid process and stylohyoid ligament are in close contact with parapharyngeal anatomical space in which beside the common carotid artery (CCA) are located the internal jugular vein, glossofaringeal, facial, vagal and hypoglossal nerve.

Stylohyoid complex, which is formed by styloid process, stylohyoid ligament and lesser horn of hyoid bone, is embriologically derived from Reichert's cartilage of the second branchial arch.

Eagle defined physiological length of the styloid process, the length is 2.5-3.0 cm.

Diagnostic procedures used for the diagnosis of this syndrome are mainly used for the diagnosis of other diseases, and the diagnosis of an enlarged styloid process or calcification of the stylohyoid ligament is mostly incidental finding. Usually the radiologic diagnosis is established during diagnoses injury and / or disease of the cervical spine. It is also evident that the styloid process can be clearly shown on the OPT (orthopantomograph).

Definitely diagnostic is carried out with CT scan radiography (computerized tomography) with 3D reconstruction.

Eagles syndroma

The styloid process, stylohyoid ligament and lesser horn of hyoid bone make stylohyoid apparatus, which is embriologically derived from Reichert's cartilage of the second branchial arch. Styloid process is located on the basis of the temporal bone behind the mastoid, it is

positioned anteroinferiorly relative to the lower aspect of the temporal bone. It is placed between the parotid gland laterally and the internal jugular vein (VJI) medially, passes between the external and internal carotid arteries (ACE and ACI) and reaches the lateral wall of the pharynx. Cranial nerves: *n.hypoglossus, n.vagus* and *n.glossopharingeus* are placed medial to the styloid process. On the styloid process m. stylohyoideus, m.styloglossus and m.stilopharingeus, stylohyoid and stylomandibular ligament are attached [3].

The normal length of the styloid process may vary. Eagle defined normal length of styloid process in the range from 25 to 30 mm. [4] Kaufman believes that the normal length is up to 30mm [5] while in some other papers the 40 mm as the upper limit was mentioned [6,7]. From the radiological point the normal styloid process length is 25mm (the length along the posterior aspect of the styloid process from the base to peak is measured) [8].

Elongated styloid process according Langlias can be classified into three types [8,9]:

1. Uninterrupted styloid process
2. Styloid process in which there is a pseudoarthrosis between the styloid process and stilohioidnog ligament
3. Segmental interrupted stylohyoid ligament that gives the appearance of multiple pseudoarthrosis.

Eagle's syndrome is most common in the third and fourth decade, slightly more often in women (ratio of women: men is 3:1) and more often bilateral than unilateral although bilateral symptoms do not necessarily occur. In our cases we describe a case of bilateral and a case of unilateral elongated styloid process, both patients were men in the fourth and fifth decade with unilateral (right side) symptoms.

Patients can develop different symptoms in the form of non-specific neck pain, pain in the ear and mastoid region that is amplified during the movements of the neck, dysphagia or odynophagia with the feeling of a foreign body in the throat, vertigo and tinnitus, because of elongation of styloid process or calcification of stylohyoid ligaments. Eagle described two syndromes which are related to the elongation of the styloid process [4,10]:

1. "Classic Eagle's syndrome" is seen in patients after pharyngeal trauma during tonsillectomy, followed by constant dull pain, the patient as the epicenter of the appearance of pain alleges the tonsillar region, the pain spreads to the ear when the patient rotate his head. The pain intensifies with the pressure in tonsillar region. Among other symptoms, there is pain when swallowing, feeling of a foreign body in

the mouth (pharynx), ringing in the ears (tinnitus) or pain spreading to the face and neck region.

2. The other form of Eagle's syndrome, is also called "stylo-carotid syndrome", is not associated with pharyngeal trauma and symptoms such as pain are the result of mechanical irritation and compression of perivascular sympathetic nerve fibers in the wall of the external and internal carotid arteries. Pain spreads along the blood vessel in the neck, during the rotation or the pressure in the neck, and extends in the supraorbital region and the parietal region (because of the pressure on the internal carotid artery), or to the infraorbital region (because of the pressure on the external carotid artery).

The etiology of this syndrome is still causing debate in medical circles. Eagle believed that surgical trauma (tonsillectomy) leads to osteitis, periostitis or tendinitis of stylohyoid complex with subsequent ossification. Crops is representative of the theory that the presence of mesenchymal elements in the stylohyoid complex (origin Reichert's cartilage) can lead to bone metaplasia under the influence of traumama or mechanical stress. There are different theories about the cause of ossification of stylohyoid ligament (theory of reactive hyperplasia and theory of reactive metaplasia are based on post-traumatic response of the body, and the theory of anatomical variations is based on anatomical variations without prior trauma). Epifanio considers that ossification is associated with the endocrine disorders in menopausal women, which leads to ligament ossification. Elevated serum calcium, phosphorus and vitamin D metabolism disorder encountered in end-stage renal disease can lead to calcification of stylohyoid ligament [10].

Although the Eagle believed that tonsillectomy is responsible for the appearance of ossification of styloid process Eagle's syndrome occurs in people who had no surgical procedures in the region.

The diagnosis is based on detailed anamnesis, clinical examination and radiological examination (OPT, lateral X ray by Eissler , CT scan with 3D reconstruction). The elongated styloid process and its deviation can be seen clearly on OPT, but for the diagnosis of Eagle's syndrome computerized tomography with 3D reconstruction is most significant, because it allows the measurement of the length of styloid process and determination of its relationship with other structures of the head and neck, which is most important for surgical planning [12].

The elongated styloid process can be radiologically, based on the density of calcification , classified into [9]:

1. Marginally calcified (calcification occurs in the outer part while in the center of process is seen lightening that occurs in most cases).
2. Partially calcified
3. Nodular complexes
4. Completely calcified

The differential diagnosis includes: diseases of the temporomandibular joint, hyoid bursitis, glossopharyngeal and sphenopalatinal neuralgia, esophageal diverticulum, migraine, temporomandibular arteritis, myofascial pain syndrome, cervikal arthritis, otitis, diseases of the salivary glands, impacted third molar, tumors, etc. [13,14,15].

Treatment of Eagle syndrome can be a conservative and surgical.

Our experience presented in this paper are based on the surgical treatment.

Conservative treatment advocated by Evans and Clairmont (symptomatic therapy similar for treatment of trigeminal neuralgia) involves the use of non-steroidal anti-inflammatory drugs, corticosteroids (corticosteroid and anesthetic injection in the region of the lesser horn of hyoid bone or the lower aspect of the tonsillar lodge), anticonvulsants, antidepressants, physical treatments and exercises for the neck [16].

Surgical treatment involves styloidectomy (removal of elongated styloid process) by extraoral or intraoral approach. The success of surgical treatment is 93.4% [12].

Intraoral approach is simpler, takes less time and avoids the surgical scar, but can lead to infection of deep neck spaces, injury of the blood vessels and one of disadvantages is poor visualization of the operative field. It is not recommended in the same act made styloidectomy for both sides by intraorally approach due to high postoperative discomfort for the patient [17,18].

Extraoral approach involves access through the cervical incision which allows better visualization of the surgical field and greater intraoperative sterility. This technique, however, lasts longer, but there is a risk of injury of the branches of the facial nerve, the patient recovery postoperatively is longer and the procedure is visible. Extraoral approach is reserved for patients who have extreme ossification practically the entire ligament- from the styloid process to the hyoid bone, we believe it is justified since it avoids the risk of intraoral access and iatrogenic injury of the neurovascular structures [19,20,21].

It is estimated that that the success of the treatment of Eagle's syndrome (both conservative and surgical) is more than 80%. It is believed that treatment failure was associated with the presence of the other factors involved in the pathogenesis of this syndrome.

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KEY DESIGN DECISIONS IN COMPLEX CRANIOFACIAL RECONSTRUCTION USING PATIENT-SPECIFIC IMPLANTS

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Abstract

Introduction

This abstract and presentation is a summary of PDR's most recent published (or in-press) research.

The application of Computer Aided Design (CAD), Computer Aided Manufacture (CAM) and Additive Manufacturing (AM) in cranio-maxillofacial and orthopeadic surgery is growing. Previously published evidence has established significant clinical benefits from using these processes to produce devices such as patient specific drilling/cutting/positioning guides [1-8] and implants [9-12]. Improved patient outcomes and shorter surgeries are possible through the design of devices that can be tailored in shape and function to ensure they are easy to use, reduce the chance of error and incorporate features that improve fit precision. CAM/AM technologies allow devices to be manufactured with fewer design constraints than alternative laboratory or in theatre-based approaches. Furthermore, it is possible to design and produce implants with tailored mechanical properties [13] or surface finishes that help to improve osseointegration [14]. Hospitals can save money by being able to reduce their inventory levels through on-demand ordering and delivery, although this is not widely reported in the literature. This can help hospitals make more efficient use of expensive staff and operating theatre resources.

CAD/CAM/AM technologies have essentially reached a point of functional and regulatory readiness, however the techniques are still not in routine use – particularly by the UK National Health Service (NHS). This issue has been reported [15] and the reasons discussed, but there is a lack of literature in this area. It is proposed that this is due to a number of factors, including: higher up-front cost than conventionally-fabricated devices (such as stock plates bent to shape prior to the procedure) [16-18], limited shared understanding between

design engineers and surgeons, material-choice uncertainty, and a lack of long-term follow-up due to the relatively recent introduction of CAD/CAM/AM. [15]

This presentation and abstract identifies design considerations, or crucial specification criteria for complex CAD/CAM/AM devices. This is a further gap in current knowledge that prevents more widespread adoption. Although appropriate design could be considered as a crucial mechanism to effectively harness the potential benefits of using CAM/AM production technologies in craniofacial surgery, it is not frequently referenced as a methodology.

Elements of this research are presented here and it is being written up in full as a journal paper for wider dissemination.

Methods

The research presented in this abstract and presentation is based on a thorough literature review and critical analysis of clinical cases where CAD/CAM/AM technologies have been used to undertake complex craniofacial reconstruction. In this study, complex craniofacial devices are defined as those which replace two or more bony surfaces (or of comminuted defects).

For the literature review, articles were searched for using the PubMed and Google Scholar indexes. Both complex craniofacial reconstructions and (relatively) simple reconstructions were considered. Abstracts were then analysed for relevance and qualifying articles reviewed in full. Nearly 100 abstracts were reviewed. This helped to establish the current state-of-the-art context reported in academic literature. Emerging themes related to design decisions and considerations were logged and categorised.

6 clinical meningioma and fibrous dysplasia cases were also critically reviewed in order to derive design considerations. Both fibrous dysplasia and meningioma are commonly benign (although not always) and slow-growing in nature, meaning the speed of device design is not generally a concern. Mimics (Materialise, Belgium) was used to segment the Computer Tomography (CT) data and create an appropriate CAD model in the STereoLithography (STL) file format. FreeForm Plus (Geomagic, 3D-Systems) was used to plan and design the guides and implants in all cases. 4 cases utilised AM production in titanium and two CAM in polyether ether ketone (PEEK). Titanium implant parts were fabricated using Laser Melting (LM) in Ti6Al4V-ELI (medical grade 23) by an appropriate supplier (3D Systems LayerWise, Belgium). CAM was used to produce the two PEEK implants using an appropriate supplier

(Synthes, Switzerland). Surgical guides produced using stereolithography (Projet 6000HD, 3D-Systems, USA) were used to guide tumour excision in some of the cases. All devices produced for the clinical cases were prescribed by the same UK maxillofacial surgeon, in the same hospital, with input from a multidisciplinary team including neurology and ophthalmology specialists. Computer-aided planning and design work was undertaken in collaboration with a university-based design development and research institute. The digital workflow was specified to overcome problems experienced by the maxillofacial surgeon in using lab-based and semi-digital techniques in prior cases that were similar.

Results – Literature Review

There was no consensus on which material was most appropriate (PEEK or titanium); both can be used to achieve a suitable clinical outcome and have a well-established track record of long-term implantation. There was a slight bias to the number of cases that used PEEK. PEEK has the advantage of being radio translucent and can be modified in theatre using burrs if required [19-22]. AM was the primary cited production method of titanium implants, whereas CAM was most commonly used for PEEK part production. There are therefore inherently different design considerations for each of the materials and manufacturing methods.

Clinical papers reporting cases frequently overlook details of device design specifications, device modelling operations, or device detailing decisions. This may be because the process was undertaken by an external implant company detached from the surgeon (with limited collaboration beyond an initial device request). Alternatively, the communication of design considerations may have been considered less important than conveying detailed descriptions of the pathology and the surgical procedure (assuming most papers were written by surgeons as the primary author). It was, however possible to identify very general design considerations, for example, the vast majority of literature stated the use of mirroring anatomy to achieve the basis for anatomical reconstruction. In order to identify further design considerations, it was necessary to employ reasoning or obvious inference. A summary list of design considerations and justifications for using a CAD/CAM/AM approach is presented below. These are categorised in table 1 under: CAD / AM / CAM justification (**A**), Material choice (**B**), Strategy (**C**) and Detailed modelling (**D**).

Design considerations from literature	Category
Consider CAD/CAM/AM:	
If the higher up-front cost of devices could be offset by improved surgical efficiency and patient outcomes.	**A**
If it could improve the cosmetic outcome.	
For large and complex implant cases.	
If it is likely to reduce operative time.	
If could offer a more accurate fit.	
It is likely to overcome the limitations of autologous reconstruction.	
It can offer a single-step excision and reconstruction procedure.	
Consider:	
PEEK if standard mini-plate fixation is preferred.	**B**
PEEK if intra-operative modifications are likely to be required (titanium is more difficult to modify in theatre).	
PEEK if mechanical properties similar to cortical bone is desirable.	
PEEK when radiolucency of the implant is desirable.	
Avoiding titanium where there might be concerns with thermal conductivity or sensitivity (a limited number of references cite issues of patient sensitivity to large titanium implants in extremes in environmental temperature).	
Consider:	
Whether surgical guides can help to accurately translate the digital plan into theatre.	**C**
Navigation for excision guidance and implant placement as an alternative to guides.	
Basing implant designs on mirrored healthy anatomy wherever possible.	
Reconstruction-site soft tissue coverage to minimise skin tension (especially along suture lines) and risk of implant exposure.	
Soft tissue contours in addition to bone.	
Using bone cement for contour or margin adjustment.	
Consider adding holes or a mesh pattern into the main implant area. *To: provide a foundation for securing the dura and temporalis muscle, preventing epidural hematoma, encouraging better tissue integration and cell growth, reducing weight, and lowering temperature conductivity.*	**D**

Table 1: Summary of design considerations from published literature

Results – Clinical Cases

An illustration of the implant designs for each of the 6 cases is provided in figures 1-6.

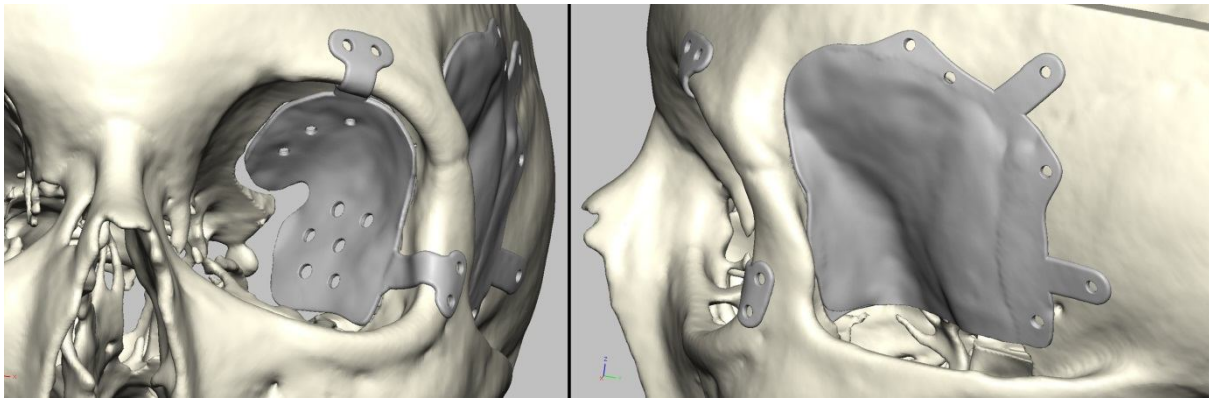

Figure 1: two-part titanium implant produced using AM. Design considerations: implant designed to sit over the defect and extended fixation tabs used in case the planned tumour margin need to be reduced/extended. 0.8mm nominal implant thickness with a satin finish.

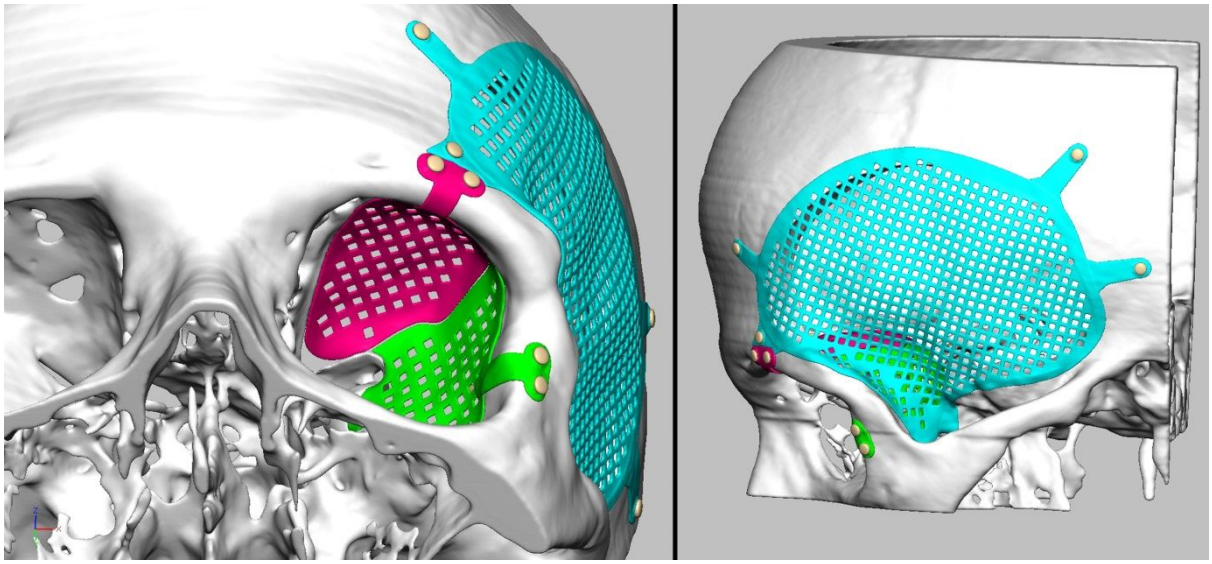

Figure 2: three-part titanium implant produced using AM. Design considerations: temporal implant designed to sit over the defect and extended fixation tabs used in case the planned tumour margin need to be reduced/extended. Orbital components designed to sit inside the created defect to reduce the volume added into the orbit (potentially proptosing the eye). 0.5mm implant thickness with localised areas increased to ensure full screw countersinking. A diamond mesh pattern was embossed into the implant components with a speculative aim of improving any future radiotherapy delivery - in case of disease recurrence

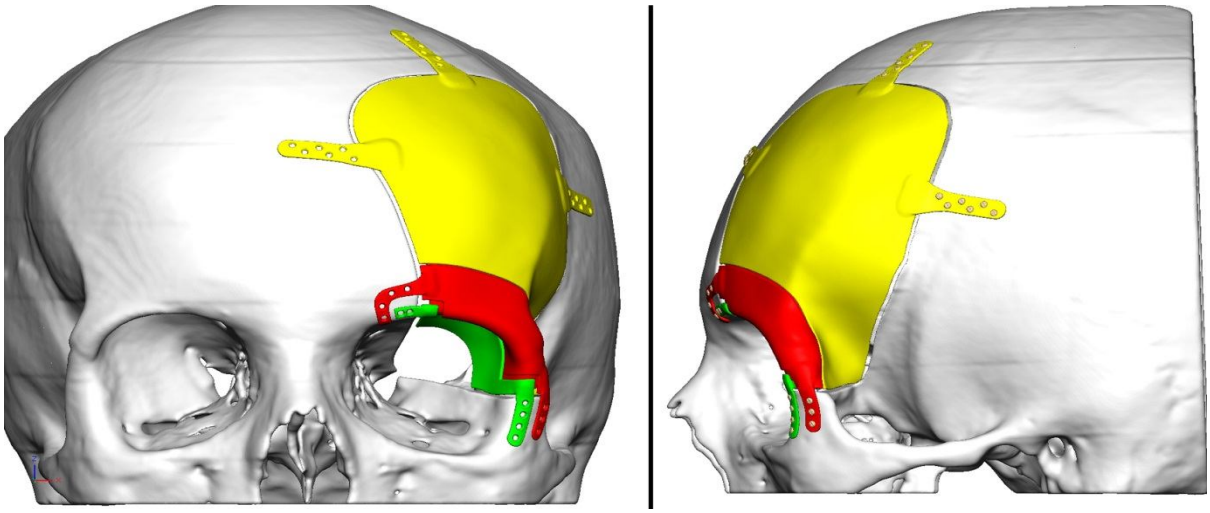

Figure 3: three-part titanium implant produced using AM. Design considerations: Surgical guides used to guide the cuts away from the frontal sinus and other critical areas. Implants designed to fit inside the created defect to avoid adding tension on the soft tissue after closure. Gap left at the bone-implant margin to allow for slight misfit. Each implant designed to work independently in case the excision margin needed to be reduced. Fixation tabs extended to accommodate potential need to extend the excision margin. 0.7mm nominal thickness.

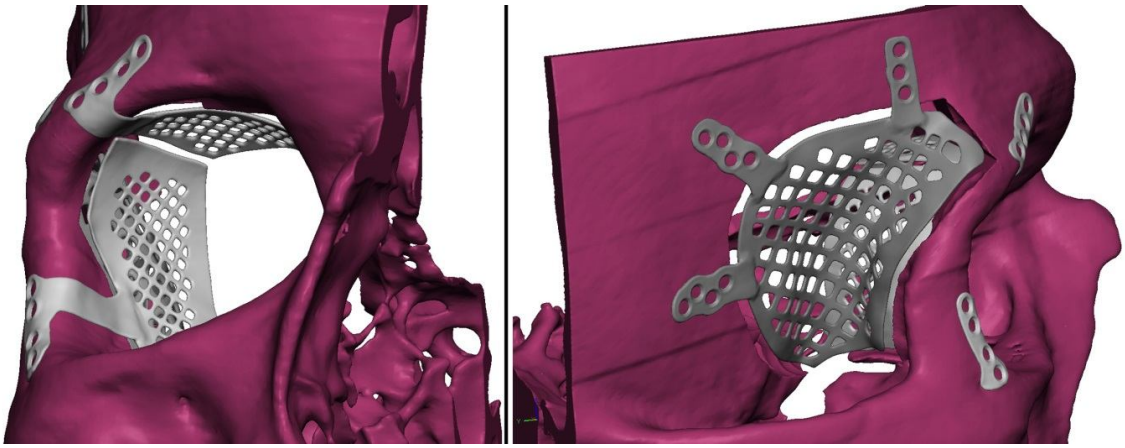

Figure 4: three-part titanium implant produced using AM. Design considerations: Each component designed to work independently to accommodate potential changes in the planned excision margin. Implants designed to fit inside the created defect to avoid adding tension on the soft tissue after closure and reduce added orbital volume. The lateral orbital rim was temporarily removed to improve access. The lateral orbital floor implant had extended fixation tabs to bridge the cut and fix the bone back correctly. A gap was left at the bone-implant margin to allow for slight misfit. A mesh pattern was applied to pre-empt potential radiotherapy and provide suture retention options for supporting the temporalis. 0.6mm nominal thickness.

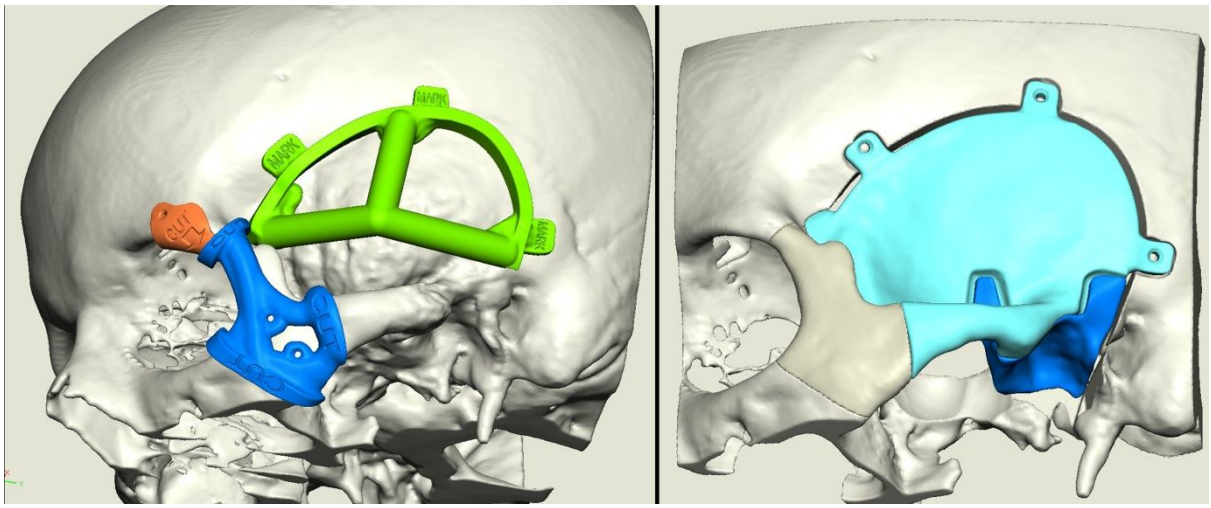

Figure 5: two-part PEEK implant. Design considerations: Surgical guides (shown in the left image) were used to temporarily osteotomies a portion of the lateral orbital rim/zygoma and guide the excision cuts for the implant. The implant was designed to fit inside the excision (with a margin). Two independent, but interacting implants were designed due to temporal fossa involvement of the disease (the decision on whether to remove disease from the fossa area was left to during the operation due to the foreseen complexity and potential for complications). The fossa was not removed, so only the temporal component was used. Countersunk tab features were designed into the implant to prevent it from being pushed into the brain. Variable implant thickness with approximately 3mm minimum thickness.

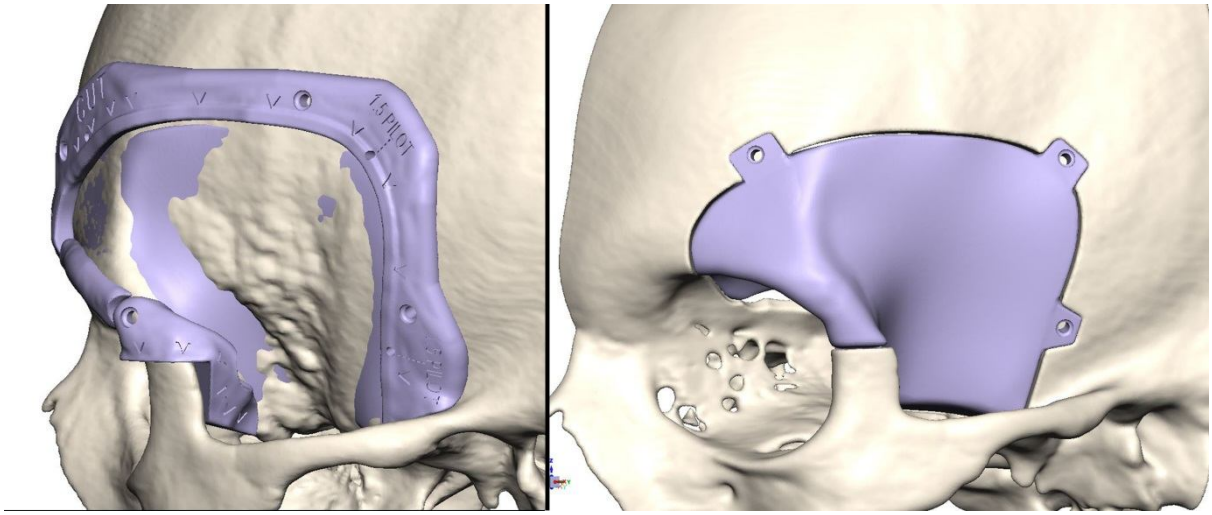

Figure 6: One-part PEEK implant. Design considerations: Surgical guides (shown in the left image) were used to guide the excision margin and avoid critical structures such as the frontal sinus. Countersunk tab features were designed into the implant to prevent it from being pushed into the brain. Variable implant thickness with approximately 3mm minimum thickness.

All cases achieved an appropriate clinical outcome with minimal complications. The case studies corroborated the design considerations identified in the literature review and introduced new considerations, which are outlined in table 2.

Summary of design considerations from the case studies
Use multi-part implant designs – particularly for the lateral orbital wall and orbital roof.
It is not usually necessary to simply replace the missing bone with the same volume of titanium or PEEK. Reduce the amount of implant material as much as possible.
Consider the importance of ensuring implants locate securely on contoured areas of anatomy.
Ensure screws are sufficiently countersunk into the implant to avoid palpability beneath the soft tissue.
Use independent fixation for each implant component.
Use long fixation tab lengths in case the excised margin needs to be extended.
Design a gap between the planned margin and the implant body to account for surgical tolerances and slight margin changes.
Design a gap between multiple implant components to accommodate surgical tolerances.
Consider using in-lay orbital implant designs to avoid over-adding volume to the orbit.
Restrict orbital roof implants to only the anterior half of the globe.
Consider including fixation tabs in PEEK implant designs to reduce the need for mini-plates and prevent the implant being pushed into the brain.
Consider using AM titanium where specific PEEK properties are not required (lower cost).

Table 2: design considerations derived from the clinical cases.

Discussion & Conclusions

Well-considered design is necessary to use CAD/CAM/AM technologies effectively in complex craniofacial reconstruction. The literature review concluded that design is frequently only considered at a macro level; details that could be considered crucial to effective usability performance, clinical function and form were not detailed. Through undertaking multiple clinical cases and critically analysing the performance of each in terms of: key aspects of usability, clinical outcome and other functions, it was possible to conclude more detailed design consideration.

The importance of a multidisciplinary approach that involved surgical disciplines and design/engineering experts was evident in all clinical cases. This was necessary to provide clear guidelines on how the design was intended to be used and perform during the operation. High dependence on the collaboration between multiple disciplines can be considered as a major barrier to more widespread adoption of CAD/CAM/AM. The development of clear, generalisable design rules and automation of design techniques are two methods that can help to eliminate this barrier. However, the complex and patient specific nature of the cases presented make this a significant challenge.

To develop a more detailed understanding of design considerations, future research must involve long-term follow-up of clinical cases and more rigorous investigation of impact CAD/CAM/AM has on the overall treatment. The authors recommend describing design considerations and decisions in detail when publishing on CAD / AM / CAM to allow audiences to develop an understanding of key decisions – beyond the choice of technology.

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Elements of this study have been developed for our newest full paper. See PDRonline.co.uk for details in the coming months.

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APPLICATION OF ADVANCED ENGINEERING SYSTEMS IN DESIGN AND FABRICATION OF CUSTOM-MADE BONE GRAFTS

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Abstract

Application of custom-made bone grafts from artificial bones represent an advanced medical approach for the treatment of bone defects in dental and maxillofacial regions. The ability to reproduce shapes with artificial bones is particularly important, and from the point of view of esthetics, it is regarded as the key to success in the field of dental and maxillofacial reconstruction. In this article the procedures used in designing and fabricating the custom-made bone grafts are presented.

Key words: Bone graft, custom-made, design, fabrication.

Introduction

The bone reconstruction process has conventionally used autologous bone, allograft bone, or artificial bone in the dental and maxillofacial regions. However, since reconstruction using autologous bone requires harvesting of the bone, while allograft bone carries the risk of infection, recently significant attention is focused on application of artificial bones. The advantages of artificial bone are that no harvesting site is needed, it has very good biocompatibility, and the surgical procedure is brief and uncomplicated. The ability to reproduce shapes with artificial bones is particularly important, and from the esthetical point of view, it is regarded as the key to success in the field of dental and maxillofacial reconstruction [1]. This article presents the procedures applied in design and fabrication of the custom-made bone grafts.

Designing the bone graft

The very first step in the graft design procedure is creation of the 3D model of mandible. In dentistry, this procedure is today mainly performed on bases of scans from Cone Beam CT (CBCT), i.e. images in DICOM format (Figure 1). This step is essential since the surface 3D

model of the mandible presents the basis for the site on which the bone graft will be designed [2, 3].

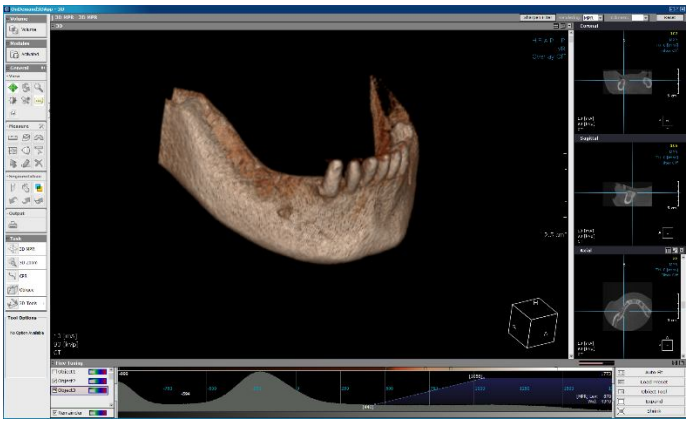


Figure 1: DICOM images of the human jaw obtained on CBCT

After the 3D model of the mandible is created, next step is to define desired shape and size of the graft, as well as its position in the jaw. This stage requires the highest level of cooperation of both oral surgeons and engineers in order to obtain a fully functional 3D model of the scaffold that would satisfy, in one hand, medical and esthetic requirements, and in the other hand, both technical and functional requirements.

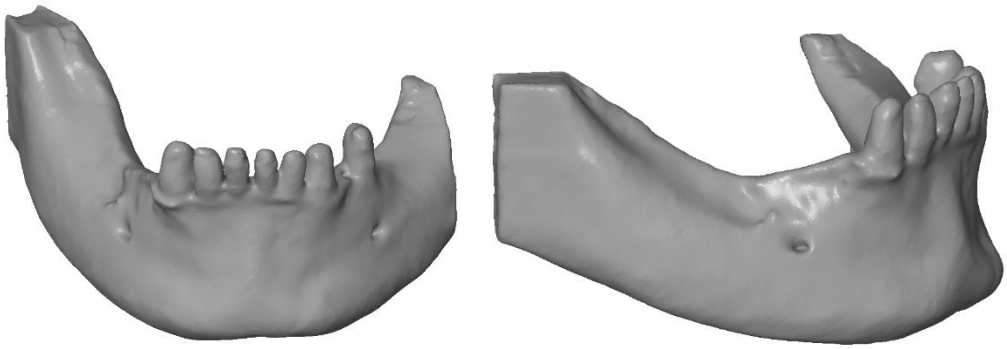


Figure 2: 3D model of the jaw created on bases of CBCT scan

Upon defining the mentioned necessary criteria, the graft designing procedure can be started. Modeling of bone grafts usually involves application of complex free-form surfaces, so the application of specialized 3D-modelling software is required in this stage. The 3D model of the mandible is used as the basis for designing the base graft surface (Figure 3). In this way, the highest level of conformation of the bone and the scaffold is provided. After the base surface is created, the upper or outer graft surface is designed by using tools for complex-surface manipulation, but also taking into consideration the desired shape, thickness and size

of the graft. The graft size is usually defined according to the number of required implants. However, smaller scaffold sizes are considered as more preferable from the point of view of receiving probability. In other words, it is desirable to split larger grafts into several smaller ones (Figure 3), of course if clinical situation allows it. Finished 3D model of the scaffold, is usually saved in stereolitography (STL) file format, which is considered as a kind of standard in this field because it enables easy manipulation and data exchange between different software platforms for CAD, CAE, CAM and RP (*rapid prototyping*) technologies [4].

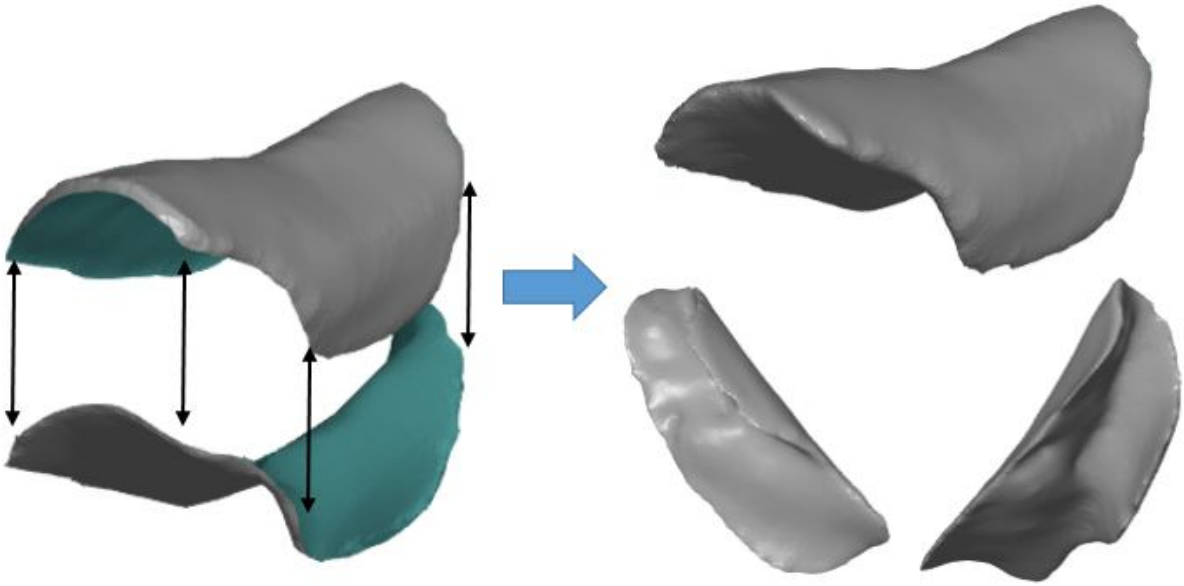


Figure 3: The graft designing procedure

Design analysis

In the next step, the 3D model of the graft is virtually fitted on the 3D model of the mandible. Specialized software, such as OnDemand3D from CYBERMED INC. allows insertion of virtual implant models into the designed 3D models of mandible with bone graft. During this stage, several geometrical features of the scaffold and its position in the mandible, in relation to the implants, should be analyzed (Figures 4). Afterwards, the final check-up by a multidisciplinary team of surgeons and engineers should be performed. This check-up comprise of the following: cross-sections analysis of the graft-bone fits; maximum graft dimensions (length, width, height); minimum graft wall thickness; undercuts on the graft; sharp edges etc.

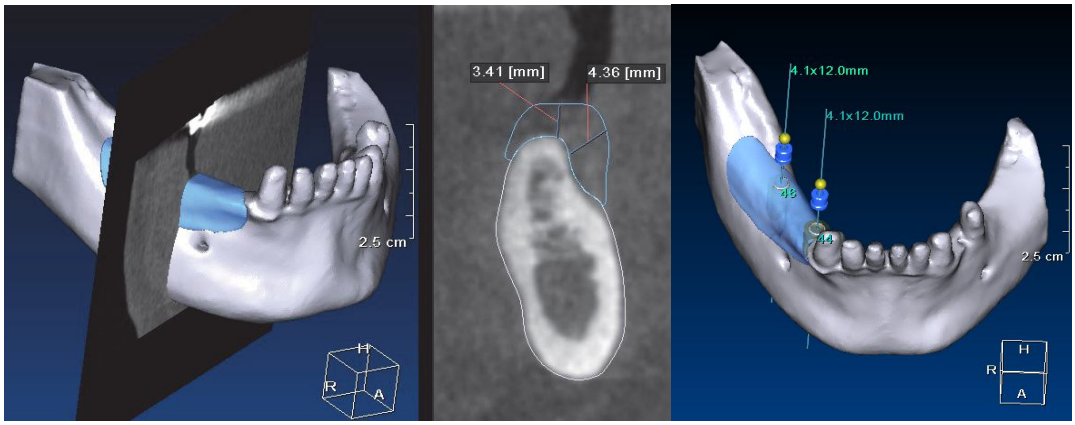


Figure 4: Analysis of geometric features of the graft and its position in the jaw in relation to the implants performed in OnDemand3D software [2]

During the process of designing the graft model, it is important to consider the technology that will be used for the graft manufacturing. Although the additive manufacturing is entering this field as well, cutting is the main technology presently used for custom-made grafts fabrication. Presence of undercuts and the minimum graft thickness are among the most important technological parameters to be considered during this process. Cross-sectional graft thickness can seriously disturb its mechanical properties and consequently endanger the final implantation result. Reduction of mechanical properties is directly associated with the porosity of graft material. Thus, graft placement into the jaw might be compromised by potential breakage of the graft while positioning and fixing it with appropriate screws. Considering the previous, performing the CAE analysis before the fabrication, primarily FEM analysis [5], is of high importance as by this step some potential serious problems can be avoided (Figure 5).

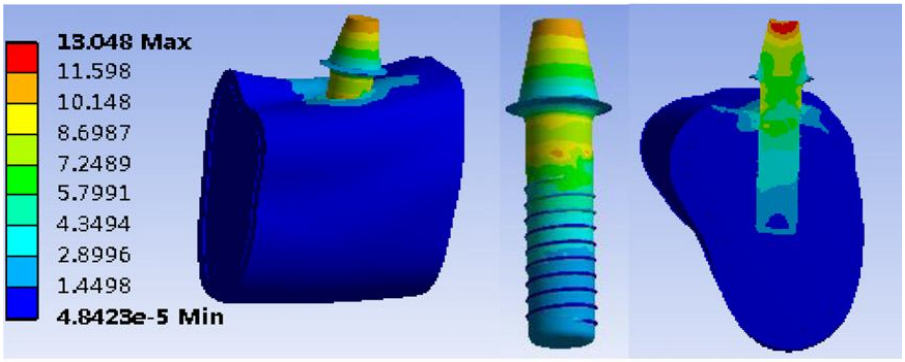


Figure 5: Example of FEM analysis [5]

After virtually satisfying both esthetic and functional requirements, the physical graft model can be manufactured along with the mandible by applying the 3D printing, i.e. rapid

prototyping technology. The printed physical 3D models of the graft and mandible enable oral surgeons to exercise and plan the operation procedure (Figure 6). Moreover, this step can be taken as the last inspection step prior to fabrication, in which identification and elimination of some potential problems, not visible in the virtual 3D model, can be performed.

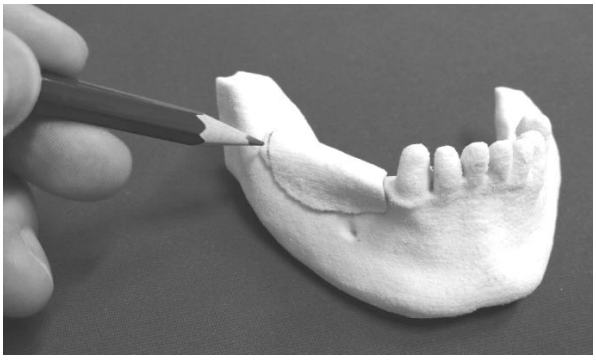


Figure 6: Assembled 3D printed models of the mandible and the graft [2]

Fabrication of the bone grafts

After the required modifications and corrections of the 3D model have been completed, the CAM step can be proceeded with. Within this step, the control program for CNC cutting machine tools is created virtually based on a CAD model. Considering the free-form shapes of the graft models, 5-axis CNC machine tools are practically indispensable in cases of grafts fabrication (Figure 7a). The CNC program comprises of technological parameters (tool paths, cutting depth, operating speeds etc.) that have to be defined according to the particular graft model, considering specific material characteristics [6]. Custom-made grafts are cut out from a pre-fabricated blocks [7, 8] (Figure 7b). After the graft has been fabricated, it needs to be sterilized according to the procedure prescribed by the material producer.

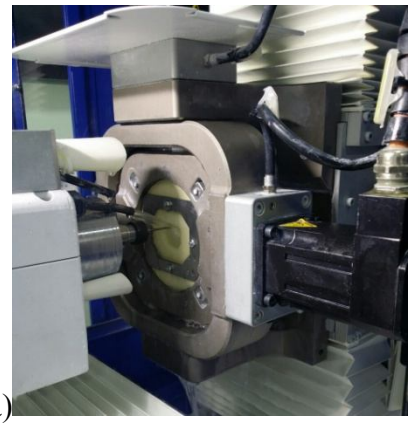
a)  b) 

Figure 7: 5-axis CNC machine tool (a), pre-fabricated graft blocks (b)

Conclusion

Current technological base already enables quality and effective design and fabrication of custom-made bone grafts. However, with further developments in the field of artificial bone materials, in the one hand, and of engineering systems for design and fabrication, in the other hand, more intensive application of this approach can be expected.

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NORWEGIAN NATIONAL PROTOCOL FOR TREATMENT OF TMD – DISORDERS OF THE TEMPOROMANDIBULAR JOINT AND MASTICATORY MUSCLES

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Abstract:
The goal of designing the national protocol of treatment is to create recommendations up to the highest standards and decrease undesirable variability in the treatment of patients with TMD. The national protocol of treatment of TMD is a clinical guide for healthcare practitioners. In this paper we shall present and briefly elaborate on the methodology of the protocol design and methods of treatment of TMD.
In most cases, TDM symptoms are rarely signs of a serious disease. Most TDM patients' condition improves significantly without any therapy, or with simple therapy involving information on the disorder and exercises. If there is a need for therapy, it should be individually adjusted, conservative and reversible.

Introduction:

TMD-temporomandibular dysfunction is a common term for a number of disorders related to the temporomandibular joint and the surrounding soft tissue structures. The most common TMD diagnoses are myalgia, arthralgia, disc displacement without reduction, disc displacement with reduction, TMD related headache, mandibular joint degenerative changes and hypermobility.

TMD usually affects adults between 25 and 40 years of age, and is most common in women. The prevalence is 3-15% in the entire population. Although the prevalence is high, the need for treatment is much lower, because the symptoms subside even without therapy. It is estimated that only about 5% patients require treatment.

TMD etiology is not fully understood, but there are several potential local and etiological factors that may cause or deteriorate TMD. Causes most commonly identified in the literature include traumas, parafunction, occlusion, psychosocial condition, genetic factors and inflammation processes.

The biomechanical model of the occurrence of chronic disorders of the locomotor system is today replaced by the biopsychosocial model. The biosocial model is also used for the explanation of the occurrence and therapy of TMD.

The goal of designing the national protocol of treatment is to create recommendations up to the highest standards and decrease the undesirable variability in the treatment of patients with TMD. The national protocol of TMD treatment is a clinical guide for healthcare practitioners and it includes recommendations for examination, diagnostics, treatment (with temporal aspects of certain treatment methods), follow-up checkups and prioritization of patients. Due to the limited number of pages, in this paper we shall only present the methodology of protocol design and briefly describe the methods of temporomandibular joint and masticatory muscles treatment.

Materials i methods:

In the designing of the national protocol of treatment the working group applied the methodology recommended by the Norwegian Directorate of Health. The working group identified the key issues and topics that a protocol should cover. Based on these, the questions in the PICO format (P – population, I – intervention, C – Comparison, O – Outcome) were formulated for the current treatment methods. On the basis of these questions the librarian undertakes search in Ovid MEDLINE, Cochrane Database of Systematic Reviews, PubMed, DARE -Database of Abstracts of Reviews of Effect. Relevant literature is reviewed and selected, primarily comprehensive articles containing meta-analysis, and then primary studies. The GRADE method (Grading of Recommendations Assessment, Development, and Evaluation) is used for the quality assessment of the literature and establishment of the scientific foundations of treatment methods. The quality of literature is classified into four levels: "High, moderate, low and very low quality". In order to design the recommendations for the treatment methods up to the highest standards, from the scientific foundation to the recommendation, the working group applied the DECIDE method (Developing and Evaluating Communication Strategies to Support Informed Decisions and Practices Based on Evidence). The DECIDE systematically implements a scientific foundation, experiences from medical practitioners and patients, adverse effects of certain methods, capacity for implementation, treatment costs and recommendations from other national protocols.

Examination and diagnostic procedures are based on the Diagnostic Criteria for Temporomandibular Disorders (DC/TMD). These criteria include two components – somatic (axis I) and psychosocial (axis II)

Discussion

Informing, counseling and exercises are recommended as the basic and primary measure in the treatment of TMD. The literature reviewed points to the positive effect of patient

informing, counseling and activity as much as other treatment methods (although no literature has been found that fulfills the methodological and statistical requirements for quality assessment). This therapy is the basis of all therapeutic methods and it gives the patient the feeling of security and control. Adequate information does not produce adverse effects.

Expertly instructed and guided exercises of mobility, strength, stretching and relaxation. The literature analyzed (low – very low quality) reports that exercises have a positive effect on the function and pain caused by TMD. There is no evidence that this method is more efficient than others or that one method of physical medicine is better than others. Exercises practiced properly have no adverse effect and may reduce the period of pain. The goal of this therapy is to promote function and relieve pain. It should be noted that some patients feel fear of moving the jaw (fear avoidance behavior).

Relaxation in the form "biofeedback, mental relaxation, mindfulness". Scarce literature in this field (low – moderate quality) indicates that this type of therapy may be an alternative, or used in combination with another type of TMD therapy. This method has no adverse effects. Biofeedback is the method which utilizes special instruments for direct feedback to the patient, e.g. about muscular tension, so the patient may practice relaxing the muscles in question. Mental relaxation involves the development of positive associations for mental and physical relaxation.

Hard occlusal splint, covering all occlusal dental surfaces. The literature reviewed (low – moderate quality) indicates that the use of occlusal splint relieves pain and that it may have lasting effects. A properly designed hard occlusal splint covering all occlusal dental surfaces has no adverse effect. The positive effect of this therapy can be expected within 4 weeks of the usage of the splint. The period of usage can be extended to 12 weeks if the effects are good. The effect of soft splint has not been well documented in the scientific literature. Soft occlusal splint is applied in adults who cannot use hard occlusal splint, or in children in order to avoid the interference with the growth of teeth or development of jaws.

Cognitive Behavioral Therapy (CBT) is a form of psychotherapy focusing on the influence of thinking how one feels and behaves. It is most commonly used in the treatment of psychological disorders such as anxiety and depression. This form of therapy is used in the treatment of persistent pain, and is usually conducted by a psychologist and a psychiatrist. KBT is recommended to persons with psychological problems alongside, or as a consequence of, persistent TMD.

The literature analyzed (low – moderate quality) reports positive effects on the function and pain in chronic TMD induced pains in adults and children. There are no known adverse effects of this form of therapy.

Selective grinding is a form of irreversible therapy and is generally not recommended in the treatment of TMD. Only in special cases if there is clear occlusal interference it may be recommended that a prosthetics specialist should assess whether this form of therapy is applicable. It is not used in acute cases or as the first recommended therapeutic method.

Acupuncture is applied as an alternative or in combination with other therapy forms in the treatment of TMD. The literature analyzed (moderate quality) points to a short-term positive effect on pain. Long-term effects are not well documented. It is recommended that acupuncture be performed by an authorized healthcare practitioner with appropriate training in the field. There are no adverse effects of this therapy.

Short-term usage of paracetamol or ibuprophen(/naproxen) in acute TMD caused pains. Paracetamol is the first choice: dosage for adults, in pregnancy and during nursing is 500-1000 mg 3 times a day; for children 15mg/kg 3 times a day. Ibuprophen or naproxen is the first choice if there is an inflammatory process (e.g. in arthrosis). The dosage of NSAIDs (ibuprophen, naproxen) depends on the type of drug and is not recommended in pregnancy.

Both paracetamol and NSAIDs may have adverse effects, the most serious complications being hepatic insufficiency (paracetamol) and risk of hemorrhages, heart or renal failure (NSAIDs). Research studies on usage of paracetamol and NSAIDs in TMD are generally very rare. There are studies (high quality) on paracetamol and NSAIDs in therapy of chronic pain, but in the treatment of TMD they are rather scarce.

Local application of NSAIDs in the form of creams or gels may be an alternative for peroral use of NSAIDs. This form of therapy can be recommended both on a short and long-term basis. The most common adverse effects are temporary local irritation and photosensitivity. The literature reviewed reports effects on pain and function in wrist arthrosis.

Certain types of antiepileptic drugs, muscle relaxants, opoids, anti-anxiety medications and antidepressants can be recommended for a brief period in the therapy of chronic TMD induced pains. All other conservative methods should be tried previously. This form of therapy should be prescribed by a practitioner experienced in chronic pain treatment. TMD is not an indication for the majority of these medications. Research studies in this field are very scarce and methodologically highly deficient. There are studies on the positive effect of tricyclic antidepressants, gabapentin and melatonin, while benzodiazepines show no more

than placebo effect. There is very little evidence that these drugs have a better effect than paracetamol or NSAIDs. Apart from addiction risks, these medications have numerous other adverse effects.

Arthrocentesis and intra-articular injection of corticosteroids or hyaluronic acid may be tried in inflammatory TMD (osteoarthritis/arthrosis). This form of therapy is a surgical procedure. Arthrocentesis involves rinsing the mandibular joint, most commonly with saline solution, followed by the injection of corticosteroid. It is always recommended to try some form of conservative reversible therapy first. The literature reviewed (low quality) indicates that this form of therapy has a positive effect on function and pain in patients with inflammatory TMD. There are no serious adverse effects of this therapeutic method.

Surgical TMD therapy: disc-repositioning, discectomy, modified ramus osteotomy, eminectomy, osteoplastic surgery and condylectomy. Before attempting a surgical procedure, it should always first be tried with a form of reversible conservative therapy. Lack of effect of conservative therapy is not in itself an indication for a surgical procedure. Surgical therapy of TMD is recommended in the cases of severely restricted function and pain. The literature reviewed (low quality) indicates that there are no major differences in the effect of surgical therapy compared to conservative therapy. The type of surgical procedure is selected by the surgeon based upon function analysis and anatomical features.

Disc dislocation is most commonly anterior, but only some patients suffer pain and decreased function. Dislocated disc is not in itself the cause of pain, although it may be a significant factor that leads to pain. The prognosis of symptomatic disc dislocation is good, as 95% patients only experience temporary disorders. Research studies on surgical disc repositioning are of low quality and highly contradictory.

Therapeutic recommendation not founded in the treatment of TMD:

Jaw orthopedics is not an indication for TMD treatment. This form of therapy is regarded as irreversible conservative therapy used in the treatment of facial and mandibular anomalies and occlusion disorders. Based on the literature (no relevant literature was found that would satisfy methodological and statistical requirements for quality assessment), there is no evidence that orthodontic therapy may prevent, treat or cause TMD. However, the treatment of major occlusal disorders may lead to the reduction of TMD symptoms.

Currently, there is no foundation for recommending the use of **botulinum toxin** in the treatment of TMD. Evidence for this form of therapy is very scarce. It can only be indicated in special cases on the basis of neurological analysis.

Research literature as regards the use of **laser (low level laser), transcutaneous electrical nerve stimulation (TENS), ultrasound, capsaicin or iontophoresis of medicaments in the therapy of TMD** is highly insufficient and the use of these methods does not seem plausible at present.

Conclusion

TMD symptoms are highly variable across patients. In most cases TMD symptoms are very rarely signs of a serious disease. Most TMD patients' condition improves considerably without therapy or with simple forms of therapy such as being informed about the disorders and exercises. If there is a need for therapy, it should be individually adjusted, conservative and reversible. If there is a need for irreversible therapy, it should be evaluated by a specialist experienced in the field of TMD.

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IMPLANT PLACEMENT IN ESTHETIC ZONE-SURGICAL CONSIDERATIONS

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Abstract

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. For that there are some rules that every implantologist should consider in order to achieve predictable results in the esthetic zone. Restorations in the anterior maxilla are clinically demanding because of the complexity of the treatment planning This article consider some of the most important facts about implant terapy in esthetic zone.

Introduction

The clinical replacement of lost natural teeth 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 anerior 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: 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 consider some of the most important facts about implant terapy in esthetic zone. Diagnostic keys like hooples tooth position, form of periodontium, biotype of periodontium, tooth shape and position of osseus crest are some intimately related to predictable periimplant esthetics.The different time of implant placement has been a topic of discussion. Post extraction implant placement in this context refers to immediate placement, early placement with soft tissue healing, early placement with partial bone healing, and late placement. A patient's gingival biotype is probably the most important aspect of planning an immediate implant [2]. A thin gingival biotype has a thin buccal plate. There is significantly more remodeling of the socket post-extraction and more soft tissue

recession, post implant placement [3]. 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 dehisciences 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 bucal to the implant. Therefoere, 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 achive 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. Apico-coronally 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 nigboring 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. In immediate implants the reference is the gingival distance of the removed teeth. 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.Choosinng 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]. Placing two implants adjacent is always a big challenge. The mean papillary height between to implants will be 3,4 mm, which is in the most of the cases insufficient to achieve an optimal esthetic result [7]. This issue can be solved by placing one implant to substitute two anterior teeth. This way it is expected to achieve a higher papilla level between an implant and a pontic (5,5mm).Several methods have been described to avoid the negative effect of an extraction like immediate implants, barrier membranes although the most suitable technique advocated to preserve the volume of the socket is the ridge preservation [8]. Lately a new technique is being described as an option to perform an immediate implant without the negative consequences of the bone remodeling after an extraction, and the rationale behind this technique is preserving a tooth fragment that will avoid the resorption that takes place after the extraction [9]. Although this technique is quiet promising we should be aware of the incoming publications about a larger follow up of this technique and the predictability of leaving a fragment inside the socket after an extraction.

Conclusion

Restorations in the anterior maxilla are clinically demanding because of the complexity of the treatment planning and high patient expecta-tions. Six months after the extraction of the maxillary incisors, soft tissue alterations can be present and bone resorption, especially horizontally,can reach almost 50%, a situation that bone preservation techniques during extraction can only partially prevent. Vertical bone deficiencies often lead to compromised esthetic outcomes. To address this problem, a variety of different hard and soft tissue grafting techniques have been suggested for both horizontal and vertical bone deficiencies. These techniques are difficult to perform and have a moderate risk of complications.

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NEW COLOR MATCHING CURRICULUM FOR DENTAL PROFESSIONALS AND STUDENTS

(from Dental Color Matcher lecture, www.scadent.org)

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Abstract

The new Color Matching Curriculum for dental professionals and students, developed by the presenter and the Society of Color and Appearance in Dentistry (SCAD, www.scadent.org), will be introduced. The lecture will emphasize color concepts and resources, methods, conditions and tools that are essential to master a plan for successful color matching in both office and dental laboratory, together with step-by-step instructions. Examples and practical suggestions will be provided, including the update on new developments on this subject. Dental Color Matcher, a color education and training online program for esthetic dentistry that has been used by dental professionals and students from 100+ countries, will be demonstrated. The lecture objectives include: UNDERSTANDING color, learning about advanced shade matching conditions and methods; contrasting dental shade guides and elaborate color-related properties of dental materials; reviewing the state of the art in tooth whitening monitoring; and learning about resources for color education and training in esthetic dentistry.

Introduction

The importance of color in esthetic dentistry

We're experiencing a boom in esthetic and cosmetic dentistry. According to a survey by the American Academy of Cosmetic Dentistry, virtually everyone believes a smile is an important social asset. Three-quarters of adults feel an unattractive smile can hurt a person's chances for career success. When asked ―what is the first thing you notice in a person's smile?" participants listed straightness, whiteness and color of teeth. On the other hand, discolored, yellow, or stained teeth were identified as characteristics that make a smile unattractive. When participants were asked what they would most like to improve about their smile, the top two desires were whiter and brighter teeth. Probably the best description of the importance of color in dentistry was offered by Dr. Stephan Bergen, one of the pioneers of esthetic dentistry:

—Color is unimportant to the physiologic success of a dental restoration, yet it could be the controlling factor in the overall acceptance by the patient.

Are we gifted for shade matching?

In reality, we are not as good in shade matching as we would like to believe. When asked to match pairs of tabs from two Classical shade guides, participants correctly matched only 50% (8 out of 16 pairs). We should keep in mind that this test was much easier than in real-life dentistry, where the exact match rarely exists! Clinical research showed that shade matching consistency by the same clinician was below 50% even under optimum conditions. When the color of natural teeth was matched using three different shade guides, the clinical acceptability of custom-made ceramic tabs made of appropriate dental ceramics ranged from 40-57%. In other words, up to 60% of tabs were clinically unacceptable.

What is color?

Color is a psychophysical sensation produced in the eye by visible light and interpreted by the brain. So we are talking about the color triplet: light source, object and observer.

A light source is any area or body that emits radiation in the visible spectra range. The light we see is always a combination of many different wavelengths. Some standard light sources are designated as A or incandescent, B, C, and D or daylight. Daylight is further subdivided/categorized into different types: D50, D55, D65 and D75.

The object interacts with light. Dependent from the material and the surface topology different portions of the light will be reflected, transmitted or absorbed. What we actually can see is the portion of light that is not absorbed by the object. Since different materials have different characteristics of absorption they exhibit different colors.

The observer is the third part of the triplet. All visual sensations are brought to the brain through the eye. The retina has two types of nerve endings, rods and cones, and these enable color perception.

Rods only record light—in other words, they see in black and white. Cones enable color vision. The three types of cones are blue, green, and red-sensitive. Visual information from the eye is then relayed to the brain where the messages from the rods and cones are interpreted.

Dimensions of color

Color is a three-dimensional phenomenon. There are various color notation systems and mathematical formulations for the three dimensions. The most popular way is the usage of value (lightness), chroma and hue.

Hue is a dimension that enables differentiation between "color families". For example, red, green, blue, yellow. Hues are placed in a closed hue circle that encompasses 360°.

Value or lightness, is a dimension that enables differentiation between light and dark colors. Value is represented as a vertical axis - pure black at the bottom and pure white at the top, with all the shades of gray in between.

Chroma is a color dimension that allows differentiation between pale and strong, weak and chromatic, that is, washed out and saturated colors. Chroma is represented as the distance from the vertical, or achromatic, axis.

CIELAB color notation system is the most frequently used for color measurements in dentistry. Achromatic coordinate L* (lightness/value), and two chromatic coordinates, a* (green-red) and b* (blue-yellow) are used to quantify color. L*a*b* values are frequently reported by color measurement instruments and they can easily be converted into value, chroma and hue.

Color of human teeth

Human teeth can be described as predominantly light, whitish-yellowish and slightly reddish. They are small and curved, with color transitions from cervical to incisal, mesial to distal, and labial-buccal to lingual. They also have variety in the thickness and translucency or opacity of the enamel and dentin. Local color characteristics, such as enamel cracks and craze lines, enamel hypoplasia, fluorosis, tetracycline staining or incisal halo, will add additional complexity to tooth color matching, communication and reproduction.

Color matching methods

Tooth color can be matched or measured by visual comparison or by utilizing shade matching instruments. Visual comparison with dental shade guides, although widely used, is subjective and to a certain extent inconsistent. Hand-held color measuring devices are objective and very helpful, but they are not widely used. Results of instrumental measurements are frequently given in corresponding shade tabs, while color differences are numerically expressed in E units, which represent the interaction of hue, value and chroma differences.

Dental shade guides

The primary requirements for good dental shade guides are logical order and adequate distribution within the tooth color space.

Three basic concepts of dental shade guides are currently present:

- VITA classical A1-D4 and Classical-keyed products, which is an empirical concept
- VITA System 3D-Master shade guides, evidence-based, scientifically grounded concept
- Others, which are proprietary concept

VITA classical A1-D4 (Classical) has been available since 1956, which probably makes it the most resilient dental product on the market. It was, and to a certain extent still is, a gold

standard for shade matching in dentistry. The vast majority of resin composites are keyed to the Classical, although huge color differences exist between some of these products and the original shade guide. The primary requirements, logical order and adequate color distribution, have frequently been listed as concerns related to the Classical.

Two tab arrangements are utilized for the Classical: The *A to D arrangement* encompasses four groups based on hue: A is red, B is yellow, C is gray, and D is reddish-gray. Within the groups, higher numbers correspond to higher chroma. The so-called value scale of the Classical represents a light to dark arrangement, from B1 (shade 1) to C4 (shade 16). The value scale is frequently used for visual monitoring of bleaching efficacy, which is expressed in shade guide units, or SGU. The SGU equals shade number (1-16) before bleaching minus the shade number after bleaching. Inconsistencies in this tab arrangement compromise findings to a certain extent.

There are three shade guides based on the VITA System 3D-Master (3D-Master): VITA Toothguide 3D-Master (Toothguide), VITA Linearguide 3D-Master (Linearguide) and VITA Bleachedguide 3D-Master (Bleachedguide). All 3D-Master shade guides have been developed based on research. According to the literature, they match the color range and distribution of human teeth the best, which means that the probability of selecting a good match will be the highest with these products.

VITA Toothguide 3D-Master was the first shade guide based on 3D-Master concept. Each tab is marked using a number- letter-number combination. The first number designates the group and represents value, with 0 as the lightest and 5 the darkest. The letter represents hue, with the letter L corresponding to yellowish, M to medium and R to a reddish hue. The final number represents chroma, with 1 being the least chromatic and 3 being the most chromatic.

Shade matching with the Toothguide requires three steps. In the first step, the lightness is determined using all tabs and the number of possible shades is reduced from a total of 29 to 2 tabs (if group 1 is selected), 3 tabs (if groups 0 or 5 are selected), or 7 tabs (if groups 2, 3 or 4 are selected). In two separate subsequent steps, chroma and hue are determined. This method can be challenging for those with little experience in tooth shade matching or with little knowledge about the physical background of the system.

VITA Linearguide 3D-Master has the same shade tabs as the Toothguide. The difference is in its design, and in its reduction of shade matching to only two steps.

A single linear scale that contains only the middle tabs from each group (0M2 to 5M2) is used in the first step. A small number of tabs with huge color differences and the familiar linear tab arrangement simplify the initial selection.

The second step is ―fine tuning within the group selected in step one, 0-1, 2, 3, 4, or 5. Many users describe the shade matching method with Linearguide as self-explanatory and user-friendly, which is the reason it is used in the Dental Color Matcher program.

VITA Bleachedguide 3D-Master is the first shade guide developed specifically for visual evaluation of tooth whitening. Whitening causes a decrease in chroma and an increase in lightness of natural teeth. With millions of people bleaching their teeth every year, the development of an adequate shade guide was greatly needed. Bleachedguide exhibits a wider color range and a more consistent color distribution, when compared to the Classical and some other products. Inclusion of very light shades complements contemporary esthetic dentistry.

Who is better: females or males, experienced practitioners/specialists or a novice?

The shade matching abilities of color-normal men and women are equal. Normal color vision, not gender, should be the criterion for choosing the person to perform shade matching. The color vision test, similar to the simulation given in our program, should be routinely administered to dental students and professionals. Color deficiency is a weakness or absence in one or more cone systems. Approximately 8% of males, that is 1 in 12 males, and 0.5% of females, or one in 200 females, are color deficient. Please note that color deficient people are not "color blind".

The literature is equivocal on the question of whether experience, that is years in practice, affects shade-matching ability. Experience is relevant, but so is the status and age of the visual organ.

Can shade matching skills improve?

When it comes to color education and training, we should not forget, as James Michener once said, “An age is called Dark, not because the light fails to shine, but because people refuse to see it.” Research on three educational and training programs to improve dentists’ color matching skills found that color matching results can be improved. Unfortunately, color education and training are not part of every dental or post-graduate curriculum. By taking the Dental Color Matcher program, you are helping to correct this shortcoming.

Shade matching conditions

Light and environment are key factors in shade matching. Ceiling light or portable light, that is, floor-, table-, or hand-held light, can be used for work with color in dentistry. When buying lamps for shade matching and reproduction in the office and lab, you should look for diffuse color corrected light, D65, D55 or similar, with a color rendering index (CRI) of 90 or greater. If this sounds complicated, ask the sales person or customer support for assistance. The recommended light intensity is 1000-1500 lux. Although the oral cavity is the

background for shade matching, the immediate surroundings, such as the patient bib and office surroundings would ideally be light gray.

Please note that this does not mean that we should have uniform and boring light gray offices and dental labs. A designated light-gray shade matching and reproduction area will be sufficient.

If portable lamps are used for shade matching, the influence of surrounding colors will be significantly reduced, especially if the ceiling light is off. If diffuse illumination is coming from the ceiling, do not forget that the patient's nose can make a shadow. A 45° angle, one- or two-directional, is recommended for floor and table light, while the viewing angle should be at 0° degrees. A 0° lighting with a 45° viewing angle is also appropriate for table light. Hand-held lights usually come with instructions on the positioning, distance and method.

A simple step-by-step outline for shade matching

Shade matching should be done by dental professionals having normal color vision. Color-deficient persons should be assisted. Tinted contact lenses/glasses should not be worn during shade matching.

First, clean the tooth whose color is to be matched, and ask your patient to remove any lipstick. If a cheek retractor is used, a clear one is preferred. Shade matching should be performed at the beginning of the appointment. Both the dentist's eye- fatigue and the patient's tooth color alteration could occur during the appointment. Observe the tooth perpendicular to its labial surface and align your eyes on the same level with the teeth. Shade matching distance should be 25-35 cm, or 10-14 inches.

Whenever possible, place the shade tabs on the same plane and with the same relative edge position as the tooth to be matched. The tab carrier should be along the tab's normal axis. When the adjacent tooth is present, tabs can be placed horizontally in between the upper and lower teeth, next to the tooth whose color is being matched. The rationale for this approach is related to the fact that an object (in our case, a tooth) placed next to an the object of identical color, might appear lighter if placed in front of it, and darker if placed behind it. Of the other hand, it might be advantageous to combine these two methods (horizontally in between the upper and lower teeth, and in front of and next to the tooth whose shade is being matched). Placing a shade tab vertically in between jaws, incisal edge facing incisal edge, would be appropriate only if the color of the incisal edges is matched – otherwise, human brain does not have ability to process mirror images; comparisons between the middle and/or gingival thirds would be influenced by the color of the incisal thirds in between them. Generally, one should determine/check tooth color in cervical, middle and incisal area given that the tab markings are predominantly related to the middle third.

A single shade matching trial should last no more than 5-7 seconds at a time. Observe a neutral gray card between trials. If case of surface texture differences, the tooth might be gently dried before shade matching, or the tab should be wet with water (tooth is already wet by saliva). Reduce the number of potential matches as quickly as possible. Separate them from the other tabs and choose the closest one or combination of shade tabs.

Translucency, gloss, surface roughness, and local color characteristics should be visualized and documented on a lab prescription accompanying digital images that include the selected shade tab/s. It is always good to verify your selection under different illuminants and different angles in order to avoid or reduce metamerism. Metamerism occurs when two colored samples appear to match under one condition but not under another.

Color matching is a comparison of our overall impression of observed objects. In other words, we cannot see lightness, chroma and hue separately. During color comparison, we see differences, not similarities, among colors. Although we can see differences in lightness, chroma and hue during tooth shade matching, these differences are mixed in a wide variety of ratios. It is quite easy, for example, to confuse an increase in chroma with a decrease in lightness. The example that all dental professionals are familiar with is related to A1 and B1 shade tabs of Classical. While B1 is considered to be the lightest shade in Classical, A1 actually has a higher value. B1 appears lighter because it is less chromatic! Therefore, frequently the best approach is simply to match the color and the best shade matching advice is SELECT THE BEST MATCH! When you must perform a dimension by dimension color matching technique, the most appropriate order is value-chroma-hue.

Once the shade is selected and agreed upon by the patient, use a high quality digital camera to take photos of the tooth and the selected shade tab aligned next to each other. In addition to keeping these pictures in the patient's record, they are very important for communication about colors. Inclusion of verbal and written instructions and custom made or modified shade tabs is very beneficial. Digital imaging enables an immediate outcome to be shared instantly by the internet, email, or a storage device.

Color matching instruments

Two instruments are presently available that facilitate work with color in dentistry: Easyshade V (VITA Zahnfabrik, Bad Säckingen, Germany) and Spectroshade Micro (MHT Optic Research, Niederhasli, Switzerland).

VITA Easyshade V is the newest generation spectrophotometer for tooth color matching, communication, reproduction and verification. The device enables quality measurement

through different mechanisms including neural network. Basic tooth shade or color by area, from cervical to incisal/occlusal third, is displayed in VITA classical A1-D4 and VITA SYSTEM 3D-MASTER shades. The instrument also indicates adequate shades for CAD/CAM materials, layered crowns, denture teeth, materials for direct fillings, and veneers. Calculation of bleach shades is an additional unique feature of this device. The Windows-based software VITA Assist and the smart phone application VITA mobile Assist enable Bluetooth communication between office and dental lab and communication with patients. According to some calculations, the savings in color matching costs using the Easyshade exceed $9,000+ per year compared to visual color matching, which is more than 4 times the price of the instrument.

SpectroShade Micro uses a digital camera connected to a LED imaging spectrophotometer that measures tooth color and indicates the closest available shade. As with Easyshade, it calculates the color difference between the natural tooth and the selected shade tab. It can analyze the color of the entire tooth. Images are saved in a patient database; together with spectral data and a link to suggested shade tabs, they can be electronically transferred.

Material-related aspect of color reproduction

Color reproduction is a combination of dental art and science. This is a topic that would require a great deal of time and space to be addressed. In a nutshell, esthetic dental materials have undergone amazing improvements related to optical properties during the last decade. Materials are now available that exhibit:

- outstanding color compatibility with natural teeth
- excellent color stability during fabrication, at placement, and after placement
- color interactions that could reduce color mismatch, such as blending and layering

However, we can still experience the of ―same hand, different outcome situation, based solely on material selection. Therefore, material selection can be a critical component for the success of a dental restoration. It requires frequent updates from professional publications, information from manufacturers, and other sources.

The future

What does the future hold? In a way, the future is now! New, improved and color-stable materials, that correspond to the color of human teeth and exhibit pronounced blending, already contribute to successful work with color and esthetic dentistry in general. Chances are good that this will change only or better.

Educated and trained dental professionals, along with affordable high-quality color matching instruments, will certainly contribute to this goal. Simply stated, the future of color and esthetic dentistry looks light and bright!

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ESTHETIC PORCELAIN RESTORATIONS

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Abstract

The use of minimal invasive treatment represents trend in modern dentistry. The treatment of teeth with prosthodontic techniques has changed considerably over the last few years. Traditional restorative protocols are considerably invasive and in most cases compromise dental structure, which often leads to loss of dental vitality and resistance. Nowadays, with the availabilty of new improved restoration materials, clinicians can approach prosthetic rehabilitation in less invasive ways.

Minimal invasive restaurations include: inlays, onlays, overlays, table tops, and veneers. The etched porcelain inlay/onlay offers three distinct advantages over comparable restorations: it is more esthetic, it restores strength to compromised teeth and it is highly conservative.

Introduction

Reconstruction of lost tooth tissue due to caries, trauma, wearing away of tooth structure (erosion, attrition, abrasion) or replacement of old tooth fillings in the posterior region can be done by multiple different procedures. There are different restaurative materials which can be used. Restorative work is the core business of dentistry. It is estimated that every year 500 million dental direct restorations are placed worldwide, of which most are composite resin restorations. As an alternative for direct restorations,indirect ceramic restorations gain popularity in restoration in posterior teeth. Due to increased esthetic demands by patients, it is likely that most indirect restorations are currently made from ceramic materials. (1)

Problems that arise from usage of composite resin for direct restoration is the bond strength between the composite resin and the tooth, the polymerization shrinkage which can jeopardize the bond with dentin, and also the delicate clinical procedures. Polymerization contraction can be overcome by improving the components of the composite material, just like the use of multiple techniques used in the application of composite resin in cavities. (2)

As an alternative for direct restauration for posterior teeth, indirect restorations are most common. Indirect restorations can be done by a technician in the laboratory by using manual or computer operated techniques (CAD-CAM), or in the dental office with CAD-CAM system which can be finished in one visit. (3)

Indirect restoration of composite resins have multiple advantages compared to direct composite fillings. Some of these advantages include: excellent marginal adaptation, decreased polymerized contraction and micro-leakage, reduced possibility of secondary caries and better control of contact points as well as easier manipulation. (3)

Due to increased esthetic demands by patients, it is likely that most indirect restorations are currently made from ceramic materials.

The concept of a porcelain inlay dates back to the end of 19.th century, when the first restorations of thos type were fabricated. The problems inherent with porcelain, such as material weakness and marginal integrity, combined with the lack of an adequate cementing medium, initially made this an unsuccessful restoration. The development of new porcelain systems,dentin adhesives, and composite resin cements have allowed these restorations to become a part of everyday rutine practice. (3)

The use of minimal invasive treatment represents trend in modern dentistry.

The treatment of teeth with prosthodontic techniques has changed considerably over the last few years.

Traditional restorative protocols are considerably invasive and in most cases compromise dental structure, which often leads to loss of dental vitality and resistance. Nowadays, with the availabilty of new improved restoration materials, clinicians can approach prosthetic rehabilitation in less invasive ways, especially in cases of severely worn teeth.

Data on the loss of vitality are limited in clinical studies on porcelain inlay/onlay restorations. Kramer and Frankenberger reported that 2% of ceramic inlays and onlays required endodontic treatment after eight years (4).Otto and Denisco reported a 7%rate of endodontic-related problems at ten years (5).

Minimal invasive restaurations include: inlays, onlays, overlays, table tops, and veneers. These restorations are highly esthetic, conservative due to the fact that they aid in the protection of healthy tooth structure as well as being long lasting.

Complete coverage all-ceramic and metal-ceramic crown preparations required the removal of 63% to 72% (by weight) of the total unprepared crown weight. Tooth preparations for ceramic veneers (porcelain laminate veneers) and resin-bonded prostheses removed 3% to

30% by weight of the crown. The preparations for all-ceramic crowns were approximately 11% less invasive than for metal -ceramic crowns (6).

For the preparation of minimal invasive restorations most of the cases finish in the enamel. Beside that these interventions are painless and the use of anesthesia is minimal (3).

Although improved new adhesives are developed, the bond strength of porcelain to enamel is still superior as compared to the bond strength of porcelain to dentine (7,8,9).

Problems associated with bonding to dentine are more complicated to resolve than those associated with bonding to enamel because of the characteristics of the dentine substrates, which include lower inorganic content, tubular structure and variations in this structure, and the presence of outward intratubular fluid movement (10).

In addition to the indication, material suitability and quality of the adhesive bond, the form and dimension of the cavity preparation can have an effect on long-term success.

Results and discussion

Porcelain inlays and onlays represent restorations which have a long term success.

Longevity reports vary between 0 and 7.5% annual failure rate (AFR)for ceramic inlays/onlays (11), while for chairside fabricated restorations (in this case the CEREC®system) this is between0.8% and 4.8% AFR (12).

The etched porcelain inlay/onlay offers three distinct advantages over comparable restorations: it is more esthetic, it restores strength to compromised teeth and it is highly conservative (3).

Clinical problems which are related to porcelain inlays/onlays are: post operative sensitivity (3 – 5% of cases)(13), fracture of the ceramic, need for endodontic treatment (2-7%) which can lead to the removal of the restorations (4,5).

Several risk factors were identified to play a role in the survival of ceramicinlays/onlays.

Three risk factors were identified as being of statistical significance: position of restoration cervical outline, use of a glass-ionomer liner, and type of adhesive.The position of the outline below or above CEJ is an obvious risk factor in clinical survival. This findings may be related to the more reliable bond to enamel compared to dentin, but also to the plain fact that restorations ending below the CEJ are generally larger,teeth are more compromised in terms of tooth substance loss, and restorations are more subject to unfavorable loading and the duration of porcelain inlay/onlay is reduced by 78% (14).

The use of a glass-ionomer cement lining resulted in a significantly higher risk for failure. On one hand, it seems that the less mechanically strong glass-ionomer liner may contribute to more deterioration of the interface and promote fracture, especially considering the very high elastic modulus of the ceramic restorations. On the other hand, the placement of such a liner may also indicate that cavities were more close to the pulp(14).

The use of the so-called gold-standard adhesives (3-step etch and rinse and two step self-etch) resulted in a better ceramic restoration outcome compared to more simplified adhesives (14).

The type of resin cements – dual-cure or only light-cure –did not affect the shear bond strength of the porcelain laminate veneer restorations (15).

Glass- ionomer cements are not recommended for cementing porcelain inlays/onlays due to the reduced hardness and strength, which can lead to fracture and loss of the retention of the inlay (16,17).

In inlays, which are precisely fit in the cavity, viscosity of the cement material has no influence on the quality of the marginal gap. Inlays which have a larger space between dentin and restoration should be cemented with composite cement of higher viscosity, which reduces the polymerization stress which increases the duration of the restoration (18).

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IMPLANT- SUPPORTED ORAL REHABILITATION FOR EDENTULOUS PATIENTS: REMOVABLE VS FIXED RESTORATIONS

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Abstract

It is well known that the number of edentulous patients world wide is large, dominantly in elderly patient group, and requires very demanding dental care and oral rehabilitation to reestablish esthetics and function, improve their life quality and social communication. The literature documentation undoubtedly confirms that implant supported or retained restorations can provide them better solution than conventional complete dentures.

The aim of this lecture is to compare different treatment options and prosthesis design to define optimal restoration protocol for edentulous patients. The key factors for successfull implant therapy are detailed diagnostic procedures and treatment planning. Through case presentations, important prosthodontic issues will be discussed. Evidence based treatment procedures and clinical experience will be used to evaluate factors influencing decision-making in treatment approaches: fixed, hybrid or mobile implant restoration. These criteria must include quality and quantity of bone available to support implants, smile line, lip and facial support, inter-arch distance, maintenance, loading protocols, occlusal and oral hygiene issues, interim restorations, esthetic and functional demands. The final decision has to be patient orientated, with applied cost/benefit ratio, rescpecting patient preference if it is not compromising the therapy outcome.

It can be concluded that all mentioned treatment options for edentualism are successfull with achieving optimal results, when indication, planning and realisation were accurate. It is suggested that the best solutions are the simplest, less invasive, involve less risk of complications and less time consuming.

Introduction

Although the incidence of edentulism is falling in Western Europe, it is still very common in our population and not exclusively seen in a group of elderly patients. The predictability of successful implant treatment introduced a new era for oral rehabilitation of the edentulous patients. There is a general agreement in the literature, that implant-supported prosthodontic management of edentulism, improves the patient's quality of life, psychological

status, social integration and therefore shoud be preferred to treatment with conventional dentures. Implant restorations provide them more comfortable solution with optimal stability and retention, efficient masticatory function, better phonetics, improved esthetics and neuromuscular control of mandibular movements. Patients are more satisfied with implant treatment option than with complete dentures, because of the increased longevity, faster adaptation, bone and soft tissue preservation.

Results and discussion

For the clinician, one of the major decisions to make is weather the patient should be restored with a fixed or removable prosthesis. The aim of this lecture is to compare the treatment options and prosthesis designs for the edentulous jows. Emphasis will be placed on individualised interdisciplinary case approach, diagnostic analyses and treatment planning. Criteria will be given to guide the practitioner in deciding whether a fixed or removable restoration should be placed. This objective will be accomplished through the review of cases, with regard to varying design considerations and factors significant for optimizing the results of implant restorations. Evidence based treatment protocols and clinical experience will be used to evaluate factors influencing decision-making in treatment approaches:

1. benefit for the patient (patient centered outcome),
2. level of difficulty (Straitforward, Advanced, Complex) according to SAC classification,
3. patient risk profile based on assesment of medical, dental, anatomic and esthetic risk factors,
4. cost effectiveness.

Contemporary implant therapy for edentulous patients follows the trend towards conservative surgery and increased use of reduced length and diameter implants. Shorter and narrower implants allow more implant placements without bone augmentation surgery, thus helping to simplify treatment and reduce patient morbidity, cost and time. Several factors affect the planning strategy: implant macro- and micro-design, size, number, location, distribution, angulation, restoration type and design, bone volume and quality. The literature yields insufficient and low quality evidence about the success and survival rates of both maxillary overdentures and fixed prostheses, with regard to the number of implants. Prosthetic guidlines will be suggested for biomechanical considerations to reduce failure rate and decrease risk for complications. Strategy would be to provide long axis implants loading**,** width reduced occlusal contour and cusps inclination compared with natural teeth in posterior

regions. It is necessary to anticipate magnitude and force direction, determined by parafunction, crown height, masticatory dinamics, gender, age, opposing dentition, arch form. Requirements for the oral hygiene maintance is cleansable design, adequate emergency profile with optimal shape of interproximal contours, avoiding overcontoured restorations.

Implant therapy of the edentulous maxilla still remains one of the most challenging restorative task, because of the number of variables that affect both the aesthetic, biological and functional aspect of the prosthesis. According to ITI SAC classification oral rehabilitation of edentulous cases with fixed restorations is concidered advanced or complexed. Patients usually prefer fixed restoration, but it should not be promised to a patient until all diagnostic criteria are evaluated. These criteria must include quality and quantity of bone available to support implants, lip line, lip and facial support, inter-arch distance, access, loading protocols, occlusal issues, interim restorations during healing and aesthetic demands. Implants should not be placed till a definitive treatment plan has been established as implant positions, number and distribution may vary depending.

Immediate loading of fixed maxillary full-arch restorations is considered complex due to a higher risk of complications during implant surgery, fabrication, delivery and function of the restoration. In situations when immediate loading of implants has not been pursued, a conventional denture will be used during healing phase. To minimize the risk of complications and uncontrolled loads on healing implants via this prothesis, implants should be placed submerged, coupled with a soft liner relieved in areas over the implants. Remaining teeth (to be replaced with the final restoration) and temporary implants, may be utilized to support the temporary prostheses. Fixed temporaries have many benefits over the removable dentures and should be explored when possible.

Implant supported hybrid restorations are one of the treatment options for edentulous cases. They require more vertical space (for the components, denture teeth and acrylic or composite veneering material, supported by metal framework), than those using PFM (porcelain-fused-to-metal) or zyrconia restorations. With former techniques, they require at least 10 to 15mm of space between restorative implant platform and occlusal plane, when the PFM restorations can be utilized in more limited spaces, with a minimum inter-arch distance of 7 to 8mm. The great advantage is that dentists can remove hybrid and screw retained fixed restorations periodically for recheck.

Unfavorable resorptive patterns of the hard and soft tissues in the maxilla can lead to limitations in the oro-vestibular implant placement. Cases with increased maxillary atrophy

and palatal implant placement could lead to restorative complications, framework fractures, poor emergency profile, inadequate lip support, interference with phonetics, more demanding oral hygiene. Attention to detailes is critical when evaluating edentulous patients for maxillary fixed restorations, as improper planning and placement of dental implants will results in compromises and higher risk of complications. In these cases the fabrication of interim prosthesis is mandatory for proper planning and esthetic analyses. The interim denture will surve as a tool to determine the patient suitability for definitive fixed restoration, for fabrication the radiographic and surgical template for ideal implant positioning from the prosthodontic point view. The height of the lip and smile line will influence the ability to hide the junction between the denture margin and soft tissues. Hard and/or soft tissue augmentation procedures, pink porcelain or resin flanges offer different scenarios for masking ridge volume deficiencies in the esthetically demending anterior maxilla.

Edentulous mandible is less challenging for oral rehabilitation than maxilla. In most cases in the lower jow, there is little esthetic risk involved, but the functional aspect is of the great importance. Cases with excessive inter-arch space often have higher incidence of technical complications, because the occlusal contacts are distant from the restoration's base support. Occlusal parafunctional habits, unfavorably AP distance and long distal cantilever extensions are associated with non-axial loading and contribute to screw loosening, screw fractures, chipping or delamination of veenered material, compromising the implant therapy outcome. According to the literature, a prosthesis cannot support a cantilever exceeding 1.5 times the anterior/posterior (AP) spread, which is the distance between the middle of the most anterior implants and the distal of the most posterior implants, without creating excessive stress on the implants or on the frame of the prosthesis (i.e., for an AP spread of 10 mm, the cantilever should not exceed 15 mm).In the mandible, in comparison with PFM restorations, hybrid prostheses will require more interocclusal space, might be bulky in oro-facial dimension, less wear resistance, repairs are more easily done, even chairside and they have a lower risk of framework distorsion during fabrication. The occlusal scheme will also have an impact on wear and the technical complications. Mutually protected occlusal concept, anterior guidance with elimination of occlusal interferences causes less wear and problems than group guidance. Except for the patients wearing dentures in both jows, where bilateral balanced occlusion and lingualized occlusion are indicated. Raising the posterior occlusal plane also helps to stabilize the weakest member of the removable prostheses, the maxillary denture.

The concept of implant overdentures has been used for many years. Their advantages versus fixed restorations are: fewer implants, less bone grafting, less specific placement, cost

decrease, easy repair and cleaning. Overdentures tend to be associated with higher rates of technical and biological compications and need more maintenance than fixed implant restorations: attachement change, relineing, new prothesis every 5-7 years, continued posterior bone lost, food impaction, prosthesis movement (Berglundh et al.2002.). Implant retained or supported overdentures are the most restorative-space demanding, especially when bar-clip retentive elements are used. Confirmed success of the Locator™ abutments, that require the least space, made them the attachment of choice in mandibular overdentures. However, suboptimal implant positioning, compromised toung space can result in comfort, functional and phonetic difficulties for the patient. Immediate loading of maxillary implants with overdentures is not recommended, in mandible Cochran et al.(2004) provided evidence that support the immediate loading of four rigidly splinted implants with a mandibular overdenture. However, it is classified as complexed and has a grater risk of complications than the use of early or conventional loading protocols.

Mandibular overdenture on two implants is very common treatment modality in everyday practice, due to its simplicity, both in surgical and prosthodontic approach, with relatively low risk for complications. Highly recommendable for elderly and patients with general health issues. Overdentures can replace the volume lost in atrophic jaws in a less invasive way than fixed restorations. The cumulative survival rate of implants placed as part of this treatment is high. Patient satisfaction levels is also good, with a positive impact on quality of life.

Conclusion is that priority should be given to those procedures that are simpler, less invasive, involve less risk of complications, and reach their goals within the shortest time frame (ITI Consensus Conference, 2008). Since the aesthetic and functional requirements and preoperative intraoral situation of each patient varies, considerable time must be spent on accurate diagnosis and planning to ensure patient desires are satisfied and predictable outcomes are achieved. Future perspectives utilizing new tehnologies 3D printing, CAD-CAM removable dentures, new materials like lithium disilicate ceramics and BioHPP, give us promising results in the short-term, but still have to prove functionality and longevity during time, and more controlled clinical studies are necessary to support these findings.

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MODERN DENTAL CEMENTS USED IN IMPLANTOPROSTHETIC DENTISTRY

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Abstract

In order to cement fixed dentures supported by the implant, there are three basic demands to be fulfilled as follows: an optimal retention (reduce the risk of decemention), passive fitting of the crowns onto the abutments (amortization of masticatory forces) and adequate removal of excess cement (reduce the risk of peri-implant caused by cement excess). The adequate retention may be achieved through a proper choice of cement in which process we should fully follow the protocol of cementation including the adequate handling of the cement and the preparation of abutment surface and the crowns. As we fill in the empty space between two stiff bonding surfaces and minimize the fitting discrepancy, the cement itself enables the crowns to passively fit onto the abutments. The removal of extra cement is the key issue in all cementation protocols. In order to access and remove the cement residue, it is highly recommendable to design individual abutments with properly positioned demarcation area that follows the contours of marginal gingiva and is positioned 1 mm below the edge at highest. The fact that 59, 6% clinical peri-implant cases are due to cement residue in peri-implant soft tissue best witnesses the importance of cement residue removal. The growing number of these complications led to a definition of a completely new disease known as *cement initiated disease – CID*.

Introduction

Implant systems are complex, highly specific combinations of either fabricated or individually designed parts that are mutually complementary and make a functional unit within the mouth cavity along with the denture.

Implant rehabilitation is an integral part of modern prosthodontics and is the best alternative for the conventional prosthodontic methods.

The first practical implantation with titanium roots in an edentulous patient back in 1965 had extremely poor results and the five-year survival was 50 % success. [1]

Despite the controversy, the following decades witnessed a successful development of implant systems. The expansion within the field over the last twenty years resulted in a 98, 6% success rate, which made the result almost ideal. [2]

A well-integrated implant serves no purpose on its own but rather as a carrier of prosthetic restaurations. Clinical practice indicates that restaurations designed on the implants may affect the success rate on five-year and ten-year follow up. There are large efforts made to define potential problems connected with prosthodontic reconstruction on implants and the prevention and minimization of potential complications. [3,4,5]

Fixation moduls of implant supported restaurations

Unlike conventional fixed prosthetic restaurations in which the crowns is attached to the tooth by using cement, the implants in implant prosthodontics provide different solutions for restauration fixation: retained screw, cementation, attachments, magnets and double crowns. What actually brought us to different solutions was an attempt to improve the passive fitting onto the implant abutments, which was crucial for the successful implant therapy. So why is passive fitting so relevant for these restaurations?

In a natural tooth, the pressure is transferred and amortized through the tooth periodontium onto the bone but in implant supported all the pressure is transferred directly onto the bone. In implantology there is a specific pressure transfer due to connection between the implant and the bone. This connection is rigid and there is no mechanism for amortization of masticatory forces. We should bear this fact in mind during the whole process of planning and design of this kind of restauration.

Cementation and retention screws are most frequently applied fixation methods. There are opposed opinions on the usage of cement and screws retained crowns on abutments as well as harsh disputes on retrievability versus aesthetics. Fixation of restauration by cementation vs screws brought disagreement among the professionals. [6,7,8,9]

Passive fitting is crucial for implant bridges. The analysis of currently available scientific papers revealed that regardless of all the efforts we cannot speak of fully passive dental restauration of screwed implants and that absolute passivity in such restaurations fixed to implant abutment is a goal we yet have to achieve within modern implantology [10,11].

Nowadays, cementation is the most frequently used method of fixation of implant-supported crowns on their abutments. Dental cement provides retention inter-surface by filling in the

space between the natural tooth and the crown or abutment and the crown and enables compensation of minor discrepancies.

Most cement used in prosthodontic is primarily designed for the purpose of crowns cementation onto the natural teeth. In previous years, the existing cements were used due to lack of cement specialized for cementation of implant abutments.

As the aesthetic prosthodontics and non-metal restaurations fixed onto titanium and ceramic abutments grew sophisticated, a need emerged for cement that would fit the aesthetic criteria. Meanwhile, implant prosthetics became a routine so the existing cements had to be adjusted to meet the needs of current trends. Hence, there were composite cements on the market to meet the needs of cementation of crowns onto implant abutments.

In implant prosthetics, cement is mostly used to connect the metal surface of abutment and the inner part of crowns unlike the natural tooth cementation in conventional prosthetics in which the enamel, dentine or restauration material replace the crown. In implant prosthetics, the decision on the cement type should focus on several factors such as surface specification, abutment shape, cement characteristics and possibility of cement residue removal. Different types of cement provide different levels of retention [12,13,14].

A seemingly routine procedure of cementation of crowns onto implant abutments proved to have been specific in different phases in comparison with the conventional prosthetics and was often the cause of many complications. Nowadays, it is an issue hectically debated on in clinical and scientific circles.

Factors that ought to be taken into account are:

- The right choice of cementation modality
- The right processing and chemical treatment of bonding surface
- The right choice of cement
- The meticulous removal of cement residue
- The regular localization of demarcation (cementation edge)

Depending on the type of selected cement and duration of fixation, there are three cementation modalities in implant prosthetics:

1. Temporary cementation
2. Semi-permanent cementation
3. Contemporary cementation

Temporary cementation modality in implantoprosthetic dentistry

Temporary cements enable retention and quick crowns stability after which the retention abates due to functional pressure and other factors that the restaurations is exposed to within the oral cavity. This type of cementation enables the practitioner to potentially remove the restaurations without a trauma and damage of the crowns, abutment or the implant.

Some features of temporary cementation used to cement crowns onto implant abutments are as follows:

- Temporary cements have different coefficients of thermal expansion in comparison with metal crown substructure and titanium abutment. As a consequence, during the change of temperature the cement contracts and expands around the metal structure which further causes abates retention
- Temporary cements display poor marginal sealing and are highly soluble in oral liquid which results in fast cement disintegration and water leakage (saliva) into the space between the crown and abutment. The result is the poor crowns retention.

Many research studies addressed the retention of restaurations fixed onto implants with temporary cements [15,16].

The usage of temporary cements in implant prosthetics has many risks. The cement losing retention is not even, and the consequences reflect in the loss of passive fitting and overloading onto the abutments. It is impossible to control retention and predict the moment in which the cement will failed. The result might be an accidental swallow or aspiration of the crowns. Indications of temporary cementation in implant prosthetics are poor and they usually refer to cementation of metal-ceramic crowns on several subsequent and parallel titanium implant abutments with a good crown fitting.

Temporary cementation of completely ceramic crowns is not recommendable due to high risk of faucet ceramic breakage up to 50%. The application of temporary cementation on short conic implant abutments is absolutely contraindicated due to high possibility of uninvited prosthetic restaurations decementation. [17]

Semipermanent cementation modality in implantoprosthetic dentistry

Retrievability is very unlikely with permanently cemented crowns. In an attempt to remove the denture from the abutment, application of force is necessary which might further cause a permanent damage of the restauration, abutment or even the implant. On the other hand, temporary cements enable an effortless crowns removal but if we consider low retention,

marginal leakage and oral liquid solubility, these cements cannot provide a long-term adequate retention and crowns stability.

In line with the aforementioned issues in implant prosthetics, a need emerged to find a solution for an adequately retained restaurations along with potential retrievability if necessary.

As a result, the market now offers temporary cements for a long-term crown cementation by major suppliers (ImProw, NobelBiocare) as well as other dental material manufacturers. Apart from the two major types of cements, temporary and permanent, there is now a third type of so-called semi-permanent cements, the design of which is currently being addressed and which might become supreme due to their characteristics. The model of semi-permanent cementation is nowadays a topic of many studies [18,19,20].

There are different modalities of conditionally contemporary cementation that are being applied in practice:

The early application of conditionally permanent cementation was accompanied by pioneer attempts to add vaseline to permanent cements ("*hand - made cements*") in order to abate retention and enable retrievability. One such retention was provisional and out of control so it was gave up on. Another attempt was to attach the conventional cement only onto the crown edge (zinc phosphate – Harvard or classical glass ionomer -Ketac Cem, Fuji I). In this attempt, the adverse marginal solubility of conventional cement was used to enable retention abatment after a certain period of time. Due to retrievability, the modality of conditionally permanent cementation is one of imperatives of modern cement systems. In line with this trend, many manufacturers of dental materials have designed specialized cements for a long-term temporary cementation, which provide an adequate retention of the restauration for 6 month up to one year.

Contemporary cementation modality in implantoprosthetic dentistry

Permanent cementation of fixed prosthesis refers to a long-term integrity of cement material despite the forces and specific conditions of the oral cavity. Poor knowledge on chemical, physical and biological features of cement materials might lead towards inadequate indications and cementation technique, which largely threatens the complete prosthetics process.

The development of cement design accompanied the development of implant systems. As the early implants were introduced, the conventional cements such as zinc phosphate and polycarboxylates were used for permanent cementation. In 1970s, the market offered the

conventional glass ionomer cements which were later improved by acrylates and were designed for cementation of prosthetic restaurations onto the natural teeth. According to different research findings, 75% of fixed prosthetic restaurations cemented with zinc phosphate lasted for twenty years [21].

In addition, comparative studies contrasting the clinical success of zinc phosphate and glass ionomer cements indicated similar low level of clinical failure for all experimental cements [22]. Due to results of these and similar studies that even compared resin cements, zinc phosphate cement had been a standard dental cement for a long time [23].

All these cements had been used with different success rates due to the lack of cements specially designed for cementation of crowns onto implant abutments.

The development of aesthetic prosthodontics and non-metal prosthetic restaurations applied onto titanium and ceramic abutments demanded new cements the aesthetics of which would fit the new trends. Meanwhile, implant prosthetics became a routine so a need emerged for the existing cements to adjust this type of dentures. The result was new composite cement on the market which was specially intended for cementation of crowns onto implant abutments.

Furthermore, retrievability is highly limited with permanently cemented restaurations. If there is a need to remove the fixed restauration from the abutment, strong force should be applied which may permanently damage the restaurations, abutment or the implant itself.

The basic advantages of permanent cementation in implant prosthetics are controlled retention and long-term stabilization as well as firm marginal fitting with resin-improved glass ionomers and composite cement. Cementation of highly aesthetic restaurations demands the usage of composite cements with highly aesthetic performance. Modern studies investigate the application of one such cement and its retention combined with different materials used for the manufacture of restaurations in the modern highly aesthetic implant prosthetics. [24,25,25,27].

Complication caused by excess cement in periimplant tissue

The difficult removal of cement residue, which may have long-term consequences in the peri-implant tissue, is a burning question.[28,29,30,31] Hence, it is necessary to strictly follow the cementation protocols.

In cases of restaurations fixation by means of cementation, individual abutments should be preferred. Hence, the crown direction, emergency profile and position of the crown edge may be optimally adjusted to each individual patient’s case. The position of the crown edge also affects the cement line position. It must be positioned up to 1 mm below the gingiva level in

order to enable the removal of cement residue and prevent peri-implantitis. There are current attempts to modify the techniques of cementation or extra-oral cementation of crowns in order to prevent cement residue in peri-implant tissue. [32]

Cement initiated disease (CID)

Over the last few years, there has been an increase in number of peri-implantitis caused by cements. Studies have shown that 59, 5% of clinical cases of peri-implantitis are caused by cement residue in peri-implant soft tissue. [33]

Doctor Bruce Houser defined the Cement Initiated Disease (CID) as an iatrogenic disease typically caused by the dental cement residue.

Cement residue is difficult to detect immediately after cementation despite the usage of rtg (two-dimensional imaging, the metal shadow of buccal and oral sides of the implant blur the cement shadow). Cement residue is a formation upon which a biofilm is formed and the dental calculus formation grows larger and the plaque continues to form. Peri-implantitis may grow into mild mucositis or even irreversible bone destruction without early symptoms.

Once the early signs of peri-implantitis are evident, the destruction is rapid and it is wrong to compare it with periodontal inflammation. First signs of periodontal inflammation are evident and are manifested through gingiva haemorrhage, which enables timely diagnosis and treatment.

In cases of peri-implantitis caused by cement residue, the bone destruction usually takes years without any symptoms. Clinical features (oedematous, red gingiva characterized with haemorrhage and suppuration) take long time to develop and bone tissue deviations are irreparable and vast. Studies have discovered that the destruction and inflammation caused by cement residue may manifest nine years after cementation.

The situation is further complicated by the fact that the modern resin-improved cements are indissoluble and their removal is rather difficult. [34,35]

The best prevention of this disease is to design individual dentures with regularly positioned cement line, strictly follow the cementation protocol and remove cement residue thoroughly.

Conclusion

Poor knowledge of chemical, physical and biological features of cementation materials and their clinical indications may lead to invalid cementation technique, which may further threaten the complete prosthetic process. Therefore, it is crucial to know the characteristics of

cement and its endurance within the oral cavity because all these facts largely affect the durability and quality of prosthetics.

A seemingly routine cementation process has proved to vary depending on different situations in comparison with conventional prosthetics and it may also cause complications. Nowadays, it is a centre of discussion in both professional and scientific circles. The right choice of cement and cementation modality, cementation protocol, individual marginal line of implant and abutment, and the adequate removal of cement residue are all factors which may prevent complication the most difficult of which is certainly periimplant cement initiated disease.

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BOOK OF ABSTRACTS

THE PREPARATION OF THE APICAL THIRD OF THE CANAL - ACHIEVING ENDODONTIC SUCCESS?

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Abstract

The success of endodontic treatment greatly depends on adequate preparation, and quality of cleaning and shaping over the entire length of the canal system, starting from the coronal to the apical segment.

The particular problem is the apical third of the canal because of the mechanical instrumentation, and chemical aspects of the preparation (irrigation), which are very difficult and limited in this part of the canal. The main reason of insufficient diameter instrumentation is the inaccessibility of this part of the canal, and therefore inadequate cleaning or inefficient removal of the smear layer.

The presence of the smear layer and debris in the apical portion of the canal has great clinical importance, because untreated canal and residual bacteria in combination with inadequate obturation represent the most common cause of endodontic failure. This layer closes the tubules and reduces the effects of irrigating solutions and adversely affects the quality of obturation.

In addition to numerous chemical agents, ultrasonic and laser techniques for removing the smear layer, a significant contribution to efficacious cleaning of the canal has been given to a new endodontic instrument, XP-ENDOFINISHER.

For proper preparation of the apical third of the canal, which includes restricting instrumentation and efficacious removal of the smear layer, the following are necessary: a correct preparation technique (crown down), implementation of adequate instruments (S apex), abundant irrigation (NaOCl and EDTA), and adequate preparation of the apical diameter (not less than ISO25).

PREVENTION OF THE ENDODONTIC TREATMENT COMPLICATIONS

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Abstract

Endodontic treatment complications are very frequent in clinical practice and they can occur in all the phases of endodontic treatment. The most important factors that provide safe and successful endodontic treatment are good knowledge of therapeutic methods and usage of adequate instruments and medicaments.

Local complications like crown perforation can be avoided with adequate access cavity and through knowledge of anatomy of cavum dentis and root canal anatomy.

The perforation of root canal at any level can be avoided with adequate access to the root canal, adequate selection and handling with endodontic instruments. Problems in canal opturation, meaning inadequate and incomplete opturation are caused by incorrect determination of the root canal length (odontometria) and inadequate preparation of root canal apical third. Previously mentioned disable application of endodontic filling materials in root canal and gutta-percha in its apical third. This compromises good apical seal.

Discoloration of the crown after endodontic treatment is caused by leaving of the necrotic parts of the pulp in the coronal cavity and by the presence of the excess endodontic filling material in the coronal cavity where it shouldn't be present. It can be caused also by some medicaments that were used during the endodontic treatment. The prevention of such complications can be done by removing all the mentioned before the final (definitive) opturation of the canal.

Complications that can affect general health of the patient are very rare (allergy on medicaments, etc.). Nevertheless we should do all the precautions for every patient. Rubber dam usage, endodontic instrument with prevention cords, through interview of the patient with information about his affinity to allergic reactions should be every day practice for every patient.

Patients with severe and chronic illnesses can have contraindication for endodontic treatment. In that case the endodontic treatment can be done only with the consent of the doctor that treats the basic illness of the patient.

MINIMAL SEDATION IN PAEDIATRIC DENTISTRY

Ivana Radović

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Abstract

The lack of adequate cooperation with a number of patients has always been a challenge for paediatric dentists. In patients with mild anxiety, the use of minimal sedation may enable easier treatments and higher quality of dental care. During minimal sedation patients are fully awake and communicative, while their protective reflexes remain unaltered. Standard methods used for minimal sedation in paediatric dentistry are oral sedation with midazolam and nitrous oxide/oxygen inhalation sedation.

Oral sedation with midazolam has many benefits. However, titration is not possible, and clinical effect of medication may not be predictable, due to individual variations in midazolam resorption. Moreover, it is not possible to increase or decrease the level of sedation, in case that is necessary.

On the other hand, nitrous oxide/oxygen inhalation sedation is associated with a number of benefits such as: proven safe and non-invasive method, easy change of concentration of the drug during the intervention or interruption of drug administration if necessary, the possibility of a precise dose titration to achieve the desired effect, rapid clinical effect, rapid elimination from the body, mild analgesic effect. The occurrence of complications is rare and is usually associated with inadequate technique and excessive sedation, which can be effectively prevented with adequate training of dentists.

It is extremely important to perform minimal sedation in conjunction with a variety of behavioral techniques. This is the only way to overcome fear and establish adequate cooperation and positive attitude toward dental care and dentist. The ultimate goal is to achieve satisfactory cooperation with the patient, so that the need for sedation in the future may be reduced or completely eliminated.

SINUS LIFT - 20 YEARS LATER

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Abstract

Sinus floor elevation is well known and clinically proven technique for improving subantral bone height necessary for implant placement with adequate stability. Two surgical approaches are in use: lateral window and crestal – osteotome technique. Treatment plan and the decision, to apply the one or the two-stage techniques are based on the amount and quality of residual bone available and the possibility of achieving primary stability for the inserted implants.

The intentions of this lecture were to assess the survival rate of grafts and implants placed with sinus floor elevation. The frequency and distribution of two approaches were compared. Implant placements were evaluated according to implant site and Cawood – Howell classification. Contributing factors to the: success rate of grafting procedure and survival rate of inserted implants were analyzed.

CURRENT CONCEPTS IN BONE AUGMENTATION TECHNIQUES

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Abstract

Alveolar resorption and impossibility for implant-prosthetic are indications for alveolar augmentation. Insufficient bone volume may be related to factors of multiple origin. They can be classified in two categories: defects of genetic or epigenetic origin (malformations or growth abnormalities) and defects ralated to local etiological origin (dental trauma, edentulous jaw and osteoporosis). Depending on the morphology of the bone defect and the quantity of bone to be repaired determine the techniques use in oral surgery. In areas of inadequate volume of alveolar bone, bone grafting is used. Bone-graft materials are: autogenous bone, allografts, alloplasts, xenografts and their combinations. They are used for filling socket defect after tooth extraction, in parodontology, augmentation of alveolar bone and sinus lift techniques. Three different processes are associated with successful bone grafting: osteogenesis, osteionduction and osteoconduction. All bone-grafting materials possess at least one of these modes of action. Autogenous bone, also known as gold standard of grafting materials, is the only osteogenic graft material and it heals into growing bone through all three modes of bone formation. Common areas from which autgenous bone can be harvasted include intraoral sites such as mandibular shymphisis, ramus or maxillary tuborosity and extraoral sites such as the iliac crest. Platelet-rich plasma (PRP) and platelet-rich fibrin (PRF) are autologues blood- derived biomaterial that show favourable biological properties add to soft and hard tissue healing, making it convenient for use in oral, periodontal, maxillofacial and plastic surgery and otolaryngology.

COMPUTER PLANNING OF IMPLANT PLACEMENT

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Abstract

With the development of modern dentistry is also developing and its integral part, implantology, in aim of improving design and performance of the implant.The objective of development is to find implant placement technique which will have the characteristics of uncomplicated implant placement, which will not require major surgical procedures, namely to find implant placement technique which will minimize the occurrence of complications after implantation.

The appearance of computer planning the implant placement, ie place, dimensions and direction of implant placement by computer-planned and made stent, will greatly facilitate the implant placement technique as well as the minimum possible occurrence of postoperative complications.

The procedure computer-guided implantology includes:

- Making of total prosthesis with the addition of marking beads
- CBCT snapshot of a patient
- Sending DICOM files in 3D Center
- Printing of surgical stent by a 3D printer
- Placing the implant

APPLICATION OF CERAMIC VENEERES IN DENTAL PRAXIS

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Abstract:
Dental veneers are thin ceramic flakes permanently cemented to the tooth. At thoose restoratoins incisal edges and aproximal surfaces are prepared. Indications for application of theese restorations are correction of color, shape, position and closure of diastema. The main usage is in anterior segment. In a side area indiction is related to the type and kind of the patient smile. It is also an indication for making the corronar tooth fractures,loosing of enamel, correction of existing occlusal scheme. Contraindication for dental ceramic venneres are loosage of more than 50% of enamel, non vital tooth with more than 50% loosage of tooth structure, and great vertical overlap. Absolute contraindication for usage of dental ceramic veneeres are patiensts with parafuncions. Edge of veneeres should ideally be in enamel, far avay form gingiva. Interproximal preparation should be in non visible tooth area. The tooth should be prepared in three dimensions, reducing 0,3-0,9mm. It is necessary to make temporarry veneeres. Design of veneeres can be planed in many ways : wax up technique, preliminary wax design, and computer design. It is important to make an occlusal contact in tooth surface. Composite cement is using for cementation of dental ceramic veneeres. It is important to start the polimerisation of cement, and after 8 seconds , to stop polimerisation, and then continue polymerization. Dental veneers design smile, and smile design life, and their use is recommended.

MUCOGINGIVAL PLASTIC SURGERY: AN UPDATE FOR THE GENERAL DENTIST

Nikola Angelov

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Abstract

Gingival recession is a widespread clinical manifestation that can adversely affect the well-being of patient. It is commonly associated with dentinal hypersensitivity and pain, root caries, as well as esthetic anxieties. Numerous procedures and materials have been proposed to address this complaint. "Periodontal plastic surgery" or "are surgical techniques performed to prevent or correct anatomic, developmental, traumatic, or disease-induced defects of the gingiva, alveolar mucosa, or bone. The main objectives of mucogingival procedures have consequently evolved from the preservation or establishment of a band of attached keratinized gingiva to the present-day concept of endorsing periodontal condition by preventing further loss of hard and soft tissues and improving the patient's esthetic appearance. Most common surgical techniques for covering root recession will be presented in a manner that addresses the needs of the general inpractitioner, with clinical cases to illustrate the basic concepts of the root coverage. Additionally a case of "gummy smile" treated with the "lip repositioning" technique will be contrasted to the root coverage procedures. Finally, an summary of key factors for success of mucogingival procedures will be discussed.

COMPARATIVE STUDY BETWEEN 3-D PRINTING LASER-SINTERED AND CASTING COBALT-CHROMIUM ALLOY

Dragoslav Stamenković
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Abstract

Dental alloys makes very dynamic part of dentistry and changes that are happening in that area, are in fact, a reflection from a development of a technology of a basic science. Mechanical and biological characteristics of the exact same alloy a lot depends of technological processes of making that alloy into a dental restoration. Melting and casting of alloys are known for centuries, and their procedures are keeping getting better and better. Still, even the perfect mold has its own disadvantages.

Completely new approach of shaping dental alloys has removed a lot of disadvantages. Technology of selective laser melting and sintering the particles of metal powder makes a great step in modern dentistry. This technology makes great break threw in a dental world. In the West European countries, it makes a standard nowadays, and in our region, very easily and shy, it is still searching for its place.

The advantages of the sintering the particles of metal powder of Co-Cr and other dental alloys over the casting is obvious and big. In short:

1. Percision of fitting of a metal framework. With a digital impression and making a virtual model, the mistakes like shrinkage of the impression material, expansion of a dental stone, expansion of a investment msterials and shrinkage of a cast object by cooling, are avoided.
2. Sintered metal framework has bigger density and it is more compacted which gives the same or better mechanical and physical properties of the alloy.
3. According to the literature, biocampatibility of a sintered dental alloys fulfills standard DIN ENO ISO 10993, and resistance to corosion DIN EN ISO 10271/22674
4. 3-D printing laser-sintered is ecologically clean technology.

In the lecture it is described the basic principles of sintering and maked the advantages of a sintering over casting dental alloys. The lecture also gives a critical approach of selective laser melting technology and compacting dental alloys.

Introduction

Dental alloys makes very dynamic part of dentistry and changes that are happening in that area, are in fact, a reflection from a development of a technology of a basic science. Mechanical and biological characteristics of the exact same alloy a lot depends of technological processes of making that alloy into a dental restoration. Melting and casting of alloys are known for centuries, and their procedures are keeping getting better and better. Still, even the perfect mold has its own disadvantages.

Completely new approach of shaping dental alloys has removed a lot of disadvantages. Technology of selective laser melting and sintering the particles of metal powder makes a great step in modern dentistry. This technology makes great break threw in a dental world. In the West European countries, it makes a standard nowadays, and in our region, very easily and shy, it is still searching for its place.

Objective

The aim of the lecture is to describe the technology of sintering metal and point out its advantages and disadvantages compared to the technology of metal casting in dental prosthetics.

Methods

The research used the Co-Cr alloys, as follows: NP Argeloy Special (USA) for casting framework of metal-ceramic and Eosint M EOS Co-Cr alloys SP2 (Germany) for sintering metal structures of metal-ceramic restorations. Patterns of Co-Cr alloy for the casting were prepared in a conventional way (melting and casting the alloy induction current in the presence of air), while the sintering of metal carried on the apparatus 280 EOsint M German in the middle of the noble gas argon and then heat for 20 minutes at a temperature of 800^{o}C.

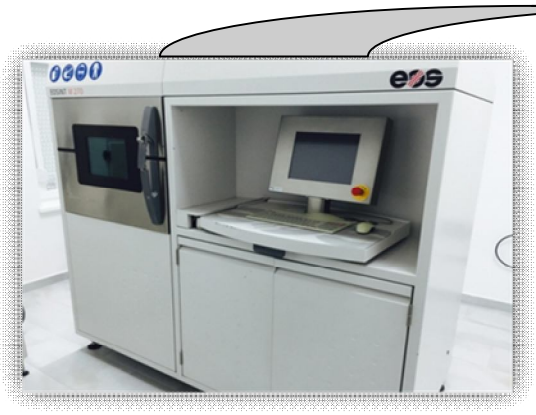

Figure 1. Device for sintering Co-Cr Alloy (EOSint M 280).

Figure 2. Laser melts and fuses the particles Co-Cr alloy on T of 1400 ° C.

The chemical composition of the alloy was determined by energy dispersive spectroscopy (EDS analysis). The mechanical properties were measured on a universal testing machine. The microstructure of the alloy samples was observed on an optical metallographic microscope and scanning electron microscope (SEM). Samples were prepared according to current standards for this type of testing.

Results and discussion

The first difference in the Co-Cr alloys which are technologically processed differently is in the form of fields delivery. Alloys for casting is in the form of solid ingot, and alloys for sintering is in the form of powder. For the sintering process is important:

- the sintering temperature and time;
- the geometry of the powder particles;
- the composition of the powder and
- the protective atmosphere in the sintering furnace.

The chemical composition of Co-Cr alloys for sintering showed the same qualitative composition, but there are differences in the quantitative composition of the alloy, namely: increased values for W, Si and O (Figure 3, Table 1).

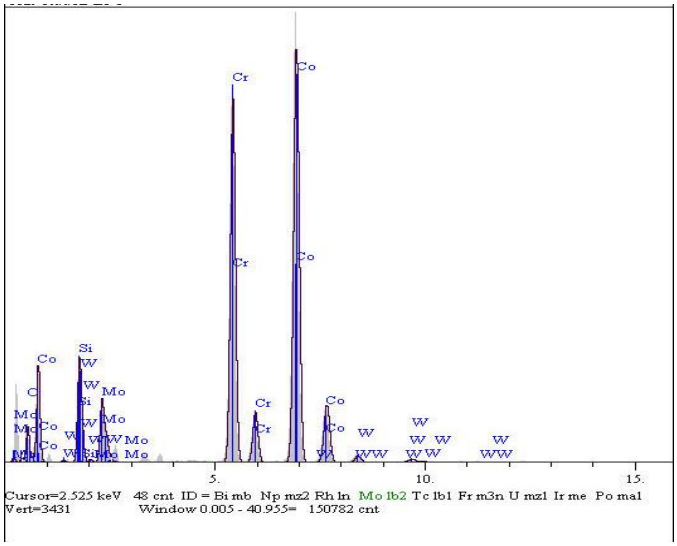

Figure 3. The results of electron dispersion spectroscopy EOS Co-Cr SP2 alloy after sintering and heat on 800°C.

Elt.	Line	Intensity (c/s)	Error 2-sig	Atomic %	Conc	
O	Ka	22.40	0.947	8.878	2.578	wt.%
Si	Ka	43.85	1.324	4.594	2.342	wt.%
Cr	Ka	404.78	4.024	27.583	26.032	wt.%
Co	Ka	511.87	4.525	54.323	58.110	wt.%
Mo	La	52.34	1.447	2.813	4.899	wt.%
W	Ma	43.78	1.323	1.810	6.038	wt.%
				100.000	100.000	wt.%

Table 1. The numerical values of the elements of electron dispersion spectroscopy EOS Co-Cr SP2 alloy after sintering and heat on 800°C.

Mechanical properties of Co-Cr alloys for sintering, before heating in the furnace at the 800°C, are showing that the tubes considerably more brittle compared to the Co-Cr alloy for casting. But after heating mechanical properties are about the same (Figure 4).

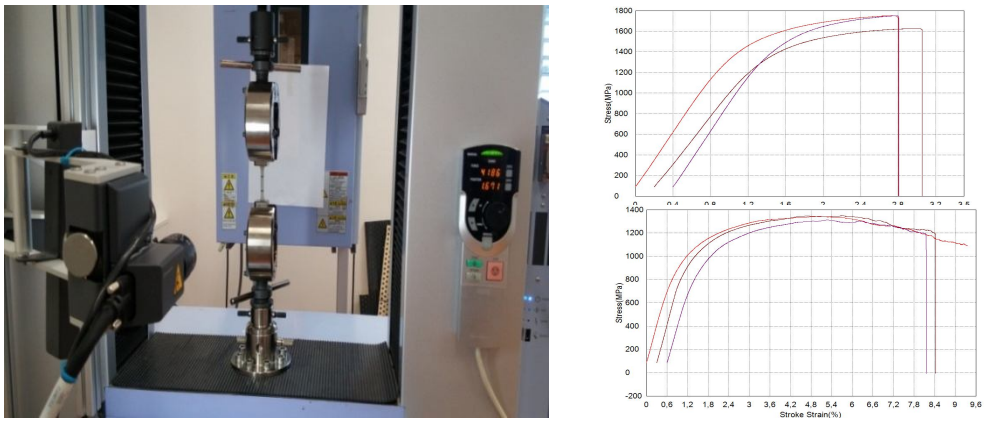

Figure 4. Universal Testing Machine and stress-strain diagram at Co-Cr alloy After sintering and after annealing in an oven at 800°C from T.

Microscopic examination of sintered Co-Cr alloy showed something more homogeneous and slightly porous structure in comparison with the Co-Cr alloy casting (Figures 5 and 6).

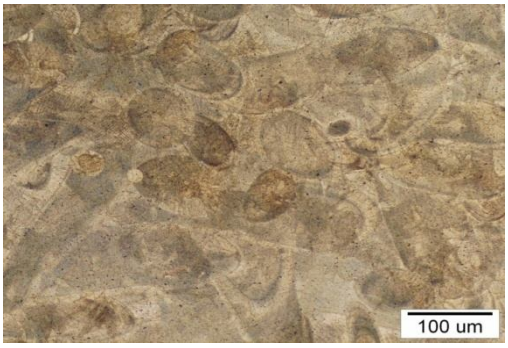

Figure 5. MM micrograph of the surface of sintered alloy.

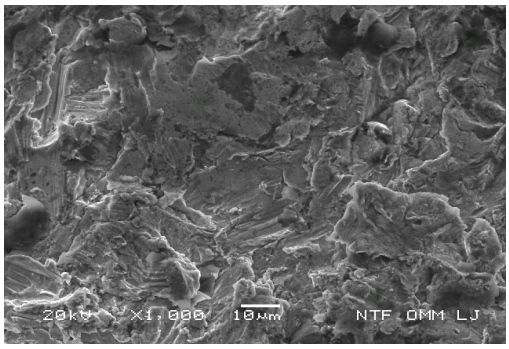

Figure 6. SEM micrograph of the surface of sintered alloy.

Conclusion

The advantages of the sintering the particles of metal powder of Co-Cr and other dental alloys over the casting is obvious and big. In short:

- percision of fitting of a metal framework. With a digital impression and making a virtual model, the mistakes like shrinkage of the impression material, expansion of a dental

stone, expansion of a investment msterials and shrinkage of a cast object by cooling, are avoided;

- sintered metal framework has bigger density and it is more compacted which gives the same or better mechanical and physical properties of the alloy;
- according to the literature, biocampatibility of a sintered dental alloys fulfills standard DIN ENO ISO 10993, and resistance to corosion DIN EN ISO 10271/22674 and
- 3-D printing laser-sintered is ecologically clean technology.

MAXILLARIS SINUS AUGMENTATION AND GRAFT VOLUME STABILITY

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Abstract

The loss of teeth in the posterior area of the upper jaw leads to resorption of the alveolar ridge and lowering the floor of the sinus maxillaris. One of the parameters for implant placement is a sufficient height of the alveolar ridge. Different treatments are used for implant placement in that area and the necessary prosthetic and functional reconstruction. Depending on alveolar ridge resorption degree and anatomical parameters of the sinus maxillaris several methods can be used for sinus augmentation. Surgical approaches and materials for sinus augmentation will be discussed.

The reduction 'shrinkage' of graft volume after sinus augmentation is known phenomenon. Changes in graft volume after augmentation can be monitored by using Cone Beam Computed Tomography (CBCT). A retrospective study shows changes in graft volume (Deproteinized Bovine Bone) over a period of 2 years after prosthetic rehabilitation.

MONOLITHIC AESTHETIC POSSIBILITIES

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Abstract

By definition "monolithic" means it is fabricated in full contour out of a single material. Traditionally crowns are made with a strong substructure of metal or zirconia. Both of these materials are very strong and virtually unbreakable. These substructures, or copings, are then veneered with a porcelain to full contour to give esthetics and function. If fabricated properly these restorations can function for many years, however they can fail due to two inherent weak spots. The interface between the coping and the porcelain veneer, and the veneering porcelain itself (90-110mpa) are both much weaker the coping itself. A monolithic crown eliminates the layer of a weaker porcelain over the crown thereby making the crown much stronger.

The two options available for monolithic crowns right now are IPS e.max, and Full Contour Zirconia restorations.

IPS e.max Lithium Disilicate is a "monolithic" glass ceramic restoration. It offers dentists improved fit, improved esthetics, and improved durability (400mpa). Metal, zirconia, resin, and conventional feldspathic porcelain still have an important role, but e.max is perhaps the most versatile and chip resistant option available. It can be "pressed" or milled using a CAD/CAM system into full contour. It has no interface, and no layered veneer. And because the ceramic ingots are blended with dentin colored and translucent ceramics, these posterior crowns match posterior dentition with slight translucency in cusp tips. They are customized with paint-on shades and then a layer of glaze for a final shine.

Full Contour Zirconia is exactly what it says, a crown made to full contour of solid zirconia. Although much less esthetic than e.max, it is far stronger (800-900mpa) and therefore well suited to withstand severe parafunctional activity. With these virtually unbreakable crowns, you can offer your patients the strength to withstand severe bruxing and avoid metal restorations. These crowns can only be made by CAD/CAM. They are milled from a block of "green" zirconia, infiltrated with a special coloring liquid and then sintered at 1500 C in a special oven. They are then customized with paint-on shades, polished, and then covered with a layer of glaze for a final shine.

Wieland Dental has recently released a high translucency zirconia block to address some of the aesthetic shortcomings of this material. The translucency of the parent material is sufficient to enhance the aesthetics of the stained and glazed crown. Wieland Dental has successfully maintained the desirable strength and biocompatibility of the original zirconia product while providing a more aesthetically pleasing final result.

The lecture will be presented indications , methods of making all-ceramic esthetic restorations through a series of clinical cases.

FROM KNIFE TO MOUSE

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Abstract

Introduction: Digital dentistry has been present in a growing number of dentistry offices and laboratories. Manual and digital manufacturing of prosthetic restauration is significantly different. Instruments and equipment change, new possibilities of using of modern materials are emerging, the way and speed of manufacturing is changing. Because of all above mentioned, it is necessary to realize that the use of digital dentistry is inevitable.

Goal: To present the possibilities and advantages of digital dentistry. To explain to new users, in a chronological order, the precise process of manufacturing by using digital dentistry. To mention the benefits, materials, indications, but also problems and mistakes that can appear, especially at the beginning of work.

The process of digital manufacturing includes:

1. Scanning – can be intraoral in the office or extra oralin the lab
2. CAD software work, opening of production order, digital preparation of model for modulation and digital modulation.
3. Work in CAM software, modulation from CAD software is prepared for milling in the machine, we choose materials and disc from which we want to do the milling. We position the object in a disc or a block, choose the strategy of milling and we do its simulation for the purpose of control.
4. Transferring to CNC software which runs the machine. By starting the software, we start the milling.
5. Cutting the milled object from the disc and implementation of the process of filtration
6. Sintering
7. Manual finalization of prosthetic restauration

Dental prosthetic prosthetic restauration made of zirconium can be produced by using several techniques.

1. Zirconium construction is faceted by faceted ceramics.

2. Zirconium construction is faceted only at vestibular side by faceted ceramics, CUT BACK technique.
3. The construction is made entirely out of zirconium, and then we do surface coloring, FULL ANATOMIC technique.

Mistakes appear at the beginning because 1) we do not know the materials (especially zirconium), 2) we do not know the software and its capabilities, 3) because of using instruments of non-reputable manufacturers and 4) because we do not stick to the defined manufacturing process suggested by the manufacturer.

Good results achieved by esthetic values of monolithic zirconium block bring to rapid sale growth.

Conclusion: The reasons for introducing digitalization In the laboratories are: the use of contemporary equipment, new materials, speedy manufacturing process, continued production of high quality prosthetic restauration, easier business operations, as well as the offer by the laboratories and the market.

ORAL PRESENTATIONS

BIOMECHANICAL APPROACH IN RESTORATIVE DENTISTRY

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Abstract
The main goal of restorative dentistry is adequate restoration of any loss of hard tooth substance in order to reestablish anatomical and functional features of teeth. Thereby, a key role for the achievement of long-term therapeutic success represents careful planning of the restorative procedure, with special attention focused on the design of cavity preparation and selection of restorative material. While planning, in addition to knowledge of the basic principles of restorative dentistry, biomechanical approach allows recognition of additional parameters that contribute to higher resistance of the remaining dental structures to unfavorable responses from the masticatory forces. This consequently ensures the preservation of the integrity of the tooth-restoration complex.

1. Introduction

In modern restorative dentistry the special importance is given to clinical procedures that favor conservation of hard tooth structure, as one of the most important factors for success of therapeutic procedure [1, 2]. For this reason, the reconstruction of extensive cavities, which are characterized by a significant loss of dental hard tissue, represents a special challenge. The main reason is that the loss of tooth structure from caries, trauma or extensive preparation, leads to a decrease in the resistance of the remaining dental structures to the masticatory forces, thus increasing the risk of fracture of the tooth and/or filling [3-7]. Accordingly, beside the restoration of the tooth morphology, implementation of an adequate restorative procedure aims to preserve the resistance of the remaining dental structures [8-10].

2. The basic principles of biomechanics in restorative dentistry

In oral environment, teeth and restorative materials are exposed to the functional and parafunctional forces. Consequently, changes in the teeth and restorations that are manifesting

in stress and strain occur. Biomechanics is a specific scientific discipline which investigates interaction of these forces with tooth structures and restorative materials, as well as the phenomena of stress and strain [11, 12].

Masticatory forces can operate at any angle and in any direction. Stress however, occurs in only two forms: normal stress and shear stress. Usually it is a combination of both. Since the occurrence of the stress is accompanied with the sequential strain (ε), according to the theory of material resistance, strain depends on the stress (Fig. 1) [11, 13].

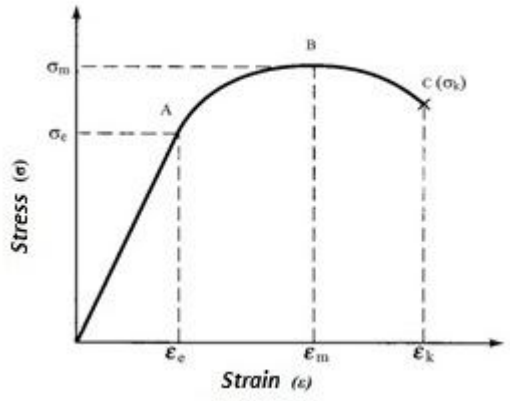

Fig. 1 Stress-strain curve

As Figure 1 shows, in the initial part of the curve (from point 0 to point A), increase of stress values is followed by the increase of strain, and this change is linearly proportional. In this area, deformation of the material is elastic, meaning that material can achieve its initial shape after the load is removed. Point A represents the elastic limit (σ_e) and it is defined as the maximum stress that a material will withstand without permanent deformation. It represents the boundary between the elastic and plastic deformation of materials. With further increase of the stress, plastic deformation occurs (part of the curve from point A to point C), which sooner or later leads to fracture (σ_k) (point C). The maximum stress that occurs in the material before the onset of a fracture is called ultimate strength (σ_m) (point B). For brittle materials (ceramics), ultimate strength and fracture strength are similar, which is why these materials fracture without large deformation. However, when selecting material for the restoration, elastic limit is more important compared to the ultimate strength, because it determines when a material will start to deform permanently.

In addition to the elastic limit, an important mechanical characteristic of the material is modulus of elasticity or Young's modulus (*E*), which represents the stiffness of a material in the area of elastic deformation [12]. The elastic properties of the material are determined by the chemical interatomic bonds. The stronger the bond between atoms is the stronger is the force necessary for their separation and deformation of the material. Thus, such a material has a higher modulus of elasticity. Therefore, elasticity of the material is only determined by the chemical structure of the material [11, 13].

3. Biomechanical characteristics of restored teeth

Intact tooth is made up of tissues that have different modules of elasticity (enamel: 48 to 84.1GPa, dentin: 13.8 to 18.6GPa) [1, 8]. While chewing, biting forces act on the broad surface of the enamel as a compression. Due to its high modulus of elasticity, the occurrence of stress is predominantly localized in the enamel, and only a smaller part of the load is transferred to the dentin, where minimal deformation occurs [4, 12]. However, a restored tooth tends to transfer stress differently, mostly as combination of compression, tension, or shear along the tooth-restoration interface. This phenomenon is especially pronounced in extensive cavities, in which it was found that one-sided loss of the marginal ridge leads to reduced fracture resistance of the teeth by 46%, while preparation of mesio-occluso-distal (MOD) cavity causes a decrease in resistance by more than 60% [3, 7]. Stress and strain in such situations, beside the modulus of elasticity, are determined by the cavity preparation design and type of restorative material [1, 4, 10, 14, 15].

3.1. Influence of cavity preparation design on biomechanical characteristics of restored teeth

Cavity preparation is a mechanical alteration of a tooth damaged by caries or trauma to receive a restorative material, in order to restore the morphological form and function of the teeth. Although the development of dental restorative materials has led to changes in the design of cavity preparation, it is still necessary to respect the basic principles to ensure the success of the therapeutic procedure: 1) complete removal of a tooth structures affected by caries lesion, 2) the inclusion of all weakened walls in preparation 3) forming a cavity shape which under the force of mastication provides adequate resistance form and prevent filling dislocation [16]. However, in addition to the above, the cavity preparation design elements

such as the cavity depth, the isthmus width and the cusp reduction must be especially considered in the planning process of the restoration of teeth, with the aim of achieving optimal biomechanical characteristics of the tooth-restoration complex.

In MOD cavities, cavity depth has the most significant influence on stress distribution [10, 14, 17, 18]. The deeper cavity is, the risk of tooth fracture is higher, which is accompanied with

the amount of loss tooth structures. Also, bending moment is higher in deeper cavities favouring breaking of the cavity walls. In contrast to the above mentioned isthmus width which is also determined by the amount of loss tooth structures, showed minimal influence on the biomechanical characteristics of the restored teeth [19-21].

Regarding the cusp reduction, traditionally it is indicated when the isthmus width is greater than 2/3 of intercuspal distance [22]. Recent research, however, showed that the thickness of the cavity walls by itself has no significant influence on the resistance of the tooth. Thus the need for this procedure remains questionable [21, 23]. Additionally, this procedure involves the removal of healthy tooth substance, which is in contrast to the current principles of restorative dentistry. However, from biomechanical point of view, a minimum cusp reduction of 1.5-2.5mm significantly changes stress distribution in the remaining tooth structure while decreasing the stress values [1, 21]. Also, cusp reduction provides the transfer of a load from the filling to the tooth in the form of compressive pressure, as is the case with an intact tooth. So, cusp reduction creates a more favorable distribution of lower stress values within the cavity walls, thus protecting the remaining tooth structures from adverse biomechanical reactions to the masticatory forces. Moreover, this contributes to increased fracture resistance of restored teeth [24].

3.2. Influence of restorative material on biomechanical characteristics of restored teeth

Continuous development and improvement of the characteristics of adhesive systems and composite resin materials, high demands of patients for aesthetic restorations, as well as the confirmed clinical longevity of these materials [25, 26], have contributed to make resin composites currently considered the materials of choice for teeth restoration. Even in cases of extensive cavity reconstruction, where fixed prosthetic could be indicated, preference should be given to conservative restoration with the use of composite resins [2, 27]. It is confirmed that this type of restoration preserves the remaining tooth substance from further preparation, a satisfactory fracture resistance of restored teeth can be accomplished, and time needed to

carry out therapeutic procedure is shorter [7-10, 28, 29]. However, due to the problem of polymerization shrinkage and subsequent appearance of stress and strain within the dental tissues; indirect composite and ceramic restorations were suggested as better solution for the restoration of extensive cavities.

The above mentioned restorative materials have different biomechanical characteristics, especially Young's modulus of elasticity. Ceramic materials have the greatest modulus of elasticity (about 90GPa) which makes them extremely rigid. Because of that, even if high stress occurs, it will display a little deformation, thus protecting the remaining tooth structure from fracture. In addition, due to its brittleness the risk of tooth fracture is minimized because the restorative material is likely to fracture before the tooth, preserving such a tooth for new restoration. Conversely, composite resins are more flexible (modulus of elasticity about 6GPa for direct restoration and 50GPa for indirect restoration). Thus, more occlusal force is transferred to the remaining tooth structure providing the higher stress and increasing the risk of unfavourable tooth fracture [3, 15].

4. Conclusions

Although modern restorative dentistry favors maximum preservation of healthy tooth substance; biomechanical approach to the restorative procedures has shown that the cusp reduction included in cavity preparation design and the use of restorative materials with higher modulus of elasticity, significantly contributes to the preservation of integrity of the remaining tooth structures, as well as achieving optimal biomechanical characteristics of the tooth-restoration complex.

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ENDODONTIC RETREATMENT

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Abstract

In the case of a failed endodontic treatment, it is necessary to re-treat the root canal. Orthograde endodontic retreatment involves removing the existing filling material from the root canal with additional cleaning, disinfection and final obturation of the canal. An important step during retreatment is to completely remove the existing filling material in order to enable access to all parts of the root canal system. However, previous studies report about the inability to completely remove obturation material from the root canal walls, regardless of the techniques or instruments used for retreatment, or the type of materials removed. The aim of a study, conducted on 120 extracted teeth was to examine the cleanliness of root canal walls after retreatment. After root canal preparation the sample was divided into two groups and obturated using two different materials (gutta-percha and resilon). Depending on the technique of removing these materials, the groups were further divided in relation to the used instruments (Hedstrom, ProTaper and Twisted File) and in relation to the use of solvents (with and without chloroform). After completing the retreatment, the roots were observed on SEM after splitting them longitudinally. Photomicrographs of each third of the canal were made at 500x, and the amount of remaining filling material was evaluated by using a grading scale. Analysis of the results indicated a higher cleanliness of canal walls after the removal of gutta-percha than after resilon removal. Rotary instruments were more efficient while removing gutta-percha, and manual Hedstrom files efficiently removed resilon. The use of solvent did not significantly affect the amount of residual material on the canal walls. Reduced cleanliness after resilon removal probably is the result of adhesive bonding of this material to the canal walls, and formation of a "monoblock". It is believed that a combination of manual and mechanical methods could result in better quality of canal walls cleaning.

Introduction

Over the years, there is a tendency to increase the success rate of endodontic treatment, however, the existence of periapical lesions in root canal treated teeth is still an often seen occurrence in everyday clinical practice. In the case of a failed primary treatment, there are three therapeutic possibilities: a) orthograde, endodontic retreatment; b) surgery, retrograde

treatment; or c) tooth extraction, as a last resort [1–3]. In most cases, the treatment of choice is orthograde endodontic retreatment and, whenever possible, this method should be favored as the most conservative [4–6]. The procedure implies removing the existing coronal reconstruction and filling material from the root canal, with additional cleaning, disinfection and final obturation.

One of the most important things during establishing the correct indications for performing endodontic retreatment is the correct diagnosis of primary endodontic therapy failure, as well as a critical assessment whether repeated therapy under given clinical conditions may result in better outcomes.

An important step during re-treatment is to completely remove the existing filling material and to enable access to all parts of the canal system, since it is known that the uncleaned and poorly obturated canal spaces are the major cause of failure [7]. Therefore, root canal materials should be easily removable in case of the need for retreatment [8]. Most often, the obturation is performed with gutta-percha in combination with a conventional sealer. Recently, resilon is proposed as an alternative to gutta-percha. It is a thermoplastic, synthetic material based on polymers of polyesters, that in combination with a sealer, adhesively bonds to the dentin of the root canal walls and leads to the formation of a "monoblock" [9, 10].

The removal of the material from the root canal can be done with various manual, engine-driven and/or ultrasonic instruments [6,11–18], and in order to facilitate the procedure, various solvents or heat can be used for softening the filling material [19,20]. Recently, an increasing number of rotary nickel titanium (NiTi) instruments are introduced on the dental market, which are specially designed for the purpose of retreatment [21,22] or which are manufactured in accordance with the latest metallurgical and technological achievements [23]. However, previous studies constantly report about the inability to completely remove material from the root canal walls, regardless of the techniques or instruments used for retreatment or the type of materials removed [24-26].

Results and discussion

An in vitro research was conducted at the department of Restorative dentistry and endodontics with the aim to determine the quality of cleaning the root canal walls after endodontic retreatment. For this purpose 120 single-rooted extracted human teeth were used, with fully formed apices and with a single, completely patent root canal. The crowns were removed by a high speed handpiece at a distance of 16 mm from the root apex. Canal preparation was done by Protaper Universal (Dentsply) rotary instruments to a size # 25 (F2) apical preparation.

One group of teeth (n=60) was obturated with gutta-percha points and an epoxy resin sealer (AHplus, Dentsply), using cold lateral compaction. In the second group, the teeth were obturated in the same manner with resilon points (RealSeal, SybronEndo) in combination with a dual-cure methacrylate sealer (RealSeal, Root Canal Sealant, SybronEndo). The quality of the root canal filling was checked using digital radiographs from two directions. In relation to the instruments and techniques used during retreatment, both groups of material were divided into three sub-groups of 20 teeth. One subgroup was desobturated using manual Hedstrom instruments and the other two subgroups using engine-driven, rotary NiTi instruments: ProTaper Universal Retreatment (Dentsply) and Twisted Files (SybronEndo). For the sequence and number of used instruments the manufacturer's instructions were respected. In each sub-group, half of the samples (n = 10) were retreated by application of solvent (total 0.15 ml of chloroform), while in the second half of the samples solvent was not used. Retreatment was considered complete when there were no visible pieces of filling material during further instrumentation and irrigation, and when the last instrument for re-preparation (# 40) has reached the working length.

The quality of cleaning of root canal walls was examined using a scanning electron microscope (JEOL-JSM-6460LV, Japan). Roots were separated by longitudinal splitting, and the selected half of the root was standard prepared for observation under SEM. Photomicrographs of the central region for each third of the canal were made at a magnification of 500x. The amount of the remaining filling material was evaluated using a scale.

Analysis of the results indicated a higher cleanliness of canal walls after gutta-percha removal than after resilon removal. Rotary instruments were more efficient while removing gutta-percha, and manual Hedstrom files efficiently removed resilon. Looking at the entire sample, ProTaper instruments left large amounts of material on the root canal walls. The use of solvent during retreatment had no significant effect on the amount of residual material. The largest amount of material was found in the apical third, regardless of the type of materials removed and regardless of the instruments or solvent used during retreatment.

The results of other researchers [25,27–30] also indicated that none of the materials could be completely removed from the root canal. Reduced cleanliness after resilon removal probably is the result of adhesive bonding of this material to the canal walls, and formation of a "monoblock" [9, 25]. The fact that the use of solvent for re-treatment had no significant effect on reducing the amount of remaining material, could be explained with the formation of a thin layer of dissolved material on the canal walls [14,31], and during re-preparation this softened

material could be additionally pressed into the dentinal tubules from where it is more difficult to remove [32]. For this reason, the effect of canal medicaments may be reduced, as well as material adaptation in the obturation phase [31]. The design and type of instruments used for retreatment affects the cleanliness of the root canal walls. It is believed that a combination of manual and mechanical methods could result in better quality of cleaning the root canal walls [25,29].

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DIAGNOSTICS OF TEMPOROMANDIBULAR JOINT DISORDERSIN EVERYDAY DENTAL PRACTICE

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Abstract

The term - temporomandibular dysfunction (TMD) encompasses a larger number of diseases of TMJ, masticatory muscles and the surrounding structures. Epidemiological studies show that 50-75 % of people in the population has some signs of the masticatory system dysfunction. TMD usually occurs between 20-40 years of age. The most important signs and symptoms of TMD are pain in the masseter muscles, TMJ, the region of the temporal muscle, limited mouth opening and sound phenomena (click and crepitus). Pain in the TMJ is the most common reason for visiting a physician.

Introduction

The diagnosis of temporomandibular joint disorders requires an adequate clinical examination and appropriate imaging technology for TMJ.

Clinical examination includes the analysis of the state of occlusal complex and functional analysis of the orofacial system. Along with the revision of the existing and the development of new protocols, it was found that a valid diagnosis of TMD requires clinical criteria applied in combination with imaging techniques, i.e. it is necessary to image TMJ by MRI or/and CT.

Development of arthrography (1944), arthrotomography (1970), computed tomography (CT) and magnetic resonance imaging (MRI) of TMJ in 1984 helped acquire new, valuable knowledge. Today, the MR imaging method represents the "gold standard" for detection of the position of the discus articularis (hereinafter referred to as disc), the presence of synovial fluid in the TMJ, and the condition of retrodiscal tissue and bone marrow signal mandibular condyle (3). MRI is non-invasive, non-contrast diagnostic method, with no presence of ionizing radiation.

The most common reason for TMJ imaging by MRI is the position and structure of the disc in patients with pain in the area of TMJ. Indications for MRI TMJ are (22): disc pathology suspecting the presence of a tumor, substantially reduced extent of mouth opening and pain that never goes away after conservative treatment.

The earliest written records that mention the problems related to the temporomandibular joint (TMJ) date back to the 5th century BC, when Hippocrates described the manual method of recovery dislocation of the mandible called " mandibular fixation "(1).A significant contribution and incentive to research in this field in 1934 was given byan otolaryngologist James Costen, who described a set of symptoms arising from TMJ, ear and sinus infections in patients with reduced vertical dimension of occlusion in jaw relationships, later called Costen syndrome (2).However, due to a poor knowledge of anatomy and physiology of TMJ, aetiology, diagnosis and therapy of these disorders was not sufficiently examined. Development of arthrography (1944), arthrotomograpfy (1970), computed tomography (CT) and magnetic resonance imaging (MRI) of TMJin 1984 helped acquire new, valuable knowledge.Today, the MR imaging method represents the "gold standard" for detection of the position of the discus articularis (hereinafter referred to as disc), the presence of synovial fluid in the TMJ, and the condition of retrodiscal tissue and bone marrow signal mandibular condyle (3). MRI is non-invasive, non-contrast diagnostic method, with no presence of ionizing radiation.

The term - temporomandibular dysfunction (TMD) encompasses a larger number of diseases of TMJ, masticatory muscles and the surrounding structures (4). Epidemiological studies show that 50-75 % of people in the population has some signs of the masticatory system dysfunction. TMD usually occurs between 20-40 years of age. The most important signs and symptoms of TMD are pain in the masseter muscles, TMJ, the region of the temporal muscle, limited mouth opening and sound phenomena (click and crepitus). Pain in the TMJ is the most common reason for visiting a physician (5).

TMD represents a significant clinical problem that affects about 5-12 % of the population (6). Besides the frequency within the musculoskeletal disorder after chronic back pain, it is the second most common condition manifested by pain and inability to work (6).

According to the Classification of the Academy of Orofacial Pain from 2008, there are three main categories of TMD: diseases and disorders of the function of TMJ (TMD or internal disorders), disorders of the function of orofacial muscles (myofascial dysfunction) and congenital and developmental disorders (7).

Internal TMJ disorders are defined as abnormal position of the disc relative to the mandibular condyle and articular eminence. Disc dislocation is the most commonly diagnosed within the internal TMJ disorders. It is believed that about 20-25 % of asymptomatic patients have confirmed disc dislocation by arthrography while about 75 % of all diseases of TMJ is disc dislocation (8, 9,10).

The only physiological movement between the mandibular condyle and disc is the rotation. The main feature of disc dislocation is the presence of translational movement between the condyle and the disc that in the normal joint does not exist. Translation happens at the beginning of opening and at the end of closing the mouth (11).

Translational movement is caused by the changed shape of the disc (usually biconvex), elongation of discal ligaments that are not elastic, and even after the elongation they retain the length and /or this happens due to chronic hyperactivity m. pterigoideus lateralis (11). Disc is most often shifted forward or anteromedially but also we find medial, lateral, and even the posterior dislocation.When the disc is dislocated forward in combination with medial or lateral dislocation, it is called anteromedial or anterolateral rotation of the disc. Moderate conditionof the disc dislocation is disc dislocation with reduction, which in some patients lead to more severe condition- disc dislocation without reduction.

The diagnosis of temporomandibular joint disorders requires an adequate clinical examination and appropriate imaging technology for TMJ.

Clinical examination includes the analysis of the state of occlusal complex and functional analysis of the orofacial system.

The analysis of the occlusal complex condition determines occlusal relations in the sagittal, frontal and horizontal planes. It involves examination of teeth and periodontal tissues, integrity and shape of the dental arches, analyzing the situation and the continuity of the occlusal plane, the occurrence of acute malocclusion and analysis of intercuspal position and relationships of teeth in different positions and eccentric movements (12).

Functional analysis of the orofacial system includes the determination of vertical dimension of occlusion, analysis of the occlusion in central and eccentric positions, palpation of the muscles and auscultation of TMJ. It is performed according to the clinical diagnostic criteria and integrated in a variety of diagnostic protocols. The most famous diagnostic protocols are: Helkimo Index (1974), Research Diagnostic Criteria for Temporomandibular Disorders- RDC / TMD (1992), and revised RDC / TMD from 2010.

Along with the revision of the existing and the development of new protocols, it was found that a valid diagnosis of TMD requires clinical criteria applied in combination with imaging techniques, i.e. it is necessary to image TMJ by MRI or/and CT (13).

Imaging methods for the diagnosis of temporomandibular dysfunction

Panoramic radiography – ortopantomogram (OPT)

The main advantage of this method is a fast display of upper and lower jaw and TMJ. OPT is not a reliable method of displaying the shape, size and position of the mandibular condyle, because the thickness of the recording layer is about 15 mm, and the distortion of the image is very common. It is also necessary that the patient opens his/her mouth to the maximum so that structure of the mandibular fossa would not superposition the condyle. This method can be used in the diagnosis of fractures of mandibular condyle and facial asymmetry, but even then it is combined with other projections or CT (14).

Tomography

Tomography superposition reduces the problem of certain structures that occurs using the OPT, and that is why it has been used for visualization of the bone structure of TMJ and early changes in the bone tissue for a long time. The coronal and sagittal applied projection was used for this purpose, especially in the case of a restricted opening mouth in TMJ ankylosis and tumors. However, nowadays, is has been replaced with CT and cone beam CT (CBCT) (15).

Computed tomography

CT and CBCT are methods used in the visualization of bony contours of the mandible and the mandibular condyle. The advantage of this method, if compared to the tomography, is a lower radiation dose and the possibility of obtaining a 3D image. The methods of choice are TMJ trauma, developmental anomalies (hypoplasia, hypertrophy, malformation of the condyles), inflammatory diseases, tumors (osteoplastic or osteolytic) and degenerative diseases (16, 17).

Arthrography

Arthrography is an invasive method that allows the evaluation of TMJ cavity and soft structure. It provides information about the position, shape and condition of the disc and allows observation of movement condylar - discal complex. The disadvantage of this method is precisely its invasiveness (injecting the needle and contrast medium into the upper and /or

lower joint space), discomfort for the patient, as well as the existence of possible complications. MRI is has completely suppressed arthrography as an imaging method TMJ (18).

Magnetic resonance imaging

MRI started to develop as a diagnostic method in 1946 when Bloch and Purcell, independently of one another described the basics which later contributed to the development of nuclear magnetic resonance spectroscopy. Lauterbur in 1973 created the first images of the phantoms using proton MRI signal (19).

MRI is based on the interaction between the hydrogen nuclei, which can be found in all body tissues, and the magnetic field generated by the MRI control system. Hydrogen nuclei, or protons, have a nonzero magnetic moment which makes them behave like a little magnets. These magnetic moments are dispersed in low magnetic field of the Earth. However, when the subject is positioned within the MRI apparatus (where the magnetic field is 10,000 times stronger than the Earth's magnetic field), the magnetic moments of protons tend to clump together in the longitudinal direction of the external magnetic field .

When the hydrogen protons are grouped in this manner, pulse field application of radio frequency (RF) is used on tissues by which we attain the energy absorption by protons. When the RF field is switched off, the protons are gradually returning to the starting position emitting the absorbed energy in the form of a radio frequency signal. The term used for denoting of the time required for protons to return to the original position is T1, or longitudinal relaxation time.

Contraindications for the use of MRI can be divided into absolute and relative. The absolute include: patients with integrated clips on aneurysms and patients with a pacemaker. Relative are ferromagnetic objects in critical regions (eyes), metal heart valves, claustrophobic and uncooperative patients, the first trimester of pregnancy, as well as patients who cannot lie during the review (20). Dental fillings, dental implants, fixed orthodontic appliances and metal prostheses are not a contraindication to imaging TMJ by MRI, because they create artifacts that can degrade image quality.

Modern appliances with strong magnetic fields of 1-3 Tesla, provide better spatial resolution and tissue (3).

The most common reason for TMJ imaging by MRI is the position and structure of the disc in patients with pain in the area of TMJ. Also, MRI allows measuring the distance

between certain anatomical structures within the TMJ. Knowing the parameters and standard dimensions of TMJ is of great importance in dentistry, especially prosthetics, orthodontics and maxillofacial surgery. Also, the results obtained using MRI give us valuable information that can be used in anthropology, paleontology and forensic medicine (21).
Indications for MRI TMJ are (22): disc pathology suspecting the presence of a tumor, substantially reduced extent of mouth opening and pain that never goes away after conservative treatment.

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THE RECOMENDATIONS FOR SELECTION OF APPROPRIATE DENTURE BASE MATERIALS

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Abstract

The lecture describes the complexity of use of denture base materials, with regard to their general characteristics, biocompatibility and mechanical properties. The first part covers the determination of strength of previously used materials, in relation to biological environment in which their function is conducted and in relation to the influence of masticatory forces which can contribute to their mechanical failure. Issues related to the testing of dental materials is described in detail and comparison is made between in vitro and in vivo methods of biocompatibility testing. The aim of the lecture is to assess and compare the degree of biocompatibility and mechanical properties of different denture base materials.

Introduction

Removable dentures are mobile dental restorations used for replacing missing teeth in patients with partial or complete edentulism. Since 1940 the main constructive material for fabrication of removable dentures was polymethylmethacrylate-PMMA (1-3). In the meantime, a lot of effort has been made in the improvement of characteristics of construction materials, affecting the composition of materials and addition of external supplements to enhance their properties. The main characteristics of dental materials can be described from three perspectives, their mechanical, esthetic and biological properties. Because esthetics of denture base materials does not differ significantly between different groups of acrylic resins, the accent of lecture will be made on the less satisfactory characteristics of the materials e.g mechanical and biological properties, based on their group affiliation.

Results and discussion

The most common method used for strengthening of PMMA is impregnation with rubber (butadiene styrene) and addition of various types of fibers. Further improvement of mechanical properties of PMMA can also be conducted by microwave irradiation, as well as

the addition of nanoparticles (4,5). Constant improvement of materials requires additional examination by the scientific community, because manufacturer is not required to state the full specification of the product, except for the components that have proven to be potentially harmful. The selection of a material and knowledge of its characteristics is necessary in order to choose the most suitable material for a given clinical situation. According to the literature, 63% of dentures fracture in the first three years of their use (6-8). Conventional procedures for construction of removable dentures include hot and cold curing acrylic resins. During polymerization process, conversion of monomers into long chains of polymers does not occur completely, leading to uneven polymerization of PMMA beads and resulting in lesser mechanical and biological properties (9). By process of diffusion, residual monomer can be gradually released into the oral cavity, which can reduce material's properties and possibly have a negative impact on health of oral mucosa. Most common adverse effects are irritation of oral mucosa and allergic reactions (10). Thus, development of new materials is mainly focused on reducing the residual monomer content, while improving ease of handling of the material. In addition, depending of the polymerization process, it is necessary to further standardize the procedures of making removable dentures, so that discrepancies in the material itself are reduced to minimal, which can lead to dentures of equal quality. Due to a complex interaction of various biological and mechanical influences in the oral cavity, predicting the behavior of the material can be enhanced by correlation of its mechanical properties. Correlation data can be used for detail examination of resin capabilities as well as to reduce testing time and cost for each specific resin (11). In relation to this, the aim of this lecture is to compare mechanical properties of acrylic resins depending on the polymerization process, using five different mechanical properties (flexural and ultimate tensile strength, elongation, fracture toughness and micro hardness). The most recent, thermoforming material is selected for comparison with the conventional systems (hot and cold curing PMMA) because according to the manufacturer, it does not contain residual monomer and polymerization process is conducted under strictly controlled conditions of the manufacturer.

The second part of the lecture will compare and evaluate different groups of acrylic resins with recommendations on the improvement of their biological properties. Biocompatibility of PMMA presents an important issue due to a known influence on health of oral mucosa and extensive use of this material. Besides dentistry, they are also used in orthopedics and cosmetics industry. Assessing the biocompatibility of a material consists of three phases that mutually overlap, from the screening procedures to the clinical trials and final evaluation of

the safety of the material. Up to date, there are about 20 different methodological procedures used for cytotoxicity assessment, which is most common method used for screening purposes (12). Problem of comparison and quantification of the results lies in the different methodological approaches, evaluation of which requires thorough analysis.

Commercial PMMA materials are considered to be safe for clinical use and can be marketed without previous investigation of biocompatibility. Current opinion is that among 5 existing groups of materials, cold curing are considered to be most toxic, but it should be noted that this depends on the composition of the material and cannot be attributed strictly on polymerization process (13,14,15). Manufacturer is obligated to state potentially toxic substances of the material, but interaction between components and their degradation products remains an issue, especially when in contact with living tissues. The incorporation of nanoparticles is a method for enhancing material's mechanical properties, with the secondary goal of maintaining its toxicity level (4). This affects polymerization process and forming of polymer chains with different internal and external structure, which is especially important when contacting underlying tissues of dentures. Alteration of material's structure can shift the balance between occurrence and releasing of potentially harmful components in oral cavity, thus adding another factor in the complex chain of mutual interactions between material's components, degradation products and living organism (2,10,16). It is expected that this could altogether affect materials toxicity, and appropriate testing should be conducted. While the benefits related to the mechanical properties have been proven, the influence of nano-modified materials on living tissues, especially the correlation between quantity of nano addition and its effect on biocompatibility of PMMA, has not been addressed.

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POSTER PRESENTATIONS

COMPOSITE RESTORATIONS BASED ON BIOACTIVE GLASS-THE FUTURE OF RESTORATIVE DENTISTRY?

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Abstract

The most common reason for replacement of dental composites in clinical practice is secondary caries on the adhesive interface of composite material with mineralized dental tissues. Marginal gap is formed because of polymerization shrinkage, specific phenomenon of all materials polymerized by free-radical activation, causing microleakage of bacteria and oral fluids toward the pulp of the tooth. Contemporary dentistry is based on finding a restorative material that posseses antimicrobial and remineralising properties in order to prolong the survival of dental composites in the oral environment.

Bioactive glass is a nanomaterial formed in laboratory conditions, often applied to stimulate regeneration of lost bone and soft tissues by inducing cell proliferation. It is composed of minerals that also naturally exist in the body-SiO_2, Ca, Na_2O, H, i P. Also, proportions of the calcium and phosphorous ions are similar to those in the human bones. Application of bioactive glass in the hydroxyapatite matrix is indicated for regeneration of periodontal osseous defects, as a bone graft to recoup alveolar bone resorption after dental extraction, as a coating material for implants, while precipitation of calcium phosphates in exposed dentin tubules decreases tooth hypersensitivity.

It was concluded that bioactive glass poseses antimicrobial effects, because of releasing calcium and phosphate ions that are toxic to bacteria and causes neutralisation of the acidic enviroment. Dental composites composed of bioactive particles have comparable mechanical properties to conventional composites. Recent studies show that adding silver and fluor particles enhances the antimicrobial effect of composite resin with bioactive glass. Adding bioactive glass to composite resins in order to extend their lifespan could significantly improve the predictability of restorative therapy with this material.

MICROMORPHOLOGICAL CHARACTERIZATION OF ADHESIVE INTERFACE OF COMPOSITE RESTORATION WITH DIFFERENT DENTIN LOCALIZATION

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Abstract

In restorative dentistry, the most frequent adherent is dentin and knowing its properties is very important for achievement the predicible adhesive bond. There are many reasons for difficult accomplishment of adhesion with dentin compared to enamel. Dentin is less mineralized, with considirable amount of colagen, hydrophilic, with low surface tension and the dentin tubules are filled with odontoblastic extensions and dentin fluid. All above mentioned have an influence on the quality of adhesive bond between composite and dentin.

Contemporary adhesive systems achieve a micro-mechanical bond with dental tissues. There are two levels for achieving the adhesive bond. First level implies forming resin microtags inside the dentinal tubules. Number, direction and diametar of dentinal tubules strongly affect the size of whole dentin surface that participates in the formation of the adhesive bond, as well as the strength of this bond. Demineralization of the anorganic component of intertubular dentin exposes the colagen fibriles to the resin, forming dentin-polymer structure known in scientific literature as hybrid layer.

The most favorable direction of dentinal tubules for achieving an adequate adhesive bond is when they are perperdincular to the walls of the cavity. On the other hand, paralel direction of dentinal tubules unavoidably leads to lower penetration of resin and formation of the low thickness hybrid layer. Adhesive bond strenght formed in such way is unpredictable, resulting in more frequent microgap formation at the composite/tooth interface, as a consequence of polymerization shrinkage. Along the microgap occurs microleakage of bacteria and oral fluid, followed by clinical manifestation in the form of postoperative sensitivity, marginal discoloration, secondary caries and irreversible changes in the pulp tissue.

VALUES OF THREE-DIMENSIONAL FUNCTIONAL SURFACE PARAMETERS OF DENTAL NANOCOMPOSITES AND THEIR INFLUENCE ON THE PROPERTIES OF COMPOSITE FILLINGS

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Abstract

During the development of industry, there was a need for improvement of surface testing methods in order to better understand the link between the real surface 3-D micromorphology and the functional properties of a surface. The analysis of areal functional surface parameters of functional parts in any industrial system of elements, is essential to understand their frictional behaviour. Oral environment is a tribological system where teeth are exposed to the cyclic mechanical, thermal, and pH changes. Considering such an environment, it can be concluded that the determination of 3-D areal texture parameters of tooth-replacing composites is of great importance for prediction and understanding of their tribological behavior during functional use.

Two representative materials were chosen for testing: nanohybrid (Filtek Z550®, 3M ESPE) and nanofilled (Filtek Ultimate Body®, 3M ESPE) which were polished by different polishing protocols (SuperSnap®, OneGloss®, DiamondDia® - Shofu). For the texture analysis the images obtained by atomic force microscopy (AFM, Veeco di CP-II) were analysed by the software packages Mountains Map® 7 and Gwyddion 2.28.

The depth histograms, volume surface parameters and watershed segmentation algorithms were calculated to describe the 3-D surface functional properties of tested specimens.

It was shown that the materials polished by multi-step polishing (MSP) had a narrower height distribution and volume surface parameters which indicated their lower wear probability. MSP system provided more isotropic and homogenous surface than a single-step system, and

it can be considered as a best polishing procedure for dental composites able to ensure their quality and durability.

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NONCARIOUS LESIONS IN CHILDREN AT THE AGE OF 14

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Abstract

INTRODUCTION: Noncariuos lesions (NCL) are defects of hard dental tissue in the area of the tooth crowns and the neck that are not caused by micro-organisms but already have been caused by mechanical and chemical agents. They are defined as abrasion, attrition and erosion, and the etiology is often multicausal.

THE AIM: To determine prevalence clinical characteristics of NCL in the population of children aged 14 years.

MATERIALS AND METHODS: The subjects were students of class VIII of Elementary school "Avram Mrazović" in Sombor. The stomatological examination covered 71 student. The examination was done in the school dental clinic by using an artificial light source, dental mirror, dental probe and syringe. Change of the type of attrition and abrasion were determined on the basis of the Index of attrition and abrasion by Richards and Brown, and change in the type of erosion are registered using BEWE index.

RESULTS: NCL on at least one tooth are registered with 98.6 % of examinees. NCL type attrition and abrasion are the most represented on the incisors (53.2 %), followed by the first molars (29 %) and canines (16 %). NCL type of erosion are registered with 8 subjects. The highest percentage are affected by vestibular surfaces of incisors and the incisal edges , while in one patient the changes registered in the vestibular cusps of the first permanent molars. Dentin sensitivity to air stimulation was not registered with any of the examinee.

CONCLUSION: Having in mind the high percentage of children with this type of damage of the teeth there is a need to pay attention to these changes in these views and consider the history any risk factors that lead to this type of damage of the teeth.

BIOCERAMIC MATERIALS IN ENDODONTICS

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Abstract

The term „bioceramics“ refers to biocompatible ceramic materials applicable for biomedical or dental use.

Endodontic applications include surgical root end filling material, root repair material, root canal sealer and pulp capping material. Bioceramic sealers are the most recent sealers composed of zirconium oxide, calcium silicates, calcium phosphate monobasic, calcium hydorxide, and various filling and thickening agents. What makes this material better from other are nano particles that exhibit exceptional adhesion to the walls of the root canal, and a strong chemical bond to dentin. Also bioceramics will not lead to inflammatory response in the periapical region. Today there are several types of bioceramic sealers, among them are ProRoot MTA (Dentsply Tulsa Dental, Tulsa,OK) , EndoSequence (ESRRM; Brasseler USA, Savannah,GA), BioAggregate (Innovative BioCeramix Inc,Canada), BioDentine (Septodont, Saint Maur des Fosses,France), ProRoot Endo Sealer (Dentsply Tulsa Dental, Tulsa,OK).

What makes this materials ideal for endodontic care is improved biocompatibility, potentially increased resistance after root canal obturation, high pH during the application that contributes a strong antibacterial effect, the ability of a good seal and easy application. Bioceramic materials have antimicrobial activity and biocompatibility similar to the MTA. Structure of bioceramic materials during mixing with water gives very good consistency, but the optimum consistency is obtained in the premixed syringes. The setting time of bioceramic sealer is three to four hours, which provide space for both surgical and conservative use. This contemporary materials have tendency to overcome the current traditional materials such as calcium hydroxide, glass-ionomer cements, composites and amalgam due to biocompatibility and because of the short setting time.

UNDESIRED CHANGES ON TOOTH ENAMEL AFTER ETCHING WITH ACID

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Abstract

By using Atomic-Force Microscopy (AFM), the changes of tooth enamel after etching with acid will be analyzed in the paper. Enamel etching causes creation of the pores into which resin or an adhesive system penetrate later. Silvestrone has established different morphological forms of etched enamel. The surface of enamel after applying phosphorous acid is demineralized in a 5–10 μm thick layer, which is the area of etched enamel. About 20 μm thick pores are created below the surface – these are the areas of qualitative pores, which are followed by the area of quantitative pores beneath, about 20 μm thick.

Besides these, there are self-etching adhesives too, that can also help achieve good adhesion. Low-viscosity monomers penetrate into the enamel surface and form a hybrid layer, as micromechanical retention, inside and around the enamel prisms. Having in mind that these structures can be seen only under a very high magnification (with an electronic microscope), this is referred to as nano-retention on enamel surface. Furthermore, the action of self-etching adhesives on the enamel surface is less aggressive compared to that of phosphoric acid, where the demineralization of the surface is 1–2 μm thick. The AFM with high lateral and vertical resolution enables examining roughness on micro and nano levels without major involvement of macroscopic components such as a wavy surface. AMF microprobe does not require any preparation of the sample and consequently, jeopardizing of the original surface. Thus it represents a direct way of experimental detecting and quantifying the surface roughness. By way of AFM, dental enamel profile treated with 35% phosphoric acid will be analyzed.

Key words: tooth enamel, atomic-force microscopy, etching with acid.

TYPES OF TREATMENS AND THEIR PERFORMANCE IN DENTAL CARE OF CHILDREN WITH AUTISM

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Abstract

Introduction: Autism is a broad term used to define multiple biological disorder that affects the brain development of children under three years of age. Autism is a developmental disorder of communication and social interaction which lasts until the end of life.

Summary: The specificity of establishing cooperation and carring out of dental procedures in autistic children resulted in a multidisciplinary project in cooperation with the school "Milan Petrovic" and the Dental Clinic of Vojvodina in order to approach and adapt children with autism to dental interventions. The methods that were used were aimed at specific autistic children both in models of behavior and the interaction: behavioral approach , models of development work and based therapeutic intervention that clearly define the specific dental procedures. A two-month collaboration with 18 users was based on the gradual establishment of a contact, in the living room of the school, through behavioral methods imagery dental procedures and dental instruments. In the next stage of cooperation methods that were used were directed to verbal communication and establish mutual trust through learning techniques of tooth brushing and dental examination. After a scenic view of the Clinic and individual preparation the children were successfully examinated at the Clinic. The visits that were later carried out was based on gradually dental interventions. Cooperation has been excellent and mutual trust has been established.

Conclusion: Using a multidisciplinary approach and the use of behavioral methods results in establishing a successfull cooperation between dentists and people with autism.

COMPARISON OF TWO GENERATION APEX LOCATORS IN TEETH WITH INCLOMPLETE ROOT FORMATION

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Abstract

Introduction: Determining the correct working length is an important step for a successful endodontic therapy. A particular challenge is to determine the working length in immature teeth with open apices, where in addition to short canals, the existence of an open apex with absence of apical constriction make the procedure more difficult. The most commonly used odontometric methods are electroodontometry and radiographic method.

Objective: To compare the accuracy of two different generation apex locators in teeth with incomplete root formation.

Method: The research was conducted at the Dental Clinic of Vojvodina, Department of Pediatric and preventive dentistry. A sample of 30 canals of young permanent teeth were selected. Inclusion criteria were: young permanent teeth with less than three years from their eruption, teeth with pulp necrosis and periapical pathology. After trepanation and establishing initial patency of the root canal, the working length was determined with Raypex (fourth-generation apex locator) and Propex (fifth generation apex locator). The criteria for a successful odontometry was the working length measured on a radiograph with a file in the canal.

Results: Values of determined working lengths with the fourth generation apex locator deviated averagely 0,927mm compared to radiographic measurements, while the values defined with the fifth generation apex locator deviated 0,856mm averagely. There is no statistically significant difference between the values measured with apex locators fourth and fifth generation.

Conclusion: Fourth and fifth generation apex locators give precise working length values in immature teeth, with a slightly higher accuracy of fifth generation apex locators.

AMELOGENESIS IMPERFECTA – THE POSSIBILITY OF CONSERVATIVE TREATMENT – CASE REPORT

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Abstract

INTRODUCTION: Amelogenesis imperfecta (AI) is a hereditary disorder of development of enamel, which includes all permanent and primary teeth with frequency of 1: 12 to 1:16000. Depending on a phase of development in which it occurs, there are three typesof AI: hypoplastic type, hypocalcified type and hypomaturation type.

CASE REPORT: Display treatment of AI on eight-year old girl I.M. Girl has hereditary disorder of developmentof enamel, hypopltastic type of AI.

MATERIALS AND METHODS: The eight-year old girl I.M. visited the Dental Clinic of Vojvodina. Clinical examination diagnosed disorderof developing enamel -hypoplastic type of AI, present in all permanent teeth. Primary teeth, most of them, were extracted. After a certain observation period, a panel of pediatric dentists at the Clinic decided to put composite veneers on the frontal teeth and GIC fillings on the first permanent molars.

RESULTS: After placing the composite veneers on front teeth we gotexcellent esthetic and functional results, the confidence of the patient significantly increased.

CONCLUSION: Patients who are suffering from AI are not aware of the seriousness of their illness at the very beginning. Also, patients are not aware of how important it is to preserve their dental tissue. In childhood (8 years), prosthetic rehabilitation is very limited. Improvement can be achieved by conservative treatment or by placing composite veneers on front teeth. The composite veneers are put on the teeth when they reach occlusal line. The cooperation of the patient with the dentist is very important for successful treatment.

THE ROOT CANAL TREATMENT IN PRIMARY TEETH

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Abstract

Introduction

Keeping the function of primary teeth requires a lot of effort in the treatment of inflamed or necrotic pulp, so the root canal treatment of milk teeth is real challenge for pediatric dentist.

Aim

The aim of this poster presentation is to show the possibilities of root canal treatment to reduce the number of early extracted primary C and E teeth.

Methodology

Pulpectomy has to be done, removal of infected pulp tissue from the root canals, irrigation and disinfection by 1% NaOCl and 2% Chlorhexidine, shaping by rotary endodontic instruments and filling root canals with $Ca(OH)_2$ + iodoform paste (Vitapex). The restoration of tooth crown in first phase could be done by GIC Triage and in second appointment by composite material.

Conclusion

The result of root canal treatment of primary canine and primary second molar is to maintain the integrity of teeth arch and to remain clinically functional till the time of replacement by permanent teeth.

CORRELATION OF BODY MASS INDEX, BODY WEIGHT AND HIGHT WITH ERUPTION TIME OF PERMANENT FIRST MOLARS AND INCISORS IN CHILDREN IN SERBIA

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Abstract

Aims and Objectives: Tooth eruption in the oral cavity occurs over a broad chronological age range and is influenced by various factors like genetics, gender, nutrition, pre-term birth, socioeconomic factors, height and weight, craniofacial morphology, hormonal factors and systemic diseases. The aim of this study was to determine the mean eruption time of permanent first molars and incisors; to compare this with Body Mass Index (BMI), body weight (BW) and body hight (BH).

Materials and Methods: 100 pre-school and school children of 'just erupted' teeth of age 5-7 years were obtained from 3 different schools and pre schools of Novi Bečej Municipality, Serbia. The inclusion criteria were: healthy children, free from any known disorder affecting growth, mental disease or congenital anomalie .Weight and height of these individuals were measured and the clinical examination of the oral cavity was done to assess the eruption status of permanent teeth. The correlation coefficient was utilized to find the correlation between BMI, BM, BH with eruption time.

Results: The correlations were determined. BMI and eruption time were found to be negatively associated. Negative association and significant correlation was observed between BM and eruption time, also between BH and eruption time.

The correlation with weight and height could be taken in account, but not the correlation with body mass index (BMI).

Conclusion: Eruption time of permanent first molars and incisors increases with decrease in BMI values, eruption time of permanent first molars and incisors increases with decrease of BM and BH values.

MANAGEMENT OF INCISOR ROOT RESORPTION CAUSED BY IMPACTED MAXILLARY CANINE. CASE REPORT

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Abstract

INTRODUCTION: Incisor root resorption associated with impacted maxillary canine is rare phenomenon which may cause severe consequences like early loss of front permanent teeth in childhood, because of that early diagnosis and treatment are imperative.

CASE REPORT: A 13-year-old girl was sent to Dental Clinic of Vojvodina with the chief problem of still missing permanent maxillary right canine. She was in the late mixed dentition period with a Class I skeletal pattern. The maxillary right canine was absent, but the maxillary right deciduous canine was still present. Panoramic radiograph revealed an impacted maxillary right canine with follicular cyst around its crown, significant apical root resorption on maxillary permanent central and lateral right incisors. Electric pulp test on both incisors was negative. Surgical, endodontic and orthodontic treatments were indicated. Surgical treatment was consisted of: removal of follicular cyst, crown deliberation of impacted canine and extraction of deciduous canine and maxillary permanent lateral right incisor. Maxillary right central incisor was endodontically treated, root filling material was MTA. On periodic radiographic examinations there was no sign of further incisor root resorption.

CONCLUSION: A panoramic radiographic screening in the period of mixed dentition is needed in early diagnosis and treatment impacted teeth in order to prevent possible consequences.

SURGICAL TREATMENT OF EXOSTOSIS ON MANDIBULAR BODY

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Abstract

Introduction: Osteoma is a benign tumor composed of mature bone tissue. It can occur on the bones, internal organs or soft tissue. When constructed out of compact bone it's called *Osteoma durum or osteoma eburneum.* If it's made of spongious bone, then it's called *osteoma spongiosum,* and if bone marrow is significantly developed then it's called *osteoma medullare*, there is also a mixed form. Depending on the localization they are divided into peripheral and central form. Exostosis is a synonym for the peripheral form.

The aim: Point out the problem that exostosis (osteoma) causes on the corpus of the mandible and show how the surgical treatment is conducted in this case.

Methodology: An 80-year-old patient has been wearing a partial acrylic denture for the past 10 years. The patient is complaining to a fracture of the denture and previous rubbing against the toothless alveolar ridge of the lower jaw on the left side. Through clinical examination a hard, painless, motionless smooth – surfaced lump is found in the region of the second premolar on the lingual surface of the left mandibular body. Radiologically - a shadow similar to bone or a little denser opaque shadow rising above the surface of the bone is visible, so suspicion of an osteoma will be pathohistologically confirmed. Osteoma treatment is surgical removal, and only if it causes interference or visible deformation as in shown case. Removal of peripheral osteoma does not represent a particular problem if you select the right approach and comply with the rules of operation on bone tissue. The use of a fiziodispenser and adequate surgical burs ensures no overheating of the bone and successful healing.

Results and Conclusion: The case is about peripheral *osteoma,* pathohistologically and in clinical vocabulary - egzostozis of the mandibular body. After removing the sutures, a repair of the denture is done with direct backing, after which it will again have stability and a good position on the jaw ridge. Osteoma relapses are very rare.

IMPACTION OF CENTRAL MAXILLAR INCISOR ASSOSIATED WITH ODONTOMA

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Abstract

An odontoma is defined as a benign odontogenic tumor made of calcificed tooth tissue. According to the level of differentiation there are two types of odontoma – those who doesn't ,and those who make dentin, enamel and cementum. Compound odontoma is less different odontogenic tumor ,and it grows very expasive, leading to the bone protrusion. The odontoma complex type is mainly made of solid tooth tissue. These tumors can occur in both the upper as well as in the lower jaw, and their evolution is slow and painless. Clinically, three types of odontomas are recognized in the literature: intraosseous (central), extraosseous (peripheral), and erupted ofontoma. Diagnosis of odontoma is usually accidental, and it is associated with late eruption of permanent teeth - the upper central incisors, and the second lower molar. The case study presents a young patient who was sent by the specialist of orthodontics for extraction of odontoma in the region of unerupted tooth 11. Intraoral examination showed the absence of the right central incisor in the upper jaw. Based on detailed anamnesis, clinical examination and analysis of panoramic radiograph , we diagnose the presence of odontoma and impaction of tooth 11. After obtaining consent, next step was surgical extraction of odontogenic tumor.

IMPACTED TOOTH ATYPICAL LOCALIZATION – CASE REPORT

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Abstract

Impacted and retained teeth are fully formed, but clinically and radiographically are not sprout at the expected place in the dental arch. And while impacted teeth cannot grow due to a mechanical obstruction, retained teeth do not growing up because of other reasons and not a mechanical barrier. Impacted and retained teeth are most often discovered incidentally by X-rays or through the clinical examination because of the presence of pain, edema or other symptoms associated with impaction and retention. Each tooth can be impacted or retained, though most often it is the third molar in the lower jaw and in the upper one, it can be the third molar or the canines, while the third most common impaction is the premolar. Of all the impactions of premolars, the most common is impacted lower second premolar, while the impaction of upper premolars is rare. This paper presents the case of a 42-year-old male patient who was sent from an ophthalmologist due to weakening of vision in the left eye to be examined for the presence of oral infection. After a detailed anamnesis, a clinical examination and analyses of orthopantomography, he has been diagnosed with the impaction of the tooth 25, and the surgical extraction of the tooth was done. According to the morphology and position, we can assume that it is probably a supernumerary impacted tooth atypically localized in the region crysta infrazygomatica.

Key words: impacted, retained, supernumerary, premolar

DIAGNOSTIC PROCEDURES IN CHILDREN WITH TEMPOROMANDIBULAR JOINT DYSFUNCTION

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Abstract

Introduction: Temporomandibular joint (TMJ) disorders in pediatric patients are increasing. Children and adolescents complain more often about pain in the region of the TMJ and seek help.

Objective: To describe the clinical diagnostic methods of determining TMJ dysfunction and determine the factors most commonly associated with TMJ disorders in the pediatric age.

Methods: The research was conducted at the Dental Clinic of Vojvodina, in the Department of Pediatric and preventive dentistry. The study included 20 children with TMJ complaints, average age 14.5 years. The analysis combined a questionnaire related to joint, muscle pain and the presence of bad habits. Extra and intraoral examinations were carried out by assessing the pattern and extent of movement of the mandible using a nonius, whereas muscle sensitivity was determined by bimanual palpation. Auscultation of TMJ sounds was conducted with a stethoscope.

Results: Clicking was observed in 40% (8/20) of the examined children and they had no complaints of subjective pain or pain during palpation. Crepitus was detected in 50% (10/20) of patients, with muscle tenderness in 80% (8/10) of children. Clicking and TMJ luxation are more common in girls than in boys. In 80% (16/20) children a presence of orthodontic anomalies was determined. The average number of occlusal contacts was 10,7. TMJ dysfunctions are more common in adolescents.

Conclusion: The results do not point out a single etiologic factor as the cause of the symptoms and signs of TMJ disorders, the complexity of the TMJ and masticatory system requires detailed analysis and commitment of dentists from early age in order to prevent further damage to these structures.

MALIGNANT TRANSFORMATION OF ORAL LEUKOPLAKIA AT ALVEOLAR RIDGE: CASE REPORT

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Abstract

Introduction: Oral leukoplakia is defined as a predominantly white lesion of the oral mucosa that cannot be characterized as any other definable lesion. Tobacco use and alcohol intake are some of the main causes of oral leukoplakia, but often the cause is unknown. It is the most common potentially malignant lesion of the oral cavity. Oral leukoplakia may appear in the form of homogeneous leukoplakia with an apparent low malignant transformation rate, or as non-homogeneous leukoplakia (erythroleukoplakia) with greater chances of malignant transformation.

Case report: A 70-year old man reported to the Department of Periodontics, Clinic for Dentistry of Vojvodina, with a chief complaint of a periodic pain in the right back region of the upper jaw for past 1 year. He had a 10-year history of tobacco and alcohol use. A physical examination revealed a 2 cm × 3 cm ulcer with indurated border on the right maxillar edentulous alveolar ridge. White well-demarcated plaque, irregular in shape, with red tissue elements was found at buccal mucosa bilaterally, upper and lower alveolar ridge, floor of the mouth, and the tongue. White lesion at left buccal mucosa contained verrucous components. The patient was immediately referred to the Clinic for Maxillofacial surgery, Clinical Center of Vojvodina, where a computed tomography scan of the head and neck was taken. Partial resection of maxilla was performed, in which the final pathological diagnosis was squamous cell carcinoma.

Conclusion: In this report, we wanted to emphasize that leukoplakia is potentially malignant lesion and that lesions of the gingiva and oral soft-tissues not healing in 2-4 weaks after trauma elimination should alert the dentist regarding the possible chances of encountering a neoplasm.

PYOGENIC GRANULOMA OF GINGIVA: A CASE REPORT

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Abstract

Introduction: Pyogenic granuloma is a reactive hyperplasia of connective tissue in response to local irritants. Intraoral it most commonly involves the tongue, lip, oral mucosa and gingiva. The gingiva is the most commonly site affected. It usually arises in response to various stimuli such as low-grade local irritation, traumatic injury, hormonal factors, or certain kinds of drugs. Pyogenic granuloma may occur at all ages but is predominantly seen in the second decade of life in young adult females.

Case report: A 13 year old systemically healthy female patient reported to Department of periodontology, Clinic for Dentistry of Vojvodina with a chief complaint of growth in the mouth involving lower left back jaw region since 6 months. The gingival overgrowth was removed in a public clinic two months back by thermocautery, however there was a recurrence and hence was referred to our department for further evaluation.

On clinical examination, a localized gingival swelling of 1cm x 1cm in size, on the interdental and attached gingiva, with clear signs of inflammation was present in relation to 36, 37. The lesion was soft in consistency and bleeding on probing was present. There were present eruption and infra-occlusion of tooth 37. The radiograph showed normal alveolar bone in the region of the growth. The blood investigation was done and was found within normal limits.

First of all, full mouth scaling was done. After reduction of the inflammation, at about 10 days, surgery was planned for excision of the lesion. The excised tissue was sent for histological examination. Based on a histological report it was finally diagnosed as a pyogenic granuloma. The patient was recalled after one and three months for a checkup and there was no growth visible clinically.

Conclusion: Pyogenic granuloma is a reactive hyperplasia/non- specific conditional gingival over growth. Diagnosis should be made with clinical and histopathological findings. Excisional biopsy with elimination of local irritations is a successful treatment option for this kind of lesion.

ASSOCIATION OF ORAL LICHEN PLANUS WITH THYROID DISEASE IN POPULATION OF VOJVODINA : A RETROSPECTIVE CASE-CONTROL STUDY

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Abstract

Intoduction. Over the last few years a novel possible association between OLP and thyroid diseases has been describe. The aim of this study was to investigate associated functional thyroid diseases in OLP patients.

Materials and methods. A total of 99 patients (74 females and 25 males, mean age 59.4 ± 13.9) with clinically and histopathologically proven cases of OLP, along with 99 age and sex matched controls without oral mucosa lesions were included in the study. This was a retrospective case-control study using data from the medical records of patients who had visited the Dental Clinic, Faculty of Medicine, between January 2007 and December 2014. Clinical characteristics of OLP lesions, presence of cutaneous LP, history of allergies, HCV infection, medical history with special regard to their thyroid and autoimmune diseases and medication intake were recorded.

Results. Significant association in prevalence of thyroid functional diseases were found (p=0.006). Thyroid gland disorders were found in 17 (17.2%) of OLP patients (14 hypothyroidism, 2 hyperthyroidism and 1 goiter or cyst), and in 4 (4%) of control subject (1 hypothyroidism, 1 hyperthyroidism and 2 goiter or cyst). Among OLP patients, the presence of coexisting autoimmune diseases was found with significance difference (p=0.013). A history of allergy was reported more frequently by the control cases (n=21) than by the OLP (n=14). HCV infection was not found in either of the study groups.

Conclusion. This study indicates connection between thyroid gland disorders (especially hypothyroidism) and OLP. There is a need for further investigations, a screening for asymptomatic OLP in woman over the 40 years old with thyroid gland disorders (hypothyroidism) or other autoimmune diseases.

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JUVENILE PERIDONTITIS IN CHILDREN – CASE REPORT

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Abstract

INTRODUCTION: Juvenile periodontitis is a specific form of periodontal disease seen in children and adolescents. Mostly it is seen in patients aged from 11-13 while rarely affects patients over 25 years. It is more frequent in females. Etiology of the disease: inheritance, immunologic predisposition, traumatic occlusion and general conditions (blood disorders, endocrine disorders and hypovitaminosis)

CASE REPORT: Patient aged seven was reffered to the clinic with a chief complaint about bleeding while toothbrushing.

During clinical evaluation gingival inflammation was observed together with supra and subgingival concrements, periodontal pockets with depth ranging from 2-3mm on first permanent molars and lower permanent incisors, tooth loosening from 2-3mm (GI:2,25, PI:1,80, AL:1,5, PD:3, TLI:2,25). X-ray analysis revealed oblique resorption of interdental bone septum in lower incisors.

Treatment included procedures that have been used in 4 year observation period. Initial therapy included sanation of inflammation by root planning, scaling and application of systemic antibiotics. During first year of therapy causative therapy had been administered in 3 month intervals. For adequate jaw relationships achievement we indicated also orthodontic treatment with formation of individual preventive and prophylactic programme. 4 years after initial diagnosis had been obtained the treatment protocol is focused on the maintaining the results of therapy (GI:1, PI:0,5, AL:0,5, PD:1, TLI:0,5–1), regular check-ups and re-motivation of patient for oral hygiene maintenance.

CONCLUSION: Juvenile periodontitis is one of the most severe disorders of peridontal tissue due to inability of its good control and prevention of tooth loss. Adequate treatment of the disease is possible only if it is discovered while in early stages.

PERIODONTOLOGY– PROSTHETIC APPROACH IN THE COMPROMISED FRONTAL REGION ESTHETIC THERAPY

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Abstract

INTRODUCTION

Rehabilitation of the patients with damaged function and esthetics of the frontal region teeth, as well as the surrounding soft tissue, often requires a multidisciplinary approach. Realization of an optimal rehabilitation in such conditions represents a challenge for a clinician.

AIM OF THE WORK

The aim of the work is to emphasize the importance of a multidisciplinary approach of the clinical doctors in achieving a full rehabilitation of the patient's smile by correction of the tooth morphological aspects and the surrounding soft tissue architecture.

MATERIAL AND METHOD

It was presented a case of a 39 years old female patient with established compromised frontal region teeth esthetic, manifested by a disturbed symmetry and harmony of the dental arch, lack of the 23 tooth, teeth discoloration and large composite fillings. Red esthetics was compromised by low vertical incisal-gingival length of clinical crowns on central and lateral incisors, as well as by inferior position of the labial frenulum. On the basis of the clinical examination and x-ray diagnostics, it was made a detailed therapy plan. In the first phase, it was performed a surgical correction of the labial frenulum, laser crown lengthening of the 11 and 12 and preparation of the teeth for fully ceramic crowns.

For the purpose of harmonization of the patient's wish with the possibilities of the therapy, it was made the visualization of future prosthetic work by diagnostic waxing of the model.

RESULT

Following the therapy plan from the surgical and prosthetic aspect, it was performed the soft tissues correction and highly esthetic fully ceramic crowns were made.

CONCLUSION

Careful multidisciplinary planning of the treatment, which includes periodontology-surgical therapy, application of the diagnostic model and making of esthetic fully ceramic crowns, are

the key to a successful prosthetic therapy in resolving esthetic and functional problems in the frontal teeth region.

COMPROMISE IN SOLVING A COMPLEX ORTHODONTIC - PROSTHETIC PROBLEM

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Abstract

Solving complex orthodontic - prosthetic and periodontal - prosthetic problems often requires compromise approach to achieve optimal solutions that will come out to meet the wishes of the patient, but at the same time to achieve satisfactorily rehabilitation from the perspective of a dentist. Proposed necessary therapeutic measures such as orthodontic treatment, periodontal surgery and implantology requirements, due to the length of therapy, and unfortunately due to financial momentum, often present an unacceptable solution for the patient. Therefore, an alternative plan of therapy is needed, as a compromise that would satisfy the requirements of both patient and dentist , and it often includes extraction or endodontic treatment of missplaced teeth with the removal of large amounts of tooth structure as an alternative to orthodontic treatment , or making major fixed restorations as an alternative to implant therapy .

MINIIMPLANTS-SUPPORTED MANDIBULAR OVERDENTURE

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Abstract

INTRODUCTION

Limiting anatomical factors that determine and compromise retention of the mandibular overdenture may be additionally worsened by very expressed resorption of the alveolar ridge. Application of a miniimplants as a retainer represents a significant step forward in the therapy protocols for treatment of the toothless lower jaw.

AIM OF THE WORK

The aim of the work was to present the manner and importance of implant retainers application for the purpose of improving the making and functional efficiency of the conventional mandibular overdenture.

MATERIAL AND METHOD

It was presented a practical application of a mini implant on a clinical example of a male patient, 60 years of age, with very expressed resorption of the alveolar ridge, high position of labial and buccal frenum attachment and consequential extremely unfavorable conditions for making of the mandibular overdenture. On the basis of the anamnesis, clinical examination and x-ray diagnostics, it was made a therapy plan, which included surgical implanting of 4 mini implant (3M ESPE MDI) and making of a complementary acrylate complete mandibular denture.

RESULT

With implantation of a mini implant in the intercanin area and making of a complete mandibular denture including parts for positioning of the retaining part of the implant, it was achieved an adequate stability and retention of the mandibular overdenture. Functional and esthetic expectations of the patient have been fulfilled.

CONCLUSION

Application of implant retainers significantly improves the function of the mandibular overdenture, compensating unfavorable anatomic conditions of the prosthesis tissue base, by which the quality of life of the patients with these kind of prosthetics solution put to a higher level.

ANTIMICROBIAL ACTIVITY OF ACRYLIC RESINS IMPREGNATED WITH SILVER NANOPARTICLES

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Abstract

Introduction. Acrylic resins are materials with a broad indication of use in dentistry because of their good mechanical characterictics and their biocompatibility. However, porosity and surface adherence makes them the collectors of infectious content. This applies particularly to cold-curable acrylates whose structure is less compact.

The aim of this study was to examine the potential antimicrobial effects of cold curing acrylics impregnated with silver nanoparticles.

Materials and Methods. Silver nanoparticles (*576832 Colloidal silver nanopowder, Sigma-Aldrich*) of *2%, 5% and 10%* concentrations were added to the powder component of the cold curing acrylic resin (*Triplex Cold, Ivoclar Vivadent*). Samples were made according to the the manufacturer's instructions and poured into a disk shape mold 10mm in diameter. A disk of silver nanoparticles was used as a control for our study.

Antimicrobial activity was investigated using the disc difusion method. Antimicrobial activity of all four samples was tested on Gram positive bacterium - *Staphylococcus aureus* ATCC 25923 and fungus *Candida albicans ATCC* 2091.

The results have shown that the control sample as well as the samples of silver impregnated acrylics resins exhibit antibacterial activity. The growth zone inhibition of *Staphylococcus aureus* in the culture medium is proportional to the concentration of silver nanoparticles in the cold curing acrylic resin. Test samples did not inhibit the growth of *Candida albicans* in the medium.

Conclusion. Silver nanoparticles in cold curing acrylic resin demonstrated antibacterial activity. Expanding their antimicrobial spectrum of activity and their potential clinical application will be the subject of future research.

Keywords: acrylic, nanoparticles, silver, nanotechnology, microbiology

NEW DESIGN OF THE ANGULATED SCREW RETAINED ABUTMENT IN PROSTHODONTICS

(CASE REPORT)

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Abstract

Introduction: Anatomic and aesthetic criteria are important factors in the procedure of implant placement in the frontal area of the upper and lower jaw. Examples from clinical practice have shown that the anatomical factors, which affect the position of the implant in the bone can compromise the final aesthetic result, that is, to a large extent dictate the selection of future prosthetic restoration. Application of hybrid restorations in implant prosthetics meets all necessary therapeutic and aesthetic criteria. Indicating of hybrid dental restorations was impossible in cases where the angulation of the implant in the bone and the abutment position dictated that the position of the abutment screw hole is positioned on vestibular or incisal surface. Having in mind the region of implant placement, aesthetic requirements of the patient and the doctor, implant manufacturers are trying to overcome the existing problems by the special design of abutment and the appropriate screwdriver. Starting from the fact that on the market today are present abutment whose implementation solves the problem of vestibular positioned screw holes we have defined the **goal of this paper:** present the clinical case which shows the possibility of the special designed angulated screw retained abutment in prosthodontics.

Case report: Patient VP, 46 years ages, in the region of the tooth 22 was placed implant NobelActive (NP, 3.5 × 15 mm) (Nobel Biocare AG, Zurich, Switzerland). Position of the implant in the bone was created that the standard abutment screw hole was located in vestibular position. Superior aesthetic and functional results were achievable using the hybrid crown whose application in this case, was only possible with the special angulated ASC abutment. The abutment design was enabled that the opening of the screw hole was in oral position and the Omnigrip Screwdriver was provided adequate compensation in a permanent positioning of the patient's mouth.

Conclusion: New design of the angulated screw retained abutment and special designed screwdriver enable production of hybrid restoration in cases where angulation of implant in the bone and the position of the screw holes compromise superior aesthetic results.

BALANCING OF THE OCCLUSION BY USING THE SELECTIVE GRINDING IN PATIENTS WITH THE TRAUMATIC OCCLUSION

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Abstract

Periodontal injuryis just one of many different pathological consequences of an occlusal trauma, and it can be classified as primary or secondary.

Primary occlusal trauma occurs when the influence of an occlusal force overcomes theresistance of healthy periodontal tissues. Secondary occlusal trauma is caused by the effect of mastication forces on teeth with already damaged periodontal tissues, due to their decreased capability to resist forces developed duringocclusion and articulation.

The aim of the occlusal therapy is to achieve simultaneous and well-balanced contact between teeth in the intercuspal position, to provide undisturbed mandibular movements and the absence of traumatic contacts in any jaw position or movement.

There are two main types of occlusal therapy: temporary and permanent.

Selective grinding is a part of the permanent (irreversible) occlusal therapy.

Selective grinding is carried out in the enamel, according to the minimally invasive preparation concept, following a natural tooth-morphology in order to keep a dental contact homogenously distributed.

These therapeutic principles are never conducted preventively due to the individual response to therapy of every patient and a diversity of periodontal compensatory capacity among them.

Providing the well-balanced occlusion is one of the most complex dental therapeutic procedures, which, besides the knowledge and the expertise of a clinician, demands his efforts toapply critical assessment ofevery individual case. Adequate selection of a diagnosis which is indicated for the occlusal therapy,along with a prediction of its therapeutic outcome,is dependent of an insufficiently investigated neuromuscular behaviour of a stomatognathic system.

PEEK HIGH PERFORMANCE POLYMERS IN PROSTHETIC DENTISTRY

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Abstract

Introduction: Polyetheretherketon (PEEK) is the most significant representative of polyaryletherketone (PAEK) family of synthetic polymers. For more than 30 years, this material has been used in medicine, primarily as material for implants in orthopedic surgery. Physical and chemical properties of PEEK material can be easily modified, by incorporation of other materials. Reinforced with 0,3-0,5μm ceramic particles, PEEK attained properties that enabled its use in restorative dentistry.

Material properties: PEEK material intended for dentistry has elastic modulus similar to cortical bone and dentin, high strength to weight ratio, high wear and corrosion resistance and low melting point (approx. 334º C). Material is radiolucent and biocompatible. In prosthodontics, it can be used for making individual abutments, crowns and smaller bridges. On the market, it is available in the form of granules for heat-pressing and as round blanks for CAD/CAM milling (computer aided design/computer aided manufacturing). Considering it is white, PEEK is often used for production of frameworks, which are than veneered with aesthetically more pleasing material, usually composite resin. This kind of bi-layered, metal-free restorations are cheaper alternative to metal-ceramic restorations made from precious alloys and all-ceramic restorations; therefore, they are accessible to larger number of patients. Another great advantage of restorations veneered with composite is ability of simple reparation in the case of damage.

Conclusion: Thanks to optimized mechanical properties, biocompatibility, veneering with composite materials and easy reparation, dental restorations made of PEEK polymers are aesthetically and functionally satisfying alternative to other types of restorations.

PERMANENTLY SOFT RELINING DENTURES – SILICONE MATERIALS

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Abstract

Soft materials for relining of dentures can be divided into materials for temporary use, which are used mainly for conditioning tissue and soft viscoelastic silicone materials for permanent (continuous) relining.

To present the clinical procedures of direct relining soft silicone which polymerize at room temperature.

Randomly, prosthetic treated patients aged 66 years. After surgical intervention in the vestibule of the mandible (31-44), the preparation of oral tissues, processing denture, selection and preparation, taking in and processing of soft material based on a silicon (UFI gel P Set-Voco).

The results are determined by the general state of health and the situation in the mouth, but the obvious advantages of silicone liners. Especially long phase of elasticity and permanent effects of depreciation, impose them on top when extensive reduction of the lower residual ridge when generalized osteoporosis, the presence of sharp bone spicules, comb-shaped edge of the blade, striking mandibular torus or genioglosne spine, sharp kriste milohioidee, exposed the mental foramen , thin movable and nerezilijentne mucous membranes. However, oral hygiene and maintenance of prostheses are one of the decisive factors of longevity of PMMA denture reline soft - silicone materials.

Therefore, today the use of preparations based on silicone successful and satisfactory in most cases. Even in patients with systemic diseases or metabolic disorders, followed by a deficit of minerals, vitamin C, protein, or lack of, in the case of various types of endocrine imbalance, with a low threshold of tolerance to mechanical and chemical irritation.

COMPARATIVE ANALYSIS OCCLUSAL INDICATORS

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Abstract

Occlusal indicators (markers) are used for recording and analysis of occlusion detection and removal of occlusal interference, as well as the production of dental restorations, occlusal during each treatment.

The aim of the work is a visual presentation of occlusal indicators, present and available in the market, with comparative advantages and disadvantages.

Methodology: Chronological listing of all three procedures for the registration of occlusal contacts: Method ferrous record photooclusiv techniques and computer methods. Results: In the dental practice, the most commonly used markers or indicators are: articulatory securities (the cheapest and most readily available in the market), colored silk ribbons, cellophane tape, a thin aluminum foil (shim - stock) tiles of the inlay wax, thin tiles of the photo-elastic resins, special varnishes, elastomers (silicones aditions) and T - scan panel. All of them, with more or less success, for identifying, locating and defining the occlusal contacts. The majority of the markers does not cause a change of vertical dimension, but clearly locate contacts, are easily applicable with minimal patient compliance and easy to use. Obtained sophisticated measuring techniques, above all computerized analysis of occlusal contacts with the receiving module and manual data converter PC notebook with T-Scan III is a modern computerized system identification number, location, time of occurrence and intensity of occlusal contacts. The results of tooth contacts are interpreted qualitatively and quantitatively, reproduce, compared and stored for the purpose of subsequent research. Because individual identification has forensic character, but in the background, behind the deformation sensitive pieso - electric films (Dental Prescale), whose maximum occlusal force is one of the indicators-indicators of functional status of the masticatory system.

The various techniques, methods and indicators occlusal contacts, despite the obvious advantages of software systems, in everyday practice is the most appropriate articulatory securities.

HEICMAN'S CROWN

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Abstract

This is a combined hollow crown made of metal and porcelain. Its vestibular metal part is made of platinized gold, and oral part of the gold. Over the vestibular part has been inflicted the layer of porcelain.

Preparation for this type of crown was performed as for one-piece metal crown, but from vestibular side it has been prepared more to make enough space for porcelain. Impression of the prepared tooth has been taken using copper or gold ring and Kerr-mass and impression over it using plaster.

On the basis of this impression, a model is made with removable die, the crown is modeled according to morphological principles, reduced for the thickness of the metal. Making of the crown is carried out on the principle of a two-piece stamping of the crown, of the two materials. The vestibular part is coated with a layer of porcelain of the corresponding color in the thickness of 0.3 mm.

DIRECT METAL LASER SINTERING IN PROSTHODONTICS

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Abstract

Introduction: Direct metal laser sintering (DMLS) is an additive manufacturing technique that uses a high-powered laser to fuse metal in form of powder into the desired 3-dimensional shape, by scanning cross-sections generated from a three dimensional digital model of the object. The laser selectively melts the powder, layer by layer, until the object is formed. In recent studies, DMLS performed similarly as casting method in terms of marginal adaptation and showed better corrosion resistance. Various metals can be used for DMLS, including medical titanium (Ti) alloy. Because of its excellent biocompatibility, ADA has classified Ti between noble and high-noble alloys but Ti is significantly less expensive, mechanically more resistant, and less thermally conductive than gold. Comparing to CoCr alloys, Ti is lighter and shows better biocompatibility.

Technique report: 3-unit fixed partial denture (FPD) framework was produced from CAD data by DMLS technology. Framework was made from Ti powder (Ti6Al4V, EOS GmbH), using EOSINT M280 system (EOS GmbH), than sandblasted with Al_2O_3 (110 μm) and steam-cleaned. Ceramics specifically intended for frameworks made of Ti was used for veneering, according to manufacturer's recommendations (Duceratin Kiss, DeguDent GmbH). Manual layering technique involved application of bonder, two opaque layers, dentine layers, and glazing. FPD was fired in a furnace (Multimat Touch&Press, DeguDent GmbH).

Conclusion: DMLS is a promising alternative to casting and milling techniques for production of metal components in prosthodontics, because it allows production of parts with complex shapes, without costly and time-consuming pre- and post-processing.