ISSN - 0976 - 4577
Indexcopernicus ID No. 5365

TRIVANDRUM DENTAL JOURNAL

JOURNAL OF INDIAN DENTAL ASSOCIATION TRIVANDRUM BRANCH

July - December 2011 Volume-2, Issue -2

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ISSN - 0976 - 4577
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JULY - DECEMBER 2011 VOLUME 2, ISSUE - 2

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Trivandrum Dental Journal has been indexed with Index Copernicus, an international indexing authority.

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Published by :
The Secretary
Indian Dental Association,
Trivandrum Branch
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ISSN - 0976 - 4577
Indexcopernicus ID No. 5365

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JULY - DECEMBER 2011 VOLUME 2, ISSUE - 2

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Editorial

Requirement of documentation in general dental practice

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In my last editorial, I had tried to stress upon the importance of integrating research into general dental practice so as to improve the knowledge base of the dental surgeon. Even though, the knowledge and skills of the dentist is the primary basis of delivering quality care, several other factors like accessibility, cost and reimbursement of care; infection control in the office; oral health record keeping; office emergency procedures; and environmental hazards can affect the quality of dental care indirectly. These factors may be considered as supports, without which the ability to deliver dental care may be compromised.

In addition to the contribution in diagnosis; treatment planning; clinical risk assessment; liability protection and practice management, clinical record keeping and documentation can help immensely in improving the quality of dental care delivery. Proper documentation can help in enhancing diagnostic acumen; selecting appropriate treatment; and ensuring continuity of dental care. More over the requirement of taking informed consent is becoming all the more important. It is only a matter of time that the process of taking informed consent and proper documentation in the dental office, is made mandatory by regulations. Inadequate documentation can make it difficult for the dentist to defend his or her clinical care when it becomes the subject of a complaint and a subsequent review.

Considering the general dental practice scenario in Kerala, it is generally seen that the documentation of cases is not a regular feature. In fact dental surgeons in general have a tendency to listen to the history of the complaint [in a very superficial manner], perform basic clinical examination and then directly considering treatment options, completely skipping the step of making a diagnosis. This can considerably compromise patient care as skipping diagnosis can result in gross omissions and lack of standardization in general dental practice. Therefore, to improve patient care, dental practitioners should learn and practice the technique of documentation.

Details regarding documentation is available with IDA HOPE a sub committee of IDA Kerala State formed by combining the SSS (Social Security Scheme) & PPS (Professional Protection Scheme) of IDA Kerala State. The website of IDA Kerala State, provides a sample case sheet the format which can be down loaded and suitably modified for individual / institutional use. The suitable entries in the sample case sheet is the minimum information that is required for documentation. The down loading can be done from the web site of the IDA kerala state **http://www.idakerala.com.**

ORIGINAL STUDY

Denture Identification as a Forensic Aid: A Comparative Evaluation of Different Techniques

Pradeep Kumar[1], George Poulose[2], K.N.Velayudhan Nair[3], K. Chandrasekharan Nair[4]

ABSTARCT

Twelve selected denture identification techniques, representing all major types of identification methods, were comparatively evaluated for their reliability as forensic aid. These techniques were subjected to seven selected forensic requirements namely Durability, Heat resistance, Acid resistance, Effect of burial, Effect of immersion in fresh water, Effect of immersion in sea water, and Radio opacity. Of these, durability was studied clinically and the remaining by laboratory methods. Result of the study helped conclude that out of the twelve techniques studied (viz : Engraving, Surface marking, Marker pen, Type carbon, Lumocolour pen, Tissue paper, Plastic chip, ID band, Steel band, Aluminium foil, Lead foil, and Microdisc), the four metallic identification techniques are the best forensic aids.

KEY WORDS :

Denture marking, Denture identification, Dental identification, Personal identification, Forensic dentistry.

INTRODUCTION :

Dental identification (personal identification) is the most significant division in forensic odontology. Identification of a person, living or dead, will have to be made in the event of unconsciousness, loss of memory, mass disasters, travel catastrophes, war , and in post-mortem identification of unknown bodies etc. Establishing precise personal identity is of considerable social, legal and forensic significance. Various traditional and scientific methods are in vogue to establish the identity of unknown remains.

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Next to fingerprints, dental identification is documented as the most accurate means of recognition. But it loses its value in edentulous person unless he/she wears a denture bearing an identifying mark. Denture marking to facilitate personal identification of edentulous persons was introduced during the later half of twentieth century. Over forty techniques have so far been reported.

There is a conspicuous lack of a comprehensive study that evaluates and compares the adequacy of major types of denture identification techniques from a forensic standpoint. This study was initiated in this context.

MATERIALS AND METHODS :

A. Denture Identification Techniques :

In the present study, twelve selected denture identification techniques were comparatively evaluated for their reliability as forensic aid. The selection was comprehensive while representative also in nature, representing about forty plus techniques reported so far. The techniques are as

shown in Table - 1 [Fig . 1 -15]. Out of these, plastic chip, ID Band, and microdisc were samples from abroad and the rest indigenous. Each technique was carried out according to the instructions supplied with samples or as per the procedure described by various workers in this field.

B. Test for Forensic Requirements :

The forensic requirements that each technique was subjected to, and evaluated with, are : (i)Durability, (ii)Heat resistance, (iii)Acid resistance, (iv)Effect of burial, (v)Effect of immersion in fresh water, (vi)Effect of immersion in sea water, and (vii)Radio-opacity. Of these seven requirements, durability was studied clinically and remaining six by laboratory methods.

Durability :

For the durability test, 72 patients were selected and grouped into twelve. Each group of 6 patients was inserted with dentures marked with one of the twelve techniques in similar locations on dentures. Dentures of each group were marked with a uniform code. Each patient was recalled at an interval of 4 weeks up to a period of 24 weeks. Once a marking become indecipherable, it was recorded as lost and that its durability limit was reached.

A total of 504 study samples were made for the laboratory study of testing the marking for the rest of the forensic requirements. The samples included complete denture, RPDs, obturators, and acrylic special trays, all in heat cure acrylic fabricated by undergraduate students as part of pre-clinical exercises. Some samples were made in 5cm x 2cm x 3mm size. For the laboratory test of one forensic requirement, 12 groups of identical samples each were used in which each group was marked with one of the 12 techniques. Similar set up was made for the 6 laboratory experiments. A uniform code 'ABCD' was adopted for standardized evaluation.

Heat Resistance :

For each technique, 6 samples were tested and one was kept as control. The 12 samples, each one marked with one of the 12 techniques were placed in a porcelain crucible and kept in a furnace. Condition of each was evaluated first at 100^0 C, and thereafter at intervals of 100^0 C up to 1000^0 C. The particular temperature interval at which a mark disappeared on a sample was recorded as its maximum heat resistance. The experiment was carried out six times in a similar manner.

Acid Resistance :

6 samples of each technique were immersed in concentrated sulphuric acid in glass vessels. 12 separate such vessels were set up for the experiment. One study sample was kept as control. The marking were observed for their loss immediately, after immersion, and daily for period up to one week. They were then observed at intervals of 4 weeks and observations recorded.

Effect of burial, immersion in fresh water, immersion in sea water :

The procedure to test these three requirements was similar to that of the above described one.

Radio-opacity :

Radiograph of six study samples of each marking technique was taken using intraoral periapical radiographic films with similar and standardized KVP, mA, and exposure time. Later the radiographs of each technique were observed on an X-ray viewer. The observations were grouped into three, namely (a) densely radio opaque, (b) moderately radio-opaque, and (c) radio-lucent.

A scoring system was adopted in all the tests. Individual score was given for each sample. The score obtained in all the experiments were totalled for each technique individually for comparison. As the higher score indicated superior position, the highest total score means the highest rank or the most reliable forensic aid. Statistical analysis was done (t test) to see whether there is any significant difference between various techniques in each of the experiment.

RESULTS :

The result are presented in table 2 to 9. Table 2 shows the results of durability test for 24 weeks period. Except three techniques, namely Surface marking, Camlin marker pen, and Type carbon, all other techniques satisfied this criteria. Technique B with a mean durability of 5.33 weeks was the least satisfactory.

Table 3 shows the result of heat resistance experiment. It can be seen that after

500^0 C, the acrylic resin burnt away completely, leaving only identification strips of techniques E-1, E-2, E-3 and E-4 in the furnace. Lead foil later burnt away at 600^0 C, and Aluminium foil between 900 - 1000^0 C. Only E-1 and E-2 trips survived 1000^0 C.

Table 4 shows results of acid resistance experiment. The results revealed that only techniques E-1, E-2 and E-4 survived 24 weeks in acids, while all other techniques dissolved in it within one week.

In the effect of burial experiment (Table-5), except for the technique B, all other 11 techniques survived. Similar was the result in effect of immersion in fresh water (Table-6). But in the experiment for effect of immersion in sea water (Table-7) all techniques survived for 24 weeks.

Table 8 shows the results of the radio-opacity experiment. Metallic techniques E-1, E-2 and E-4 were found to be radio-opaque. Technique E-3, a metallic foil, was found to be radiolucent.

Table 9 shows the total score obtained in each experiment and total ranking. Higher score indicated superiority of the technique. Technique E-2 (steel band) thus obtained the 2nd, 3rd, and 4th ranks respectively. Rank 5 was shared by techniques A, C-3, D-1, D-2 and F. Techniques C-1, C-2, and B obtained 6th, 7th, and 8th rank respectively.

TABLE – 1

Denture Identification Techniques and the Codes Used :

Code		Identification Technique
C (Inclusion Supra)	A	Engraving
	B	Surface Marking
	C-1	Camlin Marker Pen
	C-2	Type Carbon
	C-3	Lumocolor Pen
D (Inclusion Infra : non-metallic)	D-1	Tissue Paper
	D-2	Plastic Chip
E (Inclusion Infra : metallic)	E-1	ID Band
	E-2	Stainless Steel Orthodontic Molar Band
	E-3	Aluminium Foil
	E-4	Lead Foil
	F	Developing Technique (Micro Disc)

TABLE – 2

DURABILITY

Loss of Marking Over a Period of 24 Weeks :

Id Tec.	Patient 1	2	3	4	5	6	Mean Weeks	Total Score	S.D.
	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.			
A	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
B	4 1	4 1	8 2	4 1	4 1	8 2	5.33	8	2.0656
C-1	24 6	24 6	24 6	20 5	24 6	20 5	22.67	34	1.633
C-2	16 4	20 5	20 5	20 5	20 5	20 5	19.33	1.633	
C-3	24 6	24 6	24 6	24 6	24 6	24 6	24 6	36	0
D-1	24 6	24 6	24 6	24 6	24 6	24 6	24 6	36	0
D-2	24 6	24 6	24 6	24 6	24 6	24 6	24 6	36	0
E-1	24 6	24 6	24 6	24 6	24 6	24 6	24 6	36	0
E-2	24 6	24 6	24 6	24 6	24 6	24 6	24 6	36	0
E-3	24 6	24 6	24 6	24 6	24 6	24 6	24 6	36	0
E-4	24 6	24 6	24 6	24 6	24 6	24 6	24 6	36	0
F	24 6	24 6	24 6	24 6	24 6	24 6	24 6	36	0

Key to Score

up to 4 wks = 1 up to 16 wks = 4
up to 8 wks = 2 up to 20 wks = 5
up to 12 wks = 3 up to 24 wks = 6

Abbre :

Id.Tec. : Identification Technique
D.W. : Durability in weeks
Sc. : Score

TABLE – 3

HEAT RESISTANCE

Loss of Marking At Temperature Intervals of 100^0C Upto 1000^0C:

Id Tec.	Sample 1	2	3	4	5	6	Mean Weeks	Total Score
	T.R.Sc.	T.R.Sc.	T.R.Sc.	T.R.Sc.	T.R.Sc.	T.R.Sc.		
A	500 5	500 5	500 5	500 5	500 5	500 5	500	30
B	500 5	500 5	500 5	500 5	500 5	500 5	500	30
C-1	500 5	500 5	500 5	500 5	500 5	500 5	500	30
C-2	500 5	500 5	500 5	500 5	500 5	500 5	500	30
C-3	500 5	500 5	500 5	500 5	500 5	500 5	500	30
D-1	500 5	500 5	500 5	500 5	500 5	500 5	500	30
D-2	500 5	500 5	500 5	500 5	500 5	500 5	500	30
E-1	1000 10	1000 10	1000 10	1000 10	1000 10	1000 10	1000	60
E-2	1000 10	1000 10	1000 10	1000 10	1000 10	1000 10	1000	60
E-3	900 9	900 9	900 9	900 9	900 9	900 9	900	54
E-4	600 6	600 6	600 6	600 6	600 6	600 6	600	36
F	500 5	500 5	500 5	500 5	500 5	500 5	500	30

Key to Score

Resistance up to 100^0C = 1 up to 600^0C = 6
up to 200^0C = 2 up to 700^0C = 7
up to 300^0C = 3 up to 800^0C = 8
up to 400^0C = 4 up to 900^0C = 9
up to 500^0C = 5 up to 1000^0C = 10

Abbre :

Id.Tec. : Identification Technique
T.R. : Temperature
Sc. : Score

DISCUSSION

A sizeable portion of the population is edentulous, most of whom are denture wearers[1]. Approximately one fourth of the mass disaster victims are reported to be denture wearers.[2.] ADA has recommended that denture be marked for personal identification[3]. The techniques evaluated in this study were representatively selected.

The forensic tests these techniques were subjected to were as per views expressed by eminent workers in this field and various reports in journals.[2,4,5,6,7.]

TABLE – 4

ACID RESISTANCE

Loss of Marking Over a Period of 25 Weeks:

Id Tec.	Sample 1	2	3	4	5	6	Mean Weeks	Total Score
	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.		
A	1 1	1 1	1 1	1 1	1 1	1 1	1 1	6
B	1 1	1 1	1 1	1 1	1 1	1 1	1 1	6
C-1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	6
C-2	1 1	1 1	1 1	1 1	1 1	1 1	1 1	6
C-3	1 1	1 1	1 1	1 1	1 1	1 1	1 1	6
D-1	1 1	1 1	1 1	1 1	1 1	1 1	1 1	6
D-2	1 1	1 1	1 1	1 1	1 1	1 1	1 1	6
E-1	24 7	24 7	24 7	24 7	24 7	24 7	24	42
E-2	24 7	24 7	24 7	24 7	24 7	24 7	24	42
E-3	1 1	1 1	1 1	1 1	1 1	1 1	1 1	6
E-4	24 7	24 7	24 7	24 7	24 7	24 7	24	42
F	1 1	1 1	1 1	1 1	1 1	1 1	1 1	6

Key to Score

up to 1 wks = 1
up to 2 wks = 2
up to 3 wks = 3
up to 4 wks = 4
up to 5 wks = 5
up to 6 wks = 6
up to 7 wks = 7

Abbre :

Id.Tec. : Identification Techniq
D.W. : Durability in weeks
Sc. : Score

TABLE – 5

EFFECT OF BURIAL

Loss of Marking Over a Period of 24 Weeks:

Id Tec	Sample 1	2	3	4	5	6	Mean Weeks	Total Score	S.D.
	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.			
A	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
B	8 2	12 3	8 2	8 2	8 2	8 2	8.67	13	1.6330
C-1	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
C-2	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
C-3	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
D-1	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
D-2	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
E-1	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
E-2	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
E-3	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
E-4	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
F	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0

Key to Score

up to 4 wks = 1
up to 8 wks = 2
up to 12 wks = 3
up to 16 wks = 4
up to 20 wks = 5
up to 24 wks = 6

Abbre :

Id.Tec. :Identification Technique
D.W. : Durability in weeks
Sc. :Score

Durability of a denture mark means its life. What is desirable is a permanent marking .[6,8] In the present 24 weeks study, except techniques B, C-1, and C-2, all others surpassed this period. The highly unsatisfactorily low durability of Technique B as seen in this study is similar to the finding of several authors.[2,8,9,10]

A forensically reliable denture marking should be indestructible by heat or fire (approximately 1000 ^{0}C).[5,11] Only techniques E-1 (ID Band) and E-2 (Steel) could survive this test. Results of

TABLE – 6

EFFECT OF IMMERSION IN FRESH WATER

Loss of Marking Over a Period of 24 Weeks:

Id Tec	Sample 1	2	3	4	5	6	Mean Weeks	Total Score	S.D.
	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.			
A	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
B	8 2	12 3	8 2	8 2	4 1	8 2	7.33	11	1.63300
C-1	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
C-2	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
C-3	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
D-1	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
D-2	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
E-1	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
E-2	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
E-3	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
E-4	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0
F	24 6	24 6	24 6	24 6	24 6	24 6	24	36	0

Key to Score

up to 4 wks = 1
up to 8 wks = 2
up to 12 wks = 3
up to 16 wks = 4
up to 20 wks = 5
up to 24 wks = 6

Abbre :

Id.Tec. : Identification Technique
D.W. : Durability in weeks
Sc. : Score

TABLE – 7

EFFECT OF IMMERSION IN SEA WATER

Loss of Marking Over a Period of 24 Weeks:

Id Tec	Sample 1	2	3	4	5	6	Mean Weeks	Total Score
	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.		
A	24 6	24 6	24 6	24 6	24 6	24 6	24	36
B	24 6	24 6	24 6	24 6	24 6	24 6	24	36
C-1	24 6	24 6	24 6	24 6	24 6	24 6	24	36
C-2	24 6	24 6	24 6	24 6	24 6	24 6	24	36
C-3	24 6	24 6	24 6	24 6	24 6	24 6	24	36
D-1	24 6	24 6	24 6	24 6	24 6	24 6	24	36
D-2	24 6	24 6	24 6	24 6	24 6	24 6	24	36
E-1	24 6	24 6	24 6	24 6	24 6	24 6	24	36
E-2	24 6	24 6	24 6	24 6	24 6	24 6	24	36
E-3	24 6	24 6	24 6	24 6	24 6	24 6	24	36
E-4	24 6	24 6	24 6	24 6	24 6	24 6	24	36
F	24 6	24 6	24 6	24 6	24 6	24 6	24	36

Key to Score

up to 4 wks = 1
up to 8 wks = 2
up to 12 wks = 3
up to 16 wks = 4
up to 20 wks = 5
up to 24 wks = 6

Abbre :

Id.Tec. : Identification Technique
D.W. : Durability in weeks
Sc. : Score

Aluminium and steel in this experiment closely concur with that of MacEntee and Campbell[11], and Pyke[5]. The claim of the manufacturer of ID Band about its heat resistance of 1300^0 C is testified to 1000^{0}C in this study.

The result of acid resistance experiment of steel concur with that of Pyke.[5] His study was more comprehensive in that he tested nine alloys in hot concentrated HCl, H_2SO_4, HNO_3. However the

TABLE – 8

Radio – Opacity

Id Tec	Sample 1	2	3	4	5	6	Mean Weeks	Total Score
	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.	D.W.Sc.		
A	- 1	- 1	- 1	- 1	- 1	- 1	1	6
B	- 1	- 1	- 1	- 1	- 1	- 1	1	6
C-1	- 1	- 1	- 1	- 1	- 1	- 1	1	6
C-2	- 1	- 1	- 1	- 1	- 1	- 1	1	6
C-3	- 1	- 1	- 1	- 1	- 1	- 1	1	6
D-1	- 1	- 1	- 1	- 1	- 1	- 1	1	6
D-2	- 1	- 1	- 1	- 1	- 1	- 1	1	6
E-1	+_ 2	+_ 2	+_ 2	+_ 2	+_ 2	+_ 2	+_ 2	12
E-2	+ 3	+ 3	+ 3	+ 3	+ 3	+ 3	3	18
E-3	- 1	- 1	- 1	- 1	- 1	- 1	1	6
E-4	+ 3	+ 3	+ 3	+ 3	+ 3	+ 3	3	18
F	- 1	- 1	- 1	- 1	- 1	- 1	1	6

Key to Score :

+	Densely Radio-opaque,	_	=	1
+_	Moderately radio-opaque	+_	=	2
_	Radio – lucent	+	=	3

Abbre :

Id.Tec. :Identification Technique

R.S : Radiograph Status

Sc. : Score

TABLE – 9

Total Score Obtained in Each Experiment and Total Ranking

Id Tec	Table 2	3	4	5	6	7	8	Grand Total Score	Rank	Mean of Scores	S.D
A	36	30	6	36	36	36	6	186	5	26.57	14.2227
B	8	30	6	13	11	36	6	110	8	15.71	12.2027
C-1	34	30	6	36	36	36	6	184	6	26.29	14.0204
C-2	29	30	6	36	36	36	6	179	7	25.57	13.6852
C-3	36	30	6	36	36	36	6	186	5	26.57	14.2227
D-1	36	30	6	36	36	36	6	186	5	26.57	14.2227
D-2	36	30	6	36	36	36	6	186	5	26.57	14.2227
E-1	36	60	42	36	36	36	12	258	2	36.86	14.0408
E-2	36	60	42	36	36	36	18	264	1	37.17	12.3520
E-3	36	54	6	36	36	36	6	210	4	30.00	17.6635
E-4	36	36	42	36	36	36	18	240	3	34.29	7.5214
F	36	30	6	36	36	36	6	186	5	26.57	14.2227

Abbre :

Id.Tec. :Identification Technique

alloys of techniques E-1, E-3, and E-4 of the present study were not among the alloys he tested.

Experiments to test the effect of burial, immersion in fresh and sea water was done in view of the similar situations encountered by forensic team involved in personal identification of unknown bodies.[12.]

Significance of marking dentures with radio-opaque materials was emphasized by various workers.[1,2,9,11,13,14,15] This is of particular use in radiographically examining the piles of rubble at a disaster site to reveal the personal identify of victims.[4,9] In this study radiolucency seen in techniques E-3 (Al foil) is a serious drawback for its forensic application.

This study was concerned with the forensic application aspects of the selected denture identification techniques. The requirements of an ideal denture identification technique such as code, location, cost, clinical safety, ease of marking, cosmetic acceptability by patient, stress induced on denture etc, did not form part of the study.

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Source of Suppport : Nil
Conflict of Interest : None declared

ORIGINAL STUDY

Frictional characterisation of ceramic brackets with metal inserts

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ABSTRACT

With the increase in adult orthodontics the value of aesthetic brackets in practice has increased immensely. One of the major disadvantages of ceramic brackets is the increased friction. To overcome this companies have come up with a new bracket system where they use metal inserts in the slot area. The purpose of this study is to identify the frictional characteristics of these brackets and compare it with that of standard stainless steel brackets which is considered as gold standard.

KEY WORDS : ceramic brackets, metal inserts, aesthetic brackets.

The increase in adult orthodontic patients saw the emphasis being put on the aesthetic material used for making brackets. Introduction of ceramic brackets into orthodontics was to meet this increasing demand.[1,2] Ceramic brackets came with their baggage of woes like, enamel fracture while debonding, tie wing fracture, the high friction co-efficient between the bracket and the archwire, enamel abrasion and wear, all of which can interfere in the orthodontic treatment duration and results[2-7] etc.

Friction is one of the major deterents in the regular usage of ceramic brackets[7]. Friction is defined as the resistance to motion when one object moves tangentially against another object. A distinction is made between static frictional force which is the smallest force needed to start the motion and kinetic frictional force, which is the force needed to resist the sliding motion of one solid object over another at a constant speed.[8-11] During sliding mechanics, the factor of frictional resistance is an important counterforce to orthodontic tooth movement, and it must be controlled so that lower optimal forces can be applied: higher frictional resistance requires increasing the orthodontic forces.[5]

Ceramic brackets with metal insert slots have been introduced by various manufacturers with claims of combining aesthetic advantage of ceramic brackets to the frictional properties of metal brackets. Even though evaluation and comparison of friction between conventional and stainless steel insert ceramic brackets[12,13] were done, no study has been reported comparing the ceramic brackets with metal inserts of different material under scanning electron microscope. The aim of this study was to evaluate and compare frictional and slot characteristics of 0.018 slot ceramic brackets with stainless steel metal insert and gold metal insert with conventional stainless steel brackets combined with stainless steel arch wire of 0.016X0.022" dimension at 0^0 wire – bracket angulation.

MATERIALS AND METHODS

Gemini ™ stainless steel brackets (3M/ Unitek, Monrovia, Calif) was used as the gold standard for comparison of stainless steel-lined polycrystalline alumina bracket (Clarity ™, 3M/ Unitek, Monrovia, Calif) and an 18-kt gold lined

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polycrystalline alumina bracket (Luxi™, RMO Corp, Denver, Colo) The 20canine brackets of each type were grouped as follows:

Group 1: Clarity ™ brackets (ceramic with stainless steel insert)

Group 2: Luxi ™ brackets (ceramic with gold insert)

Group 3: Gemini ™ brackets (stainless steel)

Representative slot morphologies of the 3 bracket groups were obtained by sputter-coating a 150A° layer of gold-palladium prior to viewing using a scanning electron microscope (SEM) JEOL JSM 5600LV at an accelerating voltage of 15 kV.

The evaluation of friction between brackets and the arch wire was carried out as per the protocol described by Tidy.R.[14] A stimulated half arch fixed appliance with arch wire ligated in vertical position was made use of two incisors and two premolars brackets were bonded in to a rigid Perspex sheet at 8mm intervals, leaving a space of 16 mm at the centre for sliding the canine bracket to stimulate an extraction site in which the archwire stiffness and resilience have little interaction with the bracket being investigated. The arch wires were secured using 0.012" elastomeric Dispense-A-Stix™ ligatures to provide equal force on all bracket archwire interface[15]. The movable bracket was fitted with a 12mm power arm from which, weights of 50/100gms were hung to represent the single equivalent force acting at the centre of resistance of tooth root. The length of power arm was chosen to represent the distance from the slot to the centre of resistance of a typical canine tooth.

All tests were conducted under dry conditions with an Instron Universal Testing Machine (Model No. 1196, Instron Corporation, Canton, Mass) with the full scale load set at 5N and cross head moving downwards at the speed of 10mm/minute. The movable bracket was suspended from the loop cell of the testing machine while the base plate (Perspex sheet) was mounted on the cross head below. Brackets of both the sides of the upper arch were mounted on separate perpex sheets. The perspex sheet having the left side was used for friction testing only once. The canine bracket of this side was viewed under scanning electron microscope to evaluate the amount of wear that has been produced. Since the brackets were ceramic they were gold sputtered to make them visible under scanning electron microscope. A 50gm load followed by 100gm weight was suspended from the power arm and the load needed to move the bracket across the central span in the apparatus was recorded separately. Each canine bracket was tested once, and each wire specimen was drawn through the bracket once only, to eliminate the influence of wear from repeated drawing[16]. A trial run was done without any load on the power arm to rule out any binding of the archwire bracket interface. The difference between the load cell reading and the load on the power arm represents frictional resistance. The load cell reading represents the clinical force of retraction that would be applied to canine, part of which would be critical friction while the rest would be the translation force on the tooth.

The co-efficient of friction of the arch wire bracket interface can be calculated using the formula $P = \frac{2Fhì}{W}$

Where P = frictional resistance,
F = equivalent force acting at a distance,
W = bracket slot width,
h = 12 mm, and
ì = coefficient of friction.

The value of kinetic friction obtained from the graphic plotter was calculated and tabulated. Paired students 't' test was performed to analyze the significance of difference between means.

RESULTS

The co-efficient of kinetic friction for each bracket system was calculated and tabulated and the observations are contained in Fig 1. This shows the comparison of the co-efficient of kinetic friction of the three groups. Routine statistical parameters like mean, maximum and minimum range, standard deviation and standard error were calculated for each group. The Paired Student 't' test was performed to analyze the significance at the level. The 't' values were highly significant at the level of <0.001 except for the co-efficient of kinetic friction between Clarity™ brackets and stainless steel brackets for 100gms.

The rank order of bracket system according to frictional characteristics for co-efficient of kinetic friction indicated that

With 50gms load- Clarity™ > Stainless steel > Luxi™

With 100gms load- Clarity™ > Stainless steel> Luxi™

The values indicate an identical ranking of frictional resistance at both levels.

DISCUSSION:

Ceramic brackets were introduced to orthodontics in an attempt to meet the ever increasing demand for more aesthetic appliances and are popular for their aesthetics, strength and biocompatibility. Ceramic brackets are not without their disadvantages of which the two glaring drawbacks that limit their use are increased friction and irreversible damage to enamel surface on debonding.

The orthodontic biomaterial scenario is flooded with modification and newer innovations to overcome these drawbacks and of which Clarity ™ bracket systems with stainless steel insert and Luxi ™ bracket systems with gold insert in the arch wire slots have been in the use for quite some time. Manufacturers claim that the modifications enhance their frictional characteristics and make them better than stainless steel bracket.

Studies that evaluate the friction produced by different brackets and wires diverge a great deal because of the variety of methodologies, variety of alloys tested from different companies, different brackets and wire combinations, medium for testing (dry environment) saliva or substitute etc. The presence of so many variables makes comparison of results difficult.

In the present study dead weight of 50gm and 100gm were placed to keep the bracket and wire in contact and closely approximate the resistance that would be obtained in a clinical situation[14].

The study shows that the gold insert Luxi ™ bracket system has the least kinetic friction while Clarity ™ brackets showed the highest value among the three bracket systems evaluated for both 50gm and 100gms load (Fig 1). The coefficient of kinetic friction (kf) showed a similar ranking for both the loads with stainless steel bracket system value falling in between that of the two ceramic bracket systems (Fig. 1).

The mean coefficient of kinetic friction for Luxi ™ bracket system for both 100gm and 50gm load were almost half of the value produced by the Clarity ™ bracket system for the same load. The value of coefficient of kinetic friction produced by stainless steel bracket system was close to the corresponding values exhibited by Clarity ™ bracket system.

There was no significance of difference between the mean coefficient of friction of Clarity ™ bracket system and Gemini ™ bracket system for 50gms load. This is in accordance with the study by Loftus etal[11] which did not find the pair wise difference between the conventional and ceramic bracket with metal insert to be of any significance. The gold inserted Luxi ™ bracket showed a lower KF in all the tests and an almost similar value was produced by the bracket system with stainless steel bracket slot ie both Clarity ™ series confirming the hypothesis of Loftus etal[11] that the effect of the bracket on the amount of friction in different bracket arch wire combinations depends on the material of the bracket slot.

Clinically this implies that Luxi ™ bracket system effects more rapid tooth movement than Clarity ™ and the reduced arch wire bracket friction and thereby having better control on anchorage. The amount of orthodontic force required to move a tooth depends on the amount of friction created. If light forces are desired the friction level must be kept as low as possible since heavy loads are difficult to control.

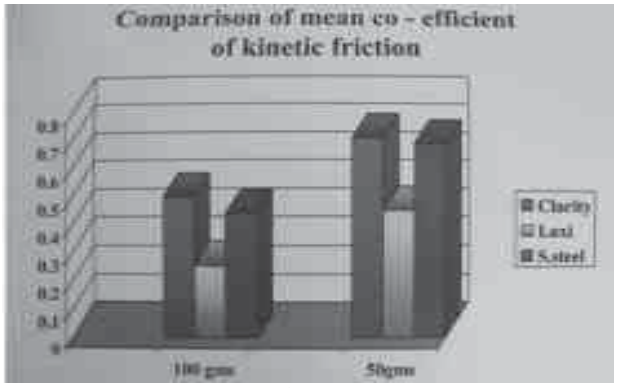

Fig 1.

The surface topography of the bracket slot is known to effect its working characteristics and evaluation of the same is important because an irregular surface is usually associated with greater friction. The present study evaluated the two metal inserts with scanning electron microscopy after the brackets were gold sputtered since ceramic is an inert metal and will be other invisible in the electron beam.

The unused gold insert slot surface showed a porous surface under x 1000 magnification, which was confirmed under x 5000 (Fig 2). This is concordant with its physical nature of being a soft metal. On the contrary stainless steel insert exhibited a relatively smoother surface though cracks were present (Fig 3)

The used gold insert slot surface revealed a large amount of wear with areas of metal peeled off from the surface (Fig 4).This wearing of slot material explains the decreased amount of friction

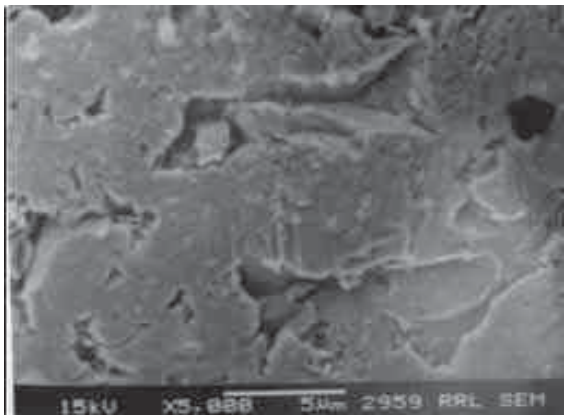

Fig 2.SEM view of unused Luxi bracket slot X 5000

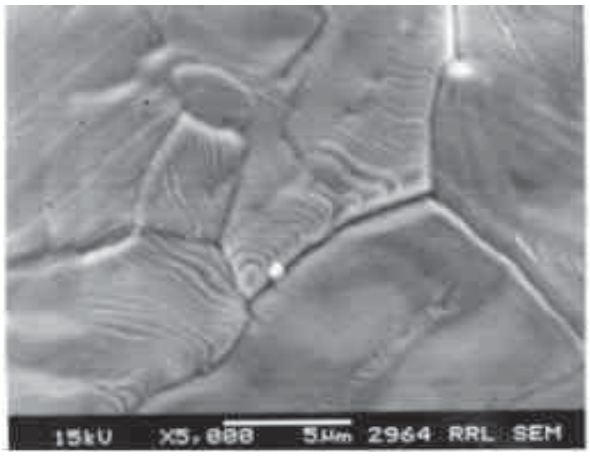

Fig 3.SEM view of unused Clarity bracket slot X 5000

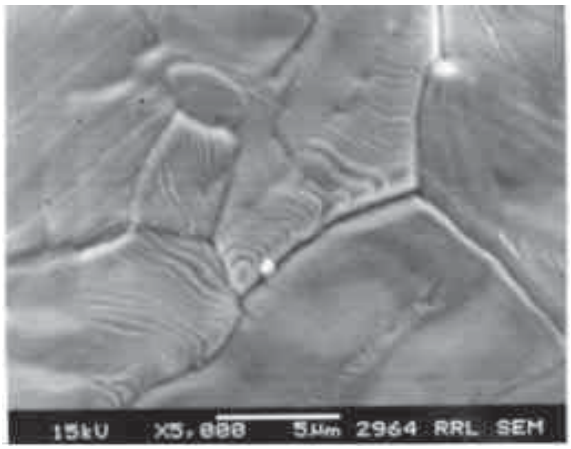

Fig 4.SEM view of used Luxi bracket slot X 5000

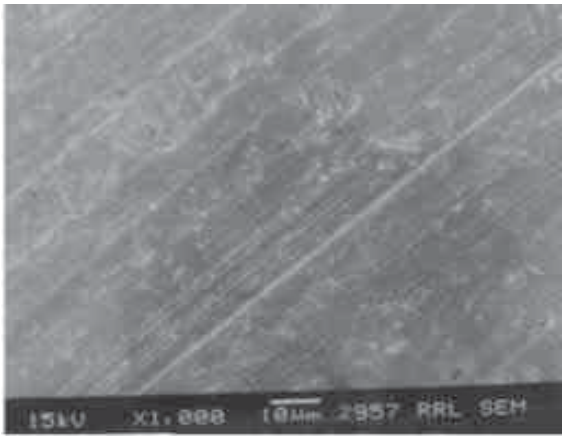

Fig 5.SEM view of used Clarity bracket slot X 5000

demonstrated by the gold inserts. The used stainless steel insert slot surface reveals a relatively smoother and less wear. (Fig5).

This clinically imply that the gold insert is primarily a single arch wire use bracket system since stainless steel considered to be the smoothest of orthodontic wires produced a large amount of wear in the bracket slot.

Summary and conclusion

The study was conducted to evaluate the frictional properties and debonding characteristics of gold inserted Luxi bracket system and stainless steel inserted Clarity bracket system and compare them with stainless steel Gemini bracket system that was used as a gold standard

The results of the present study shows that metal inserted ceramic brackets to produce frictional properties as good as stainless steel brackets.

Though Luxi brackets with gold inserts produced frictional characteristics similar to stainless steel brackets they showed very high amount of wear with stainless steel wires.Hence their performance with rougher arch wires like TMA is questionable.

A complete characterization of these bracket system will be incomplete without an in vivo evaluation.

Selection of materials with a low coefficient of friction is required to optimize treatment. The functional characteristics were marginally higher for ceramic bracket with stainless steel brackets. In the light of above findings, cases to be treated with ceramic brackets must be selected with caution, so as not to compromise treatment progress and equally important in that the possibilities and limitations in using ceramic brackets must be discussed with the patient.

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Source of Suppport : Nil
Conflict of Interest : None declared

CASE REPORT

MELKERSSON ROSENTHAL SYNDROME-A CASE REPORT

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ABSTRACT

Melkersson-Rosenthal Syndrome is a rare neurological disorder characterized by recurring facial paralysis, swelling of the face and lips (usually the upper lip), and the development of folds and furrows on the tongue. Onset of the disorder is usually in childhood or early adolescence .After the recurrent attacks, (the periods of which may range from days to years), swelling may persist and increase, eventually becoming permanent (1). The lip may become hard, cracked, and fissured with a reddish-brown discoloration. The cause of Melkersson-Rosenthal Syndrome (MRS) is unknown, but there may be a genetic predisposition (2) It can be symptomatic of Crohn's disease or sarcoidosis. It has an estimated incidence of 8/10,000 and the review of literature showed only nine reported cases in India (3).Lack of official methods to track rare diseases in our country is the main reason for less number of reported cases.

KEYWORDS

Key words: melkerson rosenthal syndrome, neurologic disorder, facialparalysis, fissured tongue

CASE REPORT

A sixty year old male patient reported to the Department of Oral Medicine and Radiology of Al Azhar Dental College, Thodupuzha with the complaint of mobile teeth. He wanted to undergo total extraction and replacement of full compliment of teeth. This patient had abnormally large upper and lower lips. He was concerned whether it will affect the extraction procedures.

A detailed history revealed that the lip swelling was recurrently occurring since 6 years. Initially the lower lip was swollen and swelling progressed to upper lip gradually. On the upper lip, the protrubance was more prominent in middle third region rather than the sides. There were periods of remission and exacerbation but the size of the lip had never returned to normalcy. The patient also informed that when the lips were swollen, fluid taken orally used to drool out.

Though the patient was not able to identify the exact factor causing exacerbation he identified a strong relationship between increased swelling and exposure to sunlight and consumption of bitter guard. The swelling was not associated with pain, itching or any other discomfort. His only concern was the swollen appearance of the lips and sympathetic query of people who sees him. He had undergone cheloplasty 1 year back at Kottayam Medical College. The swelling slowly returned to prior state within six months.

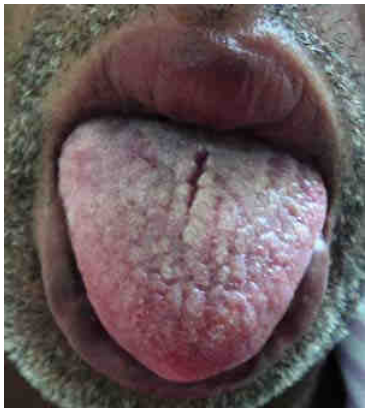

Fig. 1

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On examining the patient, the upper and lower lips were enlarged and protrubent. There were vertical fissures on vermillion border of the lips. Periorally there was a band of hypo pigmentation of about 5mm width around the upper and lower lips. Labial mucosa was normal .The lips were normal on palpation. Intra orally rest of the mucosa was within normal limits. The dorsum of the tongue exhibited fissuring which was more prominent in the anterior 2/3. The patient was partially edentulous with majority of upper and lower posterior teeth missing. The remaining teeth exhibited grade2 mobility. Cervical lymph nodes were not palpable. The system review did not reveal any abnormal finding.

Fig. 2

Routine blood and urine examinations did not reveal anything abnormal. A biopsy from the lower lip and gingiva was performed and the histopathology of lip revealed subepithelially multiple granulomas surrounded by wide cuff of lymphocytes. Granulomas were composed of epitheloid cells, Langhans and foreign body giant cells. Special stain done for fungus was negative. Histopathology of gingiva revealed a central core of connective tissue covered by a continuous lining of stratified squamous epithelium consisting of keratinocytes mainly. The nonkeratinocytes which include Langerhans cells, Merkel cells and melanocytes were seen in smaller amounts in gingival epithelium.

Fig. 3

A provisional diagnosis of Melkersson Rosenthal Syndrome was made considering the recurrent enlargement of lips, transient facial palsy and fissuring of the tongue. The histopathological impression of chronic granulomatous inflammatory lesion confirmed the diagnosis of Melkersson Rosenthal syndrome (2).

The patient was given antihistamines – Cetrizine 5mg nocturnally for a week and recalled. There was a tremendous drop in the size of the lip .Again he stated that if he worked under sunlight swelling used to exacerbate recurrently.

DISCUSSION

The Melkersson Rosenthal Syndrome (MRS) consists of a triad of recurrent attacks of facial paralysis identical with Bell's palsy, chelitis granulomatosa and fissured tongue. There may be multiple episodes nonpitting noninflammatory edema of the face. Facial edema resembles angioneurotic edema and involves upper lip and occasionally lower lip .Sometimes nose, tongue or maxillary alveolar process is involved (4).

The etiology and pathogenesis of MRS has not been determined. Factors such as infection, autoimmunity, neutrotropic factors and hypersensitivity to food additives have been suggested in the pathogenesis, but none of them are proven (6).

The differential diagnosis includes sarcoidosis (particularly if the lip lesions are associated with facial paralysis-Heerfordt's syndrome), and Crohn's disease as well as the various infections known to be associated with tuberculoid lesions. The microscopic findings are suggestive of sarcoidosis but insufficient evidence to relate this triad with sarcoidosis, as the latter is a multisystem granulomatous disease (8).There will be hilar lymphadenopathy, pulmonary infiltration, skin and eye lesions. Occasionally similar granulomatous enlargements may involve the gingiva. In Crohn's disease there will be ulcerative colitis or other disturbance of gastrointestinal tract. Gastrointestinal tract endoscopy and radiography may be used to help exclude Crohn's disease (2).Fissuring of tongue usually seen in Down's Syndrome is observed , but unlike Down's syndrome the patient is not mentally challenged.

Treatment is symptomatic and includes medication with NSAIDs and corticosteroids to reduce swelling .Patch tests may be used to exclude reactions to metals, food additives and other oral antigens(2). Surgery is indicated to relieve pressure on facial nerves and reduce swollen tissues but its effectiveness has not been established. Massages and electrical stimulation is prescribed in certain cases(1). In the absence of any specific etiology these lesions are usually treated with topical, interlesional and systemic corticosteroids with surgical reduction of the lips when the persistent swelling is a cosmetic or functional problem.(8).

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Source of Suppport : Nil
Conflict of Interest : None declared

CASE REPORT

Chronic diffuse sclerosing osteomyelitis – A case report with review of literature

P.T. Ravikumar[1], B. Sekar[2], Dominic Augustine[3], S.Murali[4]

ABSTRACT

Osteomyelitis of the mandible and maxilla are common in developing countries and their treatment may be long-standing and difficult. These infections are associated with a complex microbiota composed mainly by anaerobic bacteria, sometimes associated with micro-organisms originated from the skin and digestive tract. These data suggest that chronic osteomyelitis of the mandible and maxilla should be treated as anaerobic infections in most cases. In addition, local surgical treatments are relevant in the therapy outcome, associated to the use of antimicrobial agents, and the failure to accomplish them is a major cause of treatment failure. We present a case of chronic osteomyelitis caused by an odontogenic infection affecting the mandible of a 65 year old male patient treated by aggressive antibiotic therapy.

KEYWORDS

Osteomyelitis, bacteria, anaerobes, maxilla, mandible.

INTRODUCTION

The word "osteomyelitis" originates from the ancient Greek words osteon (bone) and muelinos (marrow) means infection of medullary portion of the bone. Common medical literature extends the definition to an inflammatory process of the entire bone including the cortex and the periosteum, recognizing that the pathological process is rarely confined to the endosteum. It usually encompasses the cortical bone and periosteum as well. It can therefore be considered as an inflammatory condition of the bone, beginning in the medullar cavity and haversian systems and extending to involve the periosteum of the affected area. The infection becomes established in calcified portion of the bone when pus and edema in the medullary cavity and beneath the periosteum compromises or obstructs the local blood supply. [1]

Following ischemia, the infected bone becomes necrotic and leads to sequestrum formation, which is considered a classical sign of osteomyelitis. [2]

Chronic osteomyelitis is a relapsing and persistent infection that evolves over months to years and is characterized by low-grade inflammation, presence of bone sequestra, new bone apposition, and, sometimes, fistulous tracts.[3] In contrast to acute purulent osteomyelitis, chronic osteomyelitis characterized by a low-grade clinical presentation, with lymphocyte and plasma cell infiltrates with necrotic areas and some bone condensation. Its occurrence in the craniofacial skeleton is rarely observed in industrialized countries.[4]

However, this infection is prevalent in developing countries, where it is infrequently associated with trauma and surgery, and its incidence, clinical signs and microbial etiology have not been studied thoroughly.[5] In the maxillofacial skeleton, chronic osteomyelitis is more often

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observed in the mandible and maxilla; and it can be limited to a unique anatomic site or spread to other areas, particularly in individuals presenting impairment of the immune response, non-controlled diabetes and hospitalized patients.[6]

The pathogenesis of these diseases may be linked to haematogenous dissemination of exogenous or commensal microorganisms living on the skin or in the digestive tract, but generally the main source of microorganisms involved in the osteomyelitis of the maxilla and mandible is the dental biofilm and oral infections, particularly endodontic infections peri-implantitis, periodontitis and gingivitis.[7]

Radiographically, osteomyelitis must be differentiated from tumors or other osteoproliferative, sclerosing, or lytic diseases. Radiographic pictures can vary with the stage of development and acuteness of the condition. In general, acute osteomyelitis shows delayed periosteal proliferative disease with little actual bone resorption. The chronic form of osteomyelitis may yield areas of sequestration with dead bone lying in a pocket of cellular debris outlined by the sclerotic border, periosteal proliferative activity, modelling of the entire cortex and endosteum, and areas of bone lysis.

CASE REPORT

A 65 year old male patient visited the Oral medicine and radiology clinic (Vinayaka Missions Sankarachariyar Dental College & Hospital-Salem) with a chief complaint of swelling in the right side of the jaw for the past two weeks. Patient gave a history of pain previously which had subsided by taking medication. The pain was gradual in onset. There was no history of bleeding or discharge from the site. He was moderately built and nourished, no relevant medical history was found.

On extraoral examination an ill defined swelling was present extending antero-posteriorly from the corner of the lip to the ramus of the mandible. It extended from the inferior border of ramus inferiorly to about 5cms above it superiorly. (Figure 1).

Intraoral examination revealed an erythematous ulcerated lesion from the distal aspect of 45 to the retromolar region. The lesion was covered with a white slough. (Figure 2) Pieces of sequestered bone was seen projecting from the surface. A foul odour was present. On palpation the lesion was soft, nontender and a pus discharge was present.

Figure 1: *An ill defined swelling present extending antero-posteriorly from the corner of the lip to the ramus of the mandible.*

His oral hygiene status was poor with generalised stains, attrition, cervical abrasion, gingival recession, mobility and periodontal pockets. The teeth in relation to the lesion showed grade 3 mobility and severe bone loss.

Figure 2: *An erythematous lesion extending from the distal aspect of 45 to the retromolar region. The lesion is covered with a white slough.*

Radiographic examination showed pathologic fracture of the buccal cortex with a moth eaten appearance with areas of patchy and diffuse sclerosis. (Figure 3)

Figure 3: *OPG showing pathologic fracture of the buccal cortex with a moth eaten appearance with areas of patchy and diffuse sclerosis.*

A provisional diagnosis of chronic osteomyelitis was made, a central malignant tumor had to be ruled out.

An incisional biopsy was made under local anaesthesia and the tissue was subjected to

histopathological examination which revealed areas of necrotic bone without osteoblastic rimming. (Figure 4)

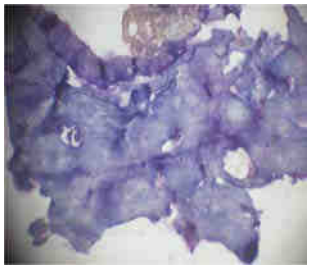

Figure 4: *H & E stain showing areas of necrotic bone without osteoblastic rimming.*

Acute and chronic inflammatory cells along with necrotic bone were present in abundance. (Figure 5)

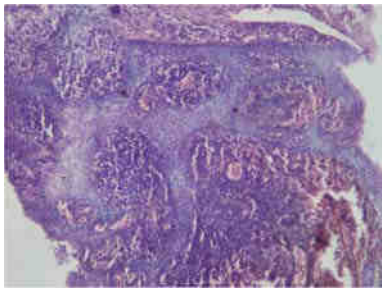

Figure 5: *H & E stain showing acute and chronic inflammatory cells along with necrotic bone*

A final diagnosis of chronic diffuse sclerosing osteomyelitis was established.

Treatment consisted of surgical debridement with hydrogen peroxide and saline and removal of the sequestra. Empirical antibiotic therapy was started with 500 mg penicillin 6 hourly. Definitive therapy consisted of clindamycin 600 mg 6 hourly. The lesion subsided and a removable partial denture has been planned.

DISCUSSION

Odontogenic infection is the most common cause of osteomyelitis of the jaws, although other causes including injury, malignant tumors, malnutrition, diabetes, chronic systemic diseases and infectious diseases occurring in hypovascularized bone may be associated with this condition.[5] The presence of different oral anaerobic species in mixed infections suggests that ecological associations may be relevant in the development of osteomyelitis of the mandible and maxilla, since most oral anaerobes depend on favorable environmental conditions and complex ecological interactions with different microbial species to develop its capacity to attack and colonize other areas of the host. Therefore, it is possible that pathogens different from those of the oral microbiota may reach the bone tissues through transient bacteremia, which are common after surgical procedures or traumas.[8]

The pathogenesis of osteomyelitis may be induced either by hematogenous origin or by dissemination of local infections, and its treatment involves removal of bone sequestra, lesion debridement, and bone decortication associated with systemic antibiotic therapy. However, in some patients, these infections are refractory to surgery and antibiotic therapy, requiring an adequate microbiological diagnosis.[9]

The occurrence, type, severity and clinical prognosis of osteomyelitis depend upon several factors, including the characteristics and virulence of the infecting pathogen, host immune response and source of infection. In addition, rapid and accurate microbiological osteomyelitis diagnosis is crucial to delineate the appropriate antibiotic therapy.[3]

Early complaints are severe, throbbing, deep-seated pain and swelling with external swelling due to inflammatory edema. Later, distension of the periosteum with pus, and finally subperiosteal bone formation cause the swelling to become firm.

The overlying gingiva is red, swollen and tender. Associated teeth are tender. They may become loose and pus may exude from an open socket or gingival margins. Muscle edema causes difficulty in opening the mouth and swallowing. Regional lymph nodes are enlarged and tender, and anaesthesia or paresthesia of the lower lip is characteristic. Frequently the patient remains well but in the acute phase there may be fever and leucocytosis. A severely ill, or very pale patient suggests underlying disease which requires investigation.

Radiographic changes do not appear until after at least 10 days. Loss of trabecular pattern and areas of radiolucency indicate bone destruction. These areas have ill-defined margins and have a fluffy or moth-eaten appearance. Areas of dead bone appear as relatively dense areas which become more sharply defined as they are progressively separated as sequestra.

Later, in young person's particularly, subperiosteal new bone formation causes a buccal swelling and appears as a thin, curved strip of new bone. Islands of dead and necrotic bone are called sequestrum that are sequestered out, pieces of sequestrum surrounded by vital bone is called involucrum.

The presence of putrid odour is generally associated with strict anaerobes of the genera Fusobacterium, Porphyromonas, Prevotella and Parvimonas, which may invade actively the tissues through the production of proteases and exopeptidases and can survive and proliferate within osteolytic lesions with poor blood supply.[10]

Although the mandible is the bone most frequently affected by chronic osteomyelitis, the factors associated with this phenomenon remain unclear. This increased frequency of osteomyelitis in the mandible also occurs in other animal species such as dogs, cats and marine mammals. It is probable that the mandibular bone structure, less plastic than the maxillary bone, may allow microbial persistence, as well as the increased vulnerability of the mandible may be related to trauma and higher incidence of predisposing factors such as pericoronitis.[11]

Other peculiarities of the mandibular bone include exuberant peripheral reactive bone formation, while this feature is rare in the maxilla.[12]

The most commonly detected oral microorganisms in osteomyelitis are represented by Gram-negative anaerobic rods, most of them considered periodontal pathogens, and facultatively anaerobic cocci of genera Staphylococcus and Enterococcus. Clindamycin is frequently used in the treatment of anaerobic infections associated with oral microorganisms, evidencing excellent efficiency in bone infections and oral bioavailability. In addition, self medication using this drug is rare.[13]

Clindamycin is an appropriate antibiotic for most Gram-positive bacteria, including some strains of community-acquired methicillin-resistant Staphylococcus aureus.[14]

If community acquired methicillin-resistant Staphylococcus aureus (MRSA) is a concern (local rates of MRSA are 5%-10%), intravenous treatment with vancomycin or clindamycin is indicated.[14]

The treatment of these infections depends on the sequestrectomy, surgical debridement of the wound, and removal of the bone cortex, associated to the systemic use of antimicrobials.[15]

ACKNOWLEDGEMENTS

The authors thank Prof. Dr. Thiruneervannan (Principal, Vinayaka Missions Sankarachariyar Dental College) for his guidance and encouragement.

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Source of Suppport : Nil
Conflict of Interest : None Declared

CASE REORT

Denture identification Methods - A clinical Study-

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ABSTRACT

Identification of dentures, in turn helps in the identification of individual. This has a high humanitarian value and becomes very important when we come across victims and their families in mass disasters. which involves natural disasters like earthquakes, flood, and tornadoes; accidental disasters like aircraft crashes, train crashes, fires etc.; and terrorism acts. It also has a vital role to play in investigative field. Studies have shown that Europeans maintain an up to date dental treatment records. Here three very simple techniques are discussed to mark complete dentures.

KEY WORDS: Denture; identification; disaster.

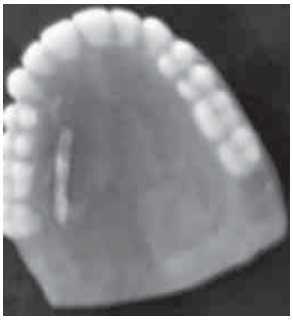
INTRODUCTION

Everyday we come across people in the public like bus station or road side, become unconscious due to various reasons like hypoglycemia , hyper tension, sun stroke, cardiac arrest etc., Sometimes these subjects are taken to hospitals and they will not be in a state to reveal their identity, in these circumstances denture identification methods may help to a certain extent in the personal identification. Denture identification may also help in locating lost or misplaced dentures in a geriatric institution. In forensic dentistry it has a major role in identifying unrecognized deceased persons, in cases of natural disasters like earthquake, tsunami, flood or road traffic accidents or in air craft accidents.

There are so many methods to achieve this goal like surface marking, inclusion technique, bar-coding, microchips, lenticular card etc.. They all have their own advantages and disadvantages. Bar-coding and microchip permit the recording of a large amount of information, but both are expensive and need to have a hand held reader or a computer to read the data. Silicone strips can be incorporated, but they are not readily available in the market. Plastic chips can be used to identify a removable prosthesis. Other methods include a computer generated and laser printed label and a radio ,based tagging transponder placed into the denture.

CASE REPORT 1

In this case a denture was delivered to a sixty year old female patient Mrs .Lekshmi, with an identification metal chip displaying SMIDS the abbreviation of the name of the institution SREE MOOKAMBIKA INSTITUE OF DENTAL SCIENCES placed inside the maxillary denture.



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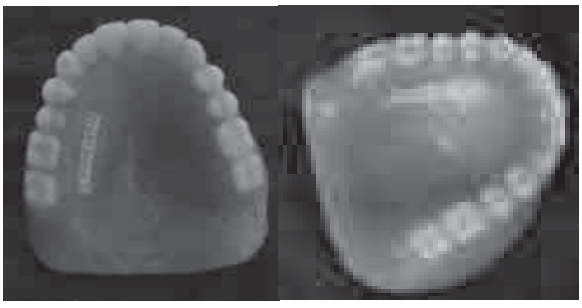
PROCEDURE

The denture was constructed in the conventional way. The name of the institution was inscribed on a matrix band with a contra angle NSK Super torque airotor handpieace and a round diamond bur. The denture base in the distopalatal region was ground off, and the matrix band was embedded with clear acrylic. The denture was then polished and delivered to the patient.

CASE 2

In the second case along with SMIDS the out patient card number was entered on a thin paper. .The finished denture was prepared by grinding the acrylic in the distopalatal region. The paper was wrapped around by cello tape .Clear auto-polymerizing acrylic resin was mixed with monomer and kept in the dough stage inside the groove, before setting, the piece of paper with identification details was embedded and was covered by clear acrylic in the dough stage .The denture was polished to a glass-like finish and it was delivered to sixty five year old Mr. Thankaraj.



CASE 3

In the third case the denture was delivered to fifty five year old male patient Mr. Chenpagaraman Pillai with a cast metal piece embedded in the maxillary denture with the out patient identification number on it. The number 25948 was carved in blue inlay wax, and was adapted to the distopalatal surface of the maxillary cast. The carved wax was attached to a sprue (3mm thickness) and was invested in phosphate bonded investment material .It was heated to a temperature of 850 ºC to burn off the wax in the burnout furnace for one and half hour .The mould was taken out and kept inside a casting machine while the vitallium pellets were kept in the crucible and it was heated in the casting machine with a blow torch (LPG & 0xygen) in the reducing flame. After an hour it was taken out, sand blasted with alumina particles of 110µ size .The sprue was separated with a carborundum disc and trimmed with tungsten carbide bur and polished with carbide bur and buff. This piece of metal casting was embedded in the denture during packing; small amount of the heat cure acrylic resin was kept on the cast metal piece to hold it in place, rest of it was used for packing and processing was done like a conventional denture. The advantage of this method over other methods is that ,even in an air craft mishap this metal piece will not be destroyed by the heat .And another added advantage is that this is radio opaque and can be seen in a radiograph.

DISCUSSION

In the first case the materials used were readily available in the clinic .The technique required only half an hour extra than for the finishing of conventional denture. It does not need any expertise. But the disadvantage was that patient´s address ,phone number or any other details for that matter could not be recorded. Because a large amount of space is required for their recording. Which will make the metal plate heavier.

In case number two a ball point pen was used to write the name and out patient number of on a thin paper strip, a strip of commonly available cellotape was used to protect the paper strip from the action of monomer .Here also the advantages

and disadvantages were the same as that of the first case.

The third case really needed a prosthodontist .Here the out patient number was carved with inlay wax ,cast in metal and was incorporated in the denture during processing stage.All these techniques share the same advantages and disadvantages.

Lenticular cards are superior for that matter .Because a large amount of informations can be recorded, and it costs only ` 45/-, but they are not readily available in the market. Plastic strips will melt on application of heat and can pose a health hazard. Computer generated and laser printed label are expensive and they need the service of experts from other faculty too. The use of a radio based tagging transponder into a complete denture needs a reading device. Metal pieces can be engraved and kept inside the denture but they make the denture heavy. Names can be carved on the surface of the denture but causes accumulation of plaque.

CONCLUSION

These methods are simple and cost effective. Does not need any skilled hand to perform the procedures. Clinical and technical procedures are relatively simple and within the remit of the general dental practitioner .All dentures must have names imbedded in the acrylic resin in the hope that problems of denture identification will be eliminated in the future.

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Source of Suppport : Nil
Conflict of Interest : None declared

CASE REORT

Prosthetic rehabilitation of a patient with nasal defect – A case report

Lylajam S.[1], Prasanth V.[2]

ABSTRACT

Prosthetic rehabilitation of acquired and congenital facial defects should encompass knowledge of the etiology, diagnosis, treatment and rehabilitation of the defect. The rehabilitation is a team approach which includes the maxillofacial surgeon, plastic surgeon, radiotherapist, chemo therapist, prosthodontist, social worker and psychotherapist. Nose is the most important and prominent organ on the face. The loss or even change in the shape will affect the appearance of a person. The fabrication of a life like prosthesis with proper color matching is a skilled art. Even though more sophisticated technologies and materials are available acrylic resin is the material of choice for financially weak patients. This case report describes the rehabilitation of a patient with acrylic resin prosthesis who lost his nose following treatment for multiple myeloma.

KEY WORDS: Nasal prosthesis, Nose rehabilitation, Maxillofacial prosthesis

Introduction

Face is that part of the body involved with expressions of personality and interaction with the environment. Any change in the shape or loss of a portion of the face can cause severe emotional trauma. Facial defects may be congenital or acquired. Acquired defects may be due to trauma or disease.

The rehabilitation of the facial defect is usually a team approach involving oral surgeon, plastic surgeon, prosthodontist and psychotherapist[1]. Nose plays an important role in the appearance of a person. Any change in shape or loss will affect the appearance very badly. This article describes the rehabilitation of a patient who lost his nose following surgical treatment of multiple myeloma.

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Multiple Myeloma

Multiple Myeloma is a neoplasm of bone that originates from the cells of bone marrow which bear a remarkable resemblance to plasma cells, a common constituent of an inflammatory infiltrate. The neoplasm is multi centric origin. Men are affected twice more than females[2]. Nose is rarely affected Treatment & Prognosis is purely palliative the disease invariably terminate fatally in an average of 2 or 3 years[2].

Case report

A 45 year old male reported to the department of Prosthodontics, Govt Dental College, Trivandrum with a nasal defect (Fig.1). A review of medical and dental history revealed that the patient was operated for multiple myeloma of the nose. Functional disabilities and disfigurement had a great psychological impact on the patient.

Treatment plan

Treatment options were discussed with the patient and a nose prosthesis made of acrylic resin was planned. The prosthesis was planned to be retained in position with the help of spectacles.

Procedure

The impression of the face was made with alginate. Care was taken to avoid flow of material into the airway. Stone model was made. Wax

Fig. 1 - Nasal Defect

Fig. 2 - Patient with Prosthesis

Fig. 3 - Prosthesis attached to spectacle

pattern was fabricated and tried on the patients face. The wax pattern was invested in plaster like for normal denture and the mold was prepared. After incorporating proper staining pigments into the acrylic, the mold was packed and cured. The nose prosthesis was retrieved, finished & polished: Tried on the face and attached to a spectacle for retention.[1,3,4] (Fig 2, Fig 3).

Discussion

Recently implants and silicone materials are used for the fabrication of a life like prosthesis. Since acrylic resin is easy to handle and inexpensive, it still remains as the material of choice for economically weak patients. Duplicating Skin with respect to texture, contour and above all color is very difficult[1]. The color of the skin depends on various factors like thickness of epidermis, presence of melanin pigment, blood supply in the area etc. The prosthesis may be colored by intrinsic or extrinsic stain. Here intrinsic stains were used and the esthetic was restored[1].

Another problem was the retention of prosthesis. Since the patient was willing to use spectacles, the prosthesis was attached to it. Prevention of entry of pollen or insects into the air way was difficult.

Conclusion

Fabrication of life like facial prosthesis is a very tiresome procedure. It requires lot of skill and patience. With all the limitations, acrylic resin was used for the fabrication of satisfactory nose prosthesis in this patient.

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Source of Suppport : Nil
Conflict of Interest : None declared

REVIEW

MTA based root canal sealers: A Review

K.SandhyaKini[1] , M Kundabala[2]

ABSTRACT

MTA has been widely used for a variety of applications such as to seal lateral root perforations, pulp capping agent, root end filling material, and a root canal filling material. Newer developments of MTA include its use as a root canal sealer. Sealers based on MTA have been reported to be biocompatible, stimulate mineralization, and encourage apatite-like crystalline deposits in the middle third and apical thirds of canal walls and obliterate discrepancies that cannot be filled with gutta-percha. These sealers due to its osseoconductivity action promotes the physiological closure of the canal by cementoid hard tissue known as endodontic grafting. Currently three novel sealers based on mineral trioxide aggregate are available namely Endo-CPM sealer, MTA Obtura & Pro Root Endo sealer.

KEY WORDS: Root Canal Sealers, MTA Endo sealers.

Introduction

It is well understood that when filling root canals with a solid core material, some form of cement is required for a fluid tight seal that fills the minor gaps between the core material and the dentinal wall of the canal to prevent leakage[1].According to Ørstavik, sealers play an important role in sealing the root canal system with entombment of remaining microorganisms and filling of inaccessible areas of prepared canals. Sealer selection may influence the outcome of endodontic treatment.[2]

MTA a Portland cement based material is currently a material of choice for treating root perforations, pulp capping, pulpotomy and root end filling.MTA was used as a root canal filling material in 1999 by Holland et al. which induced closure of the apical foramen by new cementum deposition.[3]

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An extremely important factor promoting hard tissue closure of the canal is presence of Osseoconductivity . Perfect and lasting in wet environment, hermetic seal of apical third combined with osseoconductivity of endodontic sealer ensure conditions for hard tissue closure of root canal apical orifice. Filling of the root canal with a sealer, which due to its osseoconductivity action promotes the physiological closure of the canal by cementoid hard tissue, can be called "endodontic grafting." Such endodontic grafting can ensure the lasting root's health while it constantly remains in contact with body fluids.[4] Currently three novel sealers based on mineral trioxide aggregate are available namely Endo-CPM sealer, MTA obtura, Pro Root Endo sealer.

Endo-CPM-Sealer

The composition of CPM sealer is reported to be 50%MTA, 7%SiO_2, 10% $CaCO_3$, 10%Bi_2O_3, 10%$BaSO_4$,1% propylene glycol alginate,1% propylene glycol,1% sodium citrate and 10% calcium chloride.[5] This sealer consists of fine hydrophilic particles that form a colloidal gel in the presence of moisture. It becomes solid and forms a hard sealer in one hour.

MTA–Obtura

MTA-Obtura is a mixture of white MTA with a proprietary viscous liquid[6].

ProRoot Endo Sealer

Proroot Endo sealer is a calcium silicate based endodontic sealer.

Major components of ProRoot Endo sealer are tricalcium silicate and dicalcium silicate, with the inclusion of calcium sulphate as a setting retardant, bismuth oxide as a radiopacifier and a small amount of tricalcium aluminate. Tricalcium aluminate is necessary for the initial hydration reaction of the cement. The liquid component consists of viscous aqueous solution of a water soluble polymer .[7,8]

SEALING ABILITY

Carmerilli. J.et al. evaluated the sealing ability of using the fluid filtration method. The sealing ability was of mineral trioxide aggregate sealer was similar to pulp canal sealer. Mineral trioxide aggregate sealer exhibited crystalline deposits rich in calcium and phosphorus on its surface when in contact with a physiological solution. MTA sealer released calcium ions in solution that encouraged the deposition of calcium phosphate crystals.[9]

BACTERIAL LEAKAGE

Oliveria et.al evaluated the bacterial leakage of six root canal sealers namely AH plus, Sealer 26, Epiphany SE, Sealapex ,Endofill, Endo CPM Sealer& MTA based Sealer against enterococcus faecalis. All sealers evaluated allowed bacterial leakage .The MTA based sealers leaked the most.[10]

ANTIMICROBIAL ACTIVITY

Mario et.al evaluated the antimicrobial action Micrococcus luteus, Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa, Candida albicans, Enterrococcus faecalis. The antimicrobial action of MTA against these organisms was associated with elevated pH.[11]

TISSUE REACTION

Subcutaneous tissue reaction was evaluated for Endo-CPM Sealer by Roberta et.al. Endo CPM Sealer had good biologic potential and is attributed to the addition of calcium carbonate .Calcium carbonate has shown to reduce the pH from 12.5 to 10 after setting. This restricts the surface necrosis in contact with the material which allows the action of alkaline phosphatase.[12]

RADIOPACITY

The MTA-based material, Endo CPM Sealer had satisfactory radiopacity, which is attributed to the presence of bismuth trioxide and barium sulphate.[13]

Commercially available MTA based sealer known as MTA Fillapex is highly radiopaque, slow setting time of 2hrs 20 minutes, working time of 35 minutes & is available in small automixing tips.

CONCLUSIONS

Sealers based on MTA have been reported to be biocompatible, stimulate mineralization, and encourage apatite-like crystalline deposits in the middle third and apical thirds of canal walls and obliterate discrepancies that cannot be filled with gutta-percha. MTA based sealers have good antibacterial activity, biocompatibility & radiopacity. However future studies are required to evaluate the other properties of different types of MTA based sealers.

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Source of Suppport : Nil
Conflict of Interest : None declared

REVIEW

Common failures in crown and bridge prosthesis : A Review

S Sudeep[1], William Thomas[2]

ABSTRACT:

How many of us sticks to the saying "Quality is never an accident; it is always the result of high intention, sincere effort, intelligent direction and skillfull execution" by William.A.Foster . Treatment planning in prosthodontics, as in any other field of medicine, involves assessment of probable problems leading to treatment failures. This article attempts to discuss briefly the common problems that can lead to failure of crown and bridge prosthesis[1].

KEYWORDS: Crown and Bridge, Prosthesis, Failures

INTRODUCTION

How many of us sticks to the saying "Quality is never an accident; it is always the result of high intention, sincere effort, intelligent direction and skillfull execution" by William.A.Foster . Treatment planning in prosthodontics, as in any other field of medicine, involves assessment of probable problems leading to treatment failures. This article attempts to discuss briefly the common problems that can lead to failure of crown and bridge prosthesis[1].

1. PERIODONTAL PROBLEMS [1 2 3]

When the patient presents with conditions like,

a) looseness of the bridgework
b) drifting teeth
c) bleeding tissues
d) changes in colour of the gums
e) bad taste
f) bad breath
g) abscess formation

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The evaluation of periodontal status by commonly accepted criteria like bleeding on probing, increase in pocket depth etc. can give the dental surgeon an idea regarding the health of the periodontium which needs to be mandatory for the success and longevity of crown and bridge prosthesis.

2. CARIES OF THE ABUTMENT TOOTH

Caries may be present beneath the restoration, at the margins or the root.[4,5] Incidence of the caries may not be related to the age of the patient rather to the time the bridge had functioned. An assessment of disease susceptibility and control is essential prior to formulating a definitive plan of treatment.

Caries beneath a crown and bridge prosthesis should be suspected where

a) pain and sensitivity to hot, cold, sweet foods and liquids
b) bad taste
c) bad breath
d) loose restorations
e) fractured teeth
f) discoloured teeth

3. PULPAL PROBLEMS OF THE ABUTMENT TOOTH

Pulpal problems often contribute to failure of crown and bridge. Pulpal pain can be acute or

chronic and may be precipitated during crown preparation [4,6]. Poor diagnostic technique makes it difficult to determine requirement of endodontic intervention, which can lead to failure of prosthesis. Hence proper evaluation of the Pulpal status of abutment teeth is necessary . Detailed endodontic evaluation should be considered specially when the patient complaints of:

a) hot, cold or sweet stimuli
b) pain on lying down or during exercise.

Ideally teeth with doubtful pulp should be endodontically treated prior to crown and bridge prosthesis

4. EROSION OF THE TOOTH

Dietary factors like drinking citrus or carbonated drinks often lead to erosion of teeth. In some cases it may be idiopathic or self originated with no apparent external cause. [6]

Evidence of erosion includes,
a) sensitivity to temperature changes
b) spontaneous pain due to Pulpal inflammation
c) alteration of appearance due to thinning of anterior teeth, loss of vertical dimension of the anteriors and loss of cusp anatomy.

Extensive erosion often leads to fracture of tooth that can accelerate failure of crown and bridge. Endodontic intervention and modification of the abutment should be considered prior to definitive crown and bridge restoration.

5. CRACKED TOOTH

When cracks are formed through the enamel and dentine of the tooth, patient presents with[7]:

a) pain to hot and cold foods on biting
b) loss of tooth structure following actual fracture

In such instances cracked tooth syndrome should be considered. Crown and bridge should not be planned in case of a cracked abutment.

6. SUBPONTIC INFLAMMATION

Subpontic inflammation that spread to involve adjacent teeth usually reports to the clinician with [4,8] pain, swelling, bad breath, bad taste and bleeding gums.

This can be corrected by proper designing of the prosthesis.

7. OCCLUSAL DISCREPANCIES

Following restoration with crown and bridge, some patients may report discomfort with their new occlusion. Most patients tolerate minor occlusal discrepancies but discrepancies more than 10 to 15 microns causes discomfort to the patient [7]. When there is occlusal disharmony, patient reports with

a) general discomfort with the bite due to high points
b) sore tooth
c) loose teeth or bridge
d) sensitive teeth
e) sore muscles

In such instances, occlusal adjustment should be considered. Major disharmony needs occlusal evaluation and warrants refabrication of the prosthesis.

8. CHANGE IN VERTICAL DIMENSION:-

Also can be a cause of failure and the patient complaints like [7]:-

a) altered facial appearance (indicated by complaints like, "My chin is too close to my nose")
b) dribbling saliva
c) angular cheilitis
d) alteration in muscle activity (muscle pain)
e) increased V.D, difficulty in swallowing causes muscle strain, sore throat and tired tongue.
f) clashing of teeth due to premature contact of teeth
g) difficult in mastication
h) speech problems

Problems related to abnormal vertical dimension warrants complete re-evaluation of occlusion and refabrication of the prosthesis.

9. CEMENTATION FAILURE:-

Cementation failure of fixed restoration will manifest due to[7]:-

a) inadequate tooth preparation
b) poor fitting of the restoration
c) incorrect manipulation of the cement
d) poor cementation techniques
e) occlusal mismanagement
f) abutment mobility
g) poor mechanical design of restorations

h) poor choice of materials
i) excessive forces (cantilever bridge work)

These failures may be addressed separately.

10. ESTHETIC FAILURES

Ceramic restorations more often fail aesthetically than mechanically or biologically [1,7,9]. Esthetic failures may present as follows:

a) Inability to match the patients natural teeth with available porcelain colours
b) Inadequate shade selection
c) Insufficient tooth reduction causes bulkness of restoration
d) Failure to properly apply and fire the porcelain in the lab
e) Incorrect form or a frame work design that displays metal
f) Age changes in the natural tooth over the years
g) When thin incisors are prepared, the metallic colour of the partial coverage casting may be visible through the remaining tooth structure
h) The marginal fit or cervical form of a prosthesis can promote plaque accumulation causing gingival inflammation, which produces an unnatural soft tissue colour or form that is esthetically unacceptable.

Poor colour match is the most frequent reason for the remakes of the restoration. To prevent esthetic failures, adequate work-up on the patient is mandatory as, **"Prevention is better than cure".**

CONCLUSION

It must be remembered that a patient presenting with failure might have previously demonstrated susceptibility to dental disease. Most failures are unique and revealed varying challenges to the dentist. If the dentist does not have a clear view of the causes of failure, it may not be possible to use the findings of the history and the examination to arrive at a diagnosis and formulate a treatment plan. Recall appointments should be planned to monitor and identify developing diseases and implement corrective treatment before irreversible damage. As restored teeth need more maintenance than healthy teeth.

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Source of Suppport : Nil
Conflict of Interest : None declared

REVIEW

Iatrogenic enamel de-calcification : A Review

R. Roopesh

Abstract

Enamel de-calcification is one of the most common complications of fixed orthodontic appliance therapy, especially when associated with poor oral hygiene. It is the duty of the orthodontist to recognize the high risk patients, evaluate the white spot lesions, reinforce good oral hygiene measures, institute preventive fluoride regimen and manage post treatment white spot lesions to obtain optimum aesthetic results.

Key Words - White spot lesion, Oral hygiene, Fixed Appliances, Demineralization.

Introduction

Despite the advances in orthodontic materials & techniques, the development of enamel demineralization or white spot lesions (WSL) around the brackets remains the most undesirable and common complication of fixed appliance therapy. The formation of WSL during or after completion of orthodontic treatment is discouraging to a speciality whose goal is to improve aesthetics. This leads to patient dissatisfaction and even legal complications. [1]

It is reported in literature that the overall prevalence of WSL amongst orthodontic patients ranges from 2 – 96 %. [2,3,4] Orthodontic treatment with fixed appliances and complex loop designs increases the risk of WSL due to creation of additional retention sites on surfaces that are generally not susceptible to caries. [5] This clinical process has increased since the advent of directly bonded orthodontic brackets. [6]

Demineralization around brackets can be an extremely rapid process, with visible WSL developing with in four weeks after bonding. [7,8,9,10] They appear most frequently on cervical and middle third of buccal surfaces of mandibular incisors, canines and first premolars. [11]

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White Spot Lesions

The WSL has been defined as 'Subsurface enamel porosity from carious demineralization' that is 'a milky white opacity when located on smooth surfaces'. [12]

White discolorations of enamel can be classified as – Dental flourosis, Opacities and White spot lesions. [13] A set of criteria has been developed to differentiate between flourosis and opacities. [14]

WSL can occur on any tooth surface in the oral cavity where plaque is allowed to develop and remain for a period of time. The naturally occurring self cleansing mechanisms of the oral musculature and saliva are limited by the irregular surface of brackets, bands and wires. Patients undergoing treatment with fixed appliances have a rapid increase in volume of dental plaque (with a lower pH) than that in non – orthodontic patients. [15,16] The levels of acidogenic bacteria, streptococcus mutans and lactobacillus, are significantly elevated. [17] Streptococcus mutans and lactobacilli produce acids in the presence of fermentable carbohydrates like sucrose, lowering the pH. Carious decalcification occurs when the pH drops below

the threshold for demineralization, creating an alteration in the appearance of enamel surface, which is visualised in the WSL. [16,18] Micro – leakage around orthodontic brackets also causes WSL. [19] The thermal coefficient of expansion of enamel, ceramic or metal brackets do not match. [20] So the relative expansion of these materials when exposed to the heat and cold of the oral cavity differ. [21] This repeated expansion and contraction at different co-efficient results in fluid being sucked in and out at the margins of the bracket. In comparison with ceramic brackets, metal brackets are associated with more micro leakage. [22] Micro leakage causes bacteria to colonize beneath the brackets causing demineralization.

Risk Factors for Enamel Demineralization [23]

Risk Factor	
Oral Hygiene	· Decalcification around appliance may occur with in four weeks · Proper maintenance of oral hygiene reduces risk of WSL · Self cleansing mechanism of oral structures may be impaired by the orthodontic appliance, leading to accumulation of plaque.
Diet	· Diet and Carbonated drinks high in fermentable carbohydrates decreases intra – oral pH · Volume of fluid, frequency and duration of exposure affect rate of decalcification
Salivary Characteristics	· pH, flow rate and buffering capacity of saliva influence degree of demineralization. · Saliva washes away food particles and bacteria. · Saliva delivers fluoride to enamel.
Excess bonding / failure of banding cement	· Well cemented bands may protect the teeth. Improperly cemented / loose bands results in micro leakage · Excess bonding resin forms a nidus for accumulation of plaque.

Prevention of White Spot Lesions

Oral Hygiene Instructions

It has been shown that patients wearing fixed appliance benefit from the use of electric tooth brushes. [24,25] Mechanical flosses, inter dental brushes and oral irrigation are recommended. [26]

Diet Counselling

Excessive carbohydrate consumption has been shown to increase the rate of decalcification.[27] Patients should be advised to avoid sugar containing foods and drinks.

Increasing resistance of enamel to decalcification

Fluoride has been proven to reduce enamel demineralisation and enhance demineralization. When fluoride ions are incorporated into the surface of enamel, it forms a flourapatite crystal structure that has lower solubility in oral environment compared to hydroxyapatite. Flourapatite helps in reducing tooth decay by demineralization of decalcified areas and reduction in formation of new lesions. [48]

The following are the methods of dispensing fluoride for an orthodontic patient –

1. Fluoride mouth rinses. [28,29.30]
2. Fluoride gels. [31,32,33]
3. Flouride dentifrices. [34,35,36]
4. Fluoride varnishes. [37,38]
5. Fluoride containing sealants and primers. [39,40]
6. Luting cement. [41,42]
7. Orthodontic resin adhesive with fluoride. [43,44]
8. Fluoride containing etchants. [45]
9. Fluoride incorporated into elastomers. [46]
10. Laser irradiation. [47]

Recommendations to prevent WSL

1. Educate and motivate the patients at every visit to maintain optimal oral hygiene.
2. Daily brushing with fluoride tooth paste twice a day. Use of interdental brushes to remove plaque around the brackets.
3. Daily use of fluoride mouth rinse.
4. Performing oral prophylaxis at every appointment for non – complaint patients.
5. Use of chlorhexidine mouthwash at night for 2 weeks in patients with poor oral hygiene
6. Use of topical fluoride in form of varnishes, or gels
7. Cementing the bands with good quality glass ionomer cement.

CONCLUSION

Not withstanding the phenomenal advancement in contemporary orthodontics, white spot lesions continue to plague every orthodontist. It is the duty of the orthodontist to educate the patient about the importance of maintaining good oral hygiene and dietary regimen. Fluoride is the most important agent to prevent decalcification and resist WSL from progressing.

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Source of Suppport : Nil
Conflict of Interest : None declared

REVIEW

Early diagnosis of periodontal disease – An Overview

Jose Richard[1], A.Afzal[2]

ABSTRACT

Porcelain laminate veneers has many advantages. Porcelain in the glazed state is the most esthetic restoration in dentistry. The introduction of high strength dentine bonding agents and reliable resin cements had accelerated the importance of bonded porcelain in esthetic dentistry. Diagnostic mock-ups help to address the concerns of the patient. This article updates the systematic approaches needed in the fabrication of laminate veneers.

KEY WORDS : Laminate veneers, bonded ceramics, esthetics.

Introduction

Periodontium is the supporting structure of the tooth. As a clinician, it is important to assess the periodontal condition before starting any other treatment like restoration, extraction, orthodontic treatment, prosthodontic treatment etc. There is very good long term evidence to show that once the foundation of the periodontium is stable and good plaque control is achieved, all the other treatments will have a better long term prognosis.

Diagnosis of a periodontal disease can be done using clinical assessment and radiographic assessment.

Clinically, the signs of periodontal diseases include gingival inflammation, gingival bleeding, Pus discharge, pocket formation, gingival recession, tooth mobility and migration and alveolar bone loss[1]. The patients complaints include halitosis (bad breath), difficulty in chewing, indigestion, pain, food impaction, difficulty in brushing teeth, tooth mobility, difficulty of speech and depression. A good predictor of gingival health is lack of bleeding on probing[2]. But in smokers, the gingival tissues look relatively healthy and in most cases, do not bleed on probing as smoking masks the presence of the disease[3].

An essential tool for the assessment of the periodontal tissues is the basic periodontal examination probe, also known as WHO probe. Essentially this probe has a 0.5mm diameter ball end a the tip and a black banded area marked at 3.5 – 5.5 mm. This probe was developed by British society of Periodontology from the Community Periodontal Index of Treatment Need (CPITN). This is a simple and quick way of screening patients for any underlying periodontal diseases. Another probe used is Williams periodontal probe with graduated markings at 1-2, 3-5, 7-8, 9-10 is commonly used to assess the periodontal tissues. BPF examination and scoring system divides the mouth into 6 sextants. All the teeth in a sextant are examined and scored accordingly. A furcation probe, also known as a Naber's probe, is used when assessing the degree of furcation involvement of a molar tooth. It is used to measure the amount of bone loss that has occurred within the furcation. The dark bands on the probe, represents 3mm markings. Radiographic assessment of the bone levels around each tooth, root morphology and furcation, involvement, also helps in the diagnosis of periodontal diseases. Also, it supports present and long term prognosis of the teeth. Long cone parallel radiographs or bitewing radiographs are taken of sextants when the score is '3' or more. These specific radiographs allow you to assess the

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bone amount of tooth support present and type of bone defects visible. Bone destruction patterns in periodontal disease are horizontal and angular or vertical defects. Horizontal bone loss is the most common pattern of bone loss in periodontal disease. The bone is reduced in height, but the bone margin remains approximately perpendicular to the tooth surface. The interdental septa and facial and lingual plates are affected, but not necessarily to an equal degree around the same tooth. Vertical or angular defects are those that occur in an oblique direction, leaving a hollowed-out through in the bone alongside the root; the base of the defect is located apical to the surrounding bone. Vertical defects occurring interdentally can generally be seen on the radiograph, although thick, bony plates sometimes may obscure them and they are not seen on radiographs. Vertical defects increase with age.

Radiographic appearance of periodontal disease:

- Fuzziness and a break in the continuity of the lamina dura at the mesial and distal aspect of the crest of the interdental septum have been considered as the earliest radiographic changes in periodontitis[4].
- A wedge-shaped radiolucent area is formed at the mesial and distal aspect of the crest of the septal bone. This is produced by resorption of the bone of the lateral aspect of the interdental septum, with an associated widening of the periodontal space.
- The destructive process extends across the crest of the interdental septum, and the height is reduced. Fingerlike radiolucent projections extend from the crest into the septum.
- Height of the interdental septum is progressively reduced by the extension of the inflammation and the resorption of bone.

FACTORS TO CONSIDER WHEN DETERMINING PROGNOSIS

Overall clinical factors:

- ***Patient age:*** For two patients with comparable levels of remaining connective tissue attachment and alveolar bone, the prognosis is generally better for the older of the two. For the younger patient, the prognosis is not as good because of the shorter time frame in which the periodontal destruction has occurred; the younger patient may have an aggressive type of periodontitis, or disease progression may have increasing because of systemic disease or smoking[5].
- ***Disease severity:*** A tooth with deep pockets and little attachment and bone loss has a better prognosis than one with shallow pockets and severe attachment and bone loss.
- ***Plaque control:*** bacterial plaque is the primary etiologic factor associated with periodontal disease.
- ***Patient compliance and cooperation:*** Prognosis for patients with gingival and periodontal disease is critically dependant on the patient's attitude, desire to retain the natural teeth, and willingness and ability to maintain the good oral hygiene.

Systematic and environmental factors:

- ***Smoking:*** it affects the severity of periodontal destruction and the healing potential of the periodontal tissues. As a result, patients who smoke don't respond as well to conventional periodontal therapy as patients who have never smoked[6].
- ***Systematic disease or condition:*** Prevalence and severity of periodontitis are significantly higher in patients with type 1 and type 2 diabetes than in those without diabetes and the level of control of the diabetes is an important variable in assessing the severity of periodontal disease[7]. Therefore, patients at risk for diabetes should be identified as early as possible and informed of the relationship between periodontitis and diabetes.
- ***Genetic factors:*** these may play an important role in determining the nature of host's response to the microbial challenge. Genetic polymorphisms in the interleukin-1 genes, resulting in increased production of 1L-1â, have been associated with a significant increase in risk for severe, generalized, chronic periodontitis[8].

l ***Stress:*** physical and emotional stress, as well as substance abuse, may alter the patient's ability to respond to the periodontal treatment performed. [These factors must be realistically faced in attempting to establish a prognosis.][9]

Local factors:

- ***Plaque and calculus:*** microbial challenge presented by bacterial plaque and calculus is the most important local factor in periodontal diseases. In most cases, a good prognosis depends on the ability of the patient and clinician to remove these etiologic factors.
- ***Subgingival restorations:*** these may contribute to increased plaque accumulation, increased inflammation, and increased bone loss when compared with the supragingival margins.
- ***Anatomic factors:*** Anatomic factors that may predispose the periodontium to disease and therefore affect the prognosis include short, tapered roots with large crowns[10], cervical enamel projections and enamel pearls, intermediate bifurcation ridges, root concavities, and developmental grooves. So these factors affect the efficiency of periodontal therapy and can have a negative impact on the prognosis.
- ***Tooth mobility:*** The principal causes of tooth mobility are loss of alveolar bone, inflammatory changes in the periodontal ligament and trauma from occlusion. Tooth mobility resulting from loss of alveolar bone is not likely to be corrected. Rarely, cases in which ideal plaque control was attained, healing in both hypermobile and firm teeth was found.
- ***Prosthetic and restorative factors:*** additionally special oral hygiene measures should be instituted in these cases to maintain a proper healthy periodontium.
- ***Caries, non vital teeth and Root resorption:*** For teeth mutilated by extensive caries, the feasibility of adequate restoration and endodontic therapy should be considered before undertaking periodontal treatment. The periodontal prognosis of both non vital and vital teeth does not differ from that of vital teeth. New attachment can occur to the cementum of both non vital and vital teeth.

RISK FACTORS

The clinician should be aware of the risk factors that can make the development of periodontal disease more likely. Among the risk factors, the most important ones are diabetes, smoking and genetic predisposition. A combination of these factors make certain patients much more susceptible to periodontal disease. These cases may be treated in practice initially, but referral would be required if the disease is not stabilized by initial therapy. Clinicians should be especially aware of:

- BPE scores of 3 and 4 in patients under 35 years of age.
- Smoking 10+ cigarettes a day
- Medical condition directly affecting the periodontal tissues eg. Diabetes mellitus, stress, and certain types of medication.
- Root morphology that adversely affects prognosis
- Rapid periodontal breakdon with >2mm attachment los in any one year
- A high bleeding percentage with a low plaque score
- A family history of early tooth loss due to periodontal disease.

ORAL HYGIENE

A high standard of oral hygiene is critical for successful periodontal therapy. Regular plaque removal around periodontally involved teeth leads to a reduction in disease progression.

It is essentially that the patient is taught ways that are both simple and effective to improve their plaque control at home. The daily use of a rotary electric toothbrush and interdental brushes have been found to be very effective in the control of periodontitis. It is important to get your patients to use the largest interdental brushes that will fit into each space. But this can be a little difficult – they may not be able to see the long term benefits as their gums may bleed more at first and the interproximal spaces will become larger. It is essential to continually reinforce the same message. This will reassure the patient, and after a short time

they will see visible benefits i.e. less bleeding on cleaning and healthier looking gingiva.

SUMMARY

General practitioner constitute the primary task force in dental health care. Assessing periodontal condition and maintaining good periodontal health prior to any dental procedure is very critical for long term prognosis. Local and systemic factors of periodontal disease also to be put under control. Regular oral hygiene measures are to be instructed for maintenance of dental health.

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Source of Suppport : Nil
Conflict of Interest : None Declared

REVIEW

Candida albicans in periapical infections : A review

Murali Govind[1], A. Afzal[2]

ABSTRACT

Candida species are carried in the oral cavity, gastrointestinal tract, anus, groin, vaginal canal, and vulva of healthy people, Most of these endogenous fungi are opportunistic pathogens, and infections caused by them usually arise from an imbalance of normal microbiota induced by the administration of broad spectrum antibiotics, immunosuppression, and the disruption of protective barriers. Fungal infections are usually "diseases of the diseased." And some predisposition has to be present for the host to be affected.The composition of microflora of root canals has been the focus of considerable research over the years. Results of studies clearly defined the microbial differences between primary endodontic treatment and retreatment. Apical periodontitis persisting after root canal treatment presents a more complex etiological and therapeutic situation. It appears that certain species of microorganisms, especially Gram-positive facultatives. which often have expanded representation in retreatment cases in comparison with primary endodontic treatment, possess greater resistance to antimicrobial agents used during endodontic treatment than anaerobes. This has shifted the focus of scientists to these microorganisms in recent years.

KEY WORDS : Cadida albicans, periapical infections

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Fungi constitute a small part of the microbiotics. The largest proportion of the fungai micro biota is made up of Candida species. Candida albicans is the fungal species most commonly detected in the oral cavity of both healthy and medically compromised individuals. The incidence of C albicans in the oral cavity has been reported to be 30% to 45% in healthy adults and 95% in patients infected with human immunodeficiency virus. The dorsum of the tongue is deemed to be the primary oral habitat of C albicans. Whereas other sites may be colonized secondarily. Such sites include the mucosa and surpragingivae, the dentin, the root, the subgingivae, and the periodontal pockets. A large

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number of other yeasts have also been isolated from the oral cavity, including Candida glabrata, Candida guilliermondii, Candida parapsilosis, Candida krusei, candida inconspicua, candida dubliniensis, Candida tropicalis, and Saccharomyces species[1].

The predominance of Candida albicans was justified by their frequency as commensal oral flora, explaining someway the failure of some intracanal endodontic medication. As well as causing pseudomembranous candidiasis, the common commensal yeast Candida albicans can also be the etiological agent of a variety of oral mucosal lesions, including chronic hyperplastic candidiasis.

Candida albicans is by far the fungal species most commonly isolated from infected root canals, and this species has been considered a dentinophilic microorganism because of its invasive affinity to Cell walls of fungi are usually 80% to 90% polysaccharide, with proteins, lipids, polyphosphates and inorganic ions composing the cementing matrix of the cell wall[2].

Approximately 80% to 90% of the cell wall of Calbicans is composed of carbohydrates, which are represented basically by 3 major polysaccharides: b-glucans (20%-40% of the wall's dry weight) The cell wall of C albicans also contains proteins (6%-25%) and minor amounts of lipids (1%-7%). In addition to providing rigidity and protection to the cell, the fungal cell wall plays and essential role in practically every aspect of the biology and pathogenicity of Calbicans.

MECHANISM OF FUNGAL PATHOGENICITY

Fungi have been demonstrated to possess virulence attributes that may play a role in disease causation. The mechanism believed to be involved in pathogenesis are (1) adaptability to a variety of environmental conditions (2) adhesion to a variety of surfaces (3) production of hydrolytic enzymes, (4) morphologic transition (5) bio-film formation, and (6) evasion and immunomodulation of the host defense[2].

Fungi in primary endodontic infections

Although fungi have been detected in infected root canals, their precise role as endodontic pathogens has not yet been elucidated. Regardless of the species, single or budding yeast cells were the only fungal forms observed. Candida albicans colonized most of the specimens. In some specimens, colonization of the dentinal surface was slight and no penetration within dentinal tubules was observed. In the other specimens, some area of the root canal walls were covered with large colonies of yeast cells and some dentinal tubules wee heavily infected.

Fungi have not been reported to be common members of the microbiota associated with primary endodontic infections. Even so, their occurrence has been reported by some researches using culturing, molecular genetic methods, and in situ electron microscopy Moller isolated a *Candidu* species from 1 of 29 samples form necrotic pulps of teeth with intact crowns that showed positive growth, asymptomatic pariradicular lesions. They also detected this fungal species in the blood of a patient undergoing endodontic therapy. Lane et al isolated catropicalis from 2 patient, and S cerevisiae from 1 and 27 patients with initially infected root canals. Baumgartner et al detected C albicans in 5 of 24 root canal samples by menas of a polymerase chain reaction assay. In contrast, Siqueira et al, who also used the polymerase chain reaction, detected fungi in only 1 of 50 infected root canals[3]. Sen et al found yeasts heavily associated with periradicular lesions. In 1 specimen, hyphal structures were also observed. Siqueira et al investigated the patterns of microbial colonization in primary root canal infections through scanning electron microscopy and found yeastlike cells in 1 of 15 examined teeth. They were forming a large colony with some cells in the process of budding. In addition, the presence of yeast cells was shown in the resorption lacunae of periapical root surfaces and also in periadicular granuloma.

Now it is evident that the management of persistent apical periodontitis is more complex and less uniform regarding the choice of intracanal medicaments and sequence of their use than in the management of apical periodontitis affecting non-treated teeth. Another microorganism which has been periodically identified in teeth with persistent post – treatment apical periodontitis is Candida albicans. It is obvious that yeasts are rare inhabitants of untreated root canals, unless these

canals have been open to the oral cavity. Some characteristics of yeasts are common with enterococci[4]. One of them is that both these microorganisms can survive as a monoinfection and even invade dentinal tubules. Studies have shown that sodium hypochlorite one of the most popular intracanal medicament, is a potent killing agent for Candida species while to the antimicrobial action of calcium hydroxide they are resistant. Both microorganisms, candida and enterococci share several properties necessary to establish and survive in the harsh environment of the root filled canal. These properties include resistance to various antimicrobial agents, an ability to grow in moninfections and survival in limitation of nutrients supply.

Apical periodontitis is an inflammatory process in the periapical region and in most cases chemomechanical preparation with intra – canal medications such as calcium hydroxide followed by canal obturations with gutta – percha and a sealer results in the resolution of infection and the repair of the periapical lesions. But in some cases, apical periodontiti does not properly respond to root canal treatment and leads to periapical infection, persisting for months or even years after routine root canal treatment[5].

In a study by Najzar – Fleger et al, carious lesions were reported as the main source of fungus and dental caries was reported the only part of entry on fungi into the root canal system. Therefore, proper isolation of teeth during endodontic treatment may prevent microorganisms, including Candida albicans, from entering the root canal system.

Fungi in persistent secondary endodontic infections

Fungi have occasionally been found in primary root canal infections, but they seem to be more common in the root canals of obturated teeth in which the treatment has failed. Nair et al observed yeasts in 2 of 9 surgical block biopsy specimens from periradicular lesions refractory to the endodontic treatment. Waltimo et al reported the occurrence of fungi in 47 of 692 cases of persistent endodontic infections either in pure culture or along with bacteria. C albicans was the most common isolate[6]. Other fungal species isolated were C glabrata, C guilliermondii, C inconspicua, and Geotrichum candidum. Sundqvist et al isolated C albicans from 2 of 24 canals of teeth in which endodontic treatment has failed. Under similar conditions, Molander et al found C albicans in 3 of 68 samples and Peciulience et al, in 6 of 33 culture-positive root-filled teeth associated with periradicular lesions, Hancock et al recovered C albicans from 1 of 34 root-filled teeth with chronic periradicular lesions that showed detectable microbial growth. Cheung and Ho isolated this fungal species from 2 of 12 patients from Southern China in whom treatment had failed. By examining samples from treatment failures in Brazil, Pinheiro et al found Candida species in 2 of 51 patients by using culture, whereas Siqueira and Rocas detected C albicans in 2 of 22 patient by using polymerase chain reaction. Taken together, all these reports lend support to the assertion that fungi can gain access to the root canals through contamination during endodontic therapy and can be involved in the etiology of recalcitrant periradicular lesions[7].

Microorganisms present within tubules can be unaffected by the chemomechanical procedure. As aforementioned, C albicans is able to invade dentinal tubules to a variable extent. Within tubules, the microorganism may be protected from the lethal action of endodontic medicaments by the inactivating effects by dentin.[7] In addition to the invading ability, C albicans has been demonstrated to be resistant to some intracanal medicaments after direct contact. Both features may help to explain why this fungal species has been associated with cases of persistent root canal infections. Moreover, the ability to form dentin. Candida albicans has also been discovered to be resistant to some intracanal medicaments, such as calcium hydroxide.[8]

Another important factor which started to be evident during the last years is that microbes in the root canals can grow not only as planktonic cells or in aggregates, co-aggregates, but they can also form biofilms consisting of a complex network of different microorganisms. Biofilm formation in root canals is probably initiated some time after the first invasion of the pulp chamber by planktonic oral microorganisms after some tissue breakdown[9]. Biofilms are composed of microcolonies of

bacterial cells that are distributed in a matrix which consists of exopolysaccharides, proteins, salts and cell material in an aqueous solution. The matrix takes about 85% of the volume of a biofilm. Bacterial biofilms are reported to be the most common cause of persistent inflammation.

MORPHOLOGIC CHARACTERISTICS OF FUNGI

Fungi are chemoorganotroph eukaryotic microorganism that may be found in 2 basic forms: molds and yeasts. Molds are multicellular filamentous fungi consisting of branching cylindrical tubules. A single filament is called a hypha. Hypha are either separate (divided by partition) or coenocytic (multinucleate without cross alls) and usually grow along a surface, then branch and form compact tufts, collectively called mycelium. There is extensive cytoplasmic streaming within a hypha, usually directed toward the hypha tip, and the older portion of the hypha usually become vacuolated and virtually devoid of cytoplasm. Even if a hypha possesses septum cytoplasmic movement can occur because there is usually a pore in the center of the septum.[10]

Yeasts are unicellular fungi, and cells are spherical or oval in shape. Cell division usually takes place by budding, in which a new cell forms as a small outgrowth of the mother cell. The formation of the septum is preceded by the appearance of a filament ring containing a large amount of chitin. The nucleus migrates into the neck region between the mother and the daughter cell before dividing. The bud gradually enlarges and separates from the old cell, leaving behind a bud scar. The buds that are formed are called *blasoconidia*. Pseudo hyphae are elongated yeast cells that appear as filamentous cell chains.[10]

Calbicans, one of the well-studied fungal species, can reproduce by budding, which results in the formation of yeast cells (also called blastospores or blastoconidia). The production of germ tubes results in the conversion to a hypha. The formation of pseudohyphae occurs by polarized cell division when yeast cells growing by budding have elongated without detaching from adjacent cells. In addition, under certain conditions, Calbicans can undergo the formation of chlamydospores, which are round, refractile spores with a thick cell wall. These morphologic transitions commonly represent a response of the fungus to changing environmental conditions and may permit the fungus to adapt to different sites.

Fungi have a defined nucleus enclosed by an unclear membrane. Their cell membrane contains lipids (including sterols) and glycoprotein. They also have mitochondria, golgi apparatus, ribosomes, endoplasmic reticulum, and a cell wall. Fungal cell walls resemble plant cell walls architecturally but not chemically[11]. Chitin, a polymer of N-acetylgucosamine, is a common constituent of fungal cell walls. Certain fungi contain cellulose in their cell walls. Microfibrils of chitin or cellulose are interwined and embedded in an amorphous matrix that cements them together. Other polysaccharides, such as glucans, mannans, galactosans, and chitosans, replace chitin or cellulose in some fungal walls.

Biofilms on the root canal walls may represent a mechanism by which C albicans can escape intracanal procedures of disinfection. In multilayered biofilms, the superficial layer of cells will be directly affected by a relatively high concentration of the irrigating solution. Nonetheless, the extracellular matrix of the biofilm prevent further penetration of the irrigant into deeper layers in optima concentrations to exert antimicrobial effects. Root canal instrumentation can disrupt biofilm structure, yet it is well established that instrumentation is unable to reach all root canal walls and may leave behind untouched areas containing microorganisms.

It has been demonstrated that Candida species are resistant to some medication commonly used in endodontics, such has calcium hydroxide. Waltimo et al evaluated the susceptibility of 7 strains of C albicans to 4 disinfection: iodine potassium iodide, chlorhexidine acetate, sodium hypochlorite, and calcium hydroxide. In addition, all possible pairs of the disinfections were tested to compare the effect of the combination and its components. C albicans cells were highly resistant to calcium hydroxide. The same research group studied the susceptibility of common oral Candida species to saturated aqueous calcium hydroxide solution. The yeast species tested were C albians, C glabrala, C guilliermondii, C krusei, and C

tropicalis. The susceptibility of E faecalis was also evaluated for comparative purposes. They observed that all Candida specie showed either equally high or higher resistance to adueous calcium hydroxide than did E faecalis. Because C albicans survive in a wide range of pH values, the alkalinity of saturated calcium hydroxide solution may not have any effect on C albican. In addition, calcium hydroxide solution may readily display the Ca++ ions necessary for the growth and morphogenesis of Candida. These mechanisms may explain why calcium hydroxide has been found to be ineffective against C albicans.

Ferguson et al sought of determine the in vitro susceptibility of C albicans to various irrigants and medicaments. The minimum inhibitory concentrations of NaOCl, hydrogen peroxide, chlorhexidine digluconate and aqueous calcium hydroxide were determined. Their results revealed that NaOCl hydrogen peroxide, and chlorhexidine digluconate effective against C albicans even when significantly diluted. Aqueous calcium hydroxide had no activity. When maintained in direct contact with C albicans cells, calcium hydroxide paste and CMCP were effective in killing this microorganism.[12] The antifungal effectiveness of CMCP was also shown by Valera et al who investigated the effectiveness of several intracanal medications on C dibicans harvested inside root canals, observing that CMCP was the most effective, followed by calcium hydroxide / CMCP paste.

The use of irrigating solutions with proper anti-microbial and anti-fungal properties during root canal debridement and preparation are considered enormously important. Waltimo et al introduced fungi a microorganisms resistant to endodontic treatment in apical periodontitis and demonstrated that Candida albicans species require incubation with a saturated solution of calcium hydroxide for 16 hours.

Conclusion

On the basis of these reports, it seems that some medicaments, such as chlorhexidine digluconate, calcium hydroxide combinations (with CMCP or chlorhexidine), and EDTA, have the potential to be used as effective intracanal medication for patients in whom fungal infection is suspected.

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Source of Suppport : Nil
Conflict of Interest : None Declared

REVIEW

Comparison of 4th & 5th generation bonding systems – A review

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ABSTRACT

For the past few decades of twentieth century, dentistry in general and restorative dentistry in particular has been experiencing a period of dynamic change. In restorative dentistry, the adhesive bond between restorative material and tooth substance permits an aesthetic treatment which preservers tooth substance. Choosing of bonding system has become challenging for a clinician due to rapid development of new products. This article reviews the bonding systems upto the 5th generation and gives a comparison on 4lh and 5lh generation bonding systems.

KEY WORDS : bonding systems, 4th & 5th generation

Introduction

Adhesion of dental resins to enamel and dentin has progressed dramatically in the 40 years since Buonocore introduced the technique of etching enamel with phosphoric acid to improve the adhesion of resin fillings to enamel. To better describe the adhesives, the term "generation" was established, which permits a relatively simple classification of adhesive systems. The first dental adhesives bonded resins to enamel only, with little or no dentin adhesion or sealing of dentin margins. Subsequent generations of dental adhesives have dramatically improved the bond strength to dentin and the sealing of dentin margins while retaining a strong bond to enamel.[1]

The adhesive systems used today offer satisfactory bond strengths for both enamel and dentin. The problem with most systems is their method of use, since dentin adhesives are characterized by a complex series of steps. Error in use and the associated reduction in bond strength may result in premature failure of an adhesive restoration.[2]

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The individual generations are distinguished, for example, by the fact that the smear layer on the dentin was not removed by the first products (2nd generation), whereas with later generations it is removed with phosphoric acid (3rd, 4th and 5th generations). Another distinguishing feature is the number of components used. While 4th generation adhesives mostly consist of a primer and a bonding agent, 5th generation products, known as "one-bottle-adhesives", only have a single component for both the priming and bonding stages.[1]

Whereas the term "generations" is frequently applied to adhesive systems which require separate etching, it is virtually impossible to categorize self-etching products in terms of "generations".

Among the scientists who contributed significantly in the field of bonding adhesive system are Michael Buonocore (Etching of enamel by phosphoric acid and bonding to acrylic resin. 1955). R.L. Bowen (Development of Composite resin 1962) / Nobuo Nakabayahi (Resin reinforced hybrid layer, 1982), Takao Fusayama et al. (Total etch teeth 1979), J. Kanca et al (Moist bonding technique 1992)[2a].

Adhesion Mechanism of Conventional Adhesives

Adhesive dentistry permits a minimally invasive preparation technique. Preparations for restoration can be designed so that less tooth substance has to be removed because no retentive shape has to be

created. The bond between the restorative material and the hard tooth substance is created by adhesive systems. The adhesion mechanism upon which it is based is explained in greater detail below.

Mechanisms of Adhesion to the Enamel

Untreated enamel does not allow any durable bond with the composite material because it only has minimal porosities and its surface energy is not very suitable for wetting with monomers. Owing to the acid conditioning, for example with 30% to 40% ortho-phosphoric acid, enamel prisms and interprismatic enamel are dissolved to a different extent and a microretentive relief is created.[3]

On etched enamel, a low-viscosity composite or an adhesive (bonding agent) disperses easily, penetrates the microporosities of the treated enamel surface treated and thus provides for microretentive bonding of the composite.

Bonding of adhesive resin to dentin

Several concepts been proposed which are as followed:-

1. Bonding via resin tag formation in the dentinal tubules of etched dentin (Nordenvall et all 1980)
2. Formation of precipitates on pre-treated dentinal substrates to which an adhesive resin may be chemically or mechanically bonded (Bowen, Cobb & Rapsot 1983)
4. A fourth concept is diffusion and impregnation of monomers into the subsurface of pre-treated dentin substrates and their polymerization creating a hybrid layer or resin-reinforced dentin layer (Nakabayasshi et al 1982, Wang and Nakabayahi 1991). The boding agent may act.
    a) by way of chemical reaction
    b) by their ability to penetrate not only the dental tubules but also the intertubular substance of the surface layer of the dentin.

GENERATION OF DENTIN BONDING AGENTS [1,3,4,5]

1. First Generation dentin Bonding agent

The first commercial system of this type (Cervident, S S White) added a surface active co-monomer N-phenylglycine glycidyl methacrylate (Bowen 1965) to the BIS-GMA resin to facilitate chelation with surface calcium. NPG-GMA acts as a coupling agent in which one end of this molecule bonds to dentin while the other bonds (polymerizes) to composite resin. Studies of this system (Huget et al 1979) found poor adhesion of resin to the dentin (Mean shear strength 3 PMa). Another example is Cosmic bond (Amalgamated Dental. London).

2. Second Generation Dentin Bonding agents

The next generation of dentin adhesive agents primarily used polymerizable phosphates added to BIS-GMA resins. Adhesives that used, a phosphate group to promote bonding to the calcium in mineralized tooth structures were generally referred to as phosphate bonding systems.

One major concern with these systems was that the phosphate bond to calcium in the dentin was not strong enough to resist the hydrolysis resulting from water immersion. This hydrolysis resulting from either saliva exposure or moisture from the dentin itself, could result in composite resin debonding from the dentin and causing microleakage. Since dentin was not etched in these early bonding systems, much of the adhesion was due to bonding to the smear layer. Some of the second-generation systems were thought to soften the smear layer and thus improve resin penetration. However, these systems resulted in bond strengths to dentin that were weak and unreliable.

Mean shear Bond strength ranges from 2 to 7 MPa.

Examples are:

Clearfil (Kuraray Co. Japan, contains a reaction product of 2-HEMA and phenyl P) Scortach bond (3M Dental, MN contains a halophospheriopus ester of BIS-GMA). Others are, Bondite, Creation Bond, Kular Dentin Adhesive, Prisma Universal Bond, Dentin Adhesit,

3. Third Generation Dentin Bonding agents

This system utilized a conditioning step either to modify or remove smear layer; Bowen et al (1982) developed a multistep adhesive system that has been called an oxalate bonding system. This system utilized a dentin conditioner of 2.5% nitric acid in combination of ferric oxalate (later aluminium

oxalate). This conditioning step as followed by sequential treatments of NTG-GMA and PMDM (also referred to as F-N-P system).

This multistep procedure can be described as

E + n x p + B i.e. Etch + Prime (n coats) + Bond

Mean shear bond strength reported are in the range of 9 to 18 Mpa.

Examples: Tenure, Mirage, Bond, Gluma Bonding System, Scotch bond 2, XR Primer / XR Bond, Prisma Universal Bond 2&3, Denthesive, clear filliner bond

With the advent of 4th generation DBA, 1st, 2nd, 3rd generation DBA become obsolete and not marketed now.

4. Fourth Generation Dentin Bonding agents

Modern adhesive relay on diffusion and impregnation of results into the substrate of partially decalcified dentin followed by polymerization creating a hybrid resin reinforced layer.

Fourth generation systems have a dentin conditioning step followed by application of a multi component resin systems, Earlier, air drying was recommended for the dentin but now the adhesives are designed to work on well hydrated or moist dentin (Moist bonding technique, Kanca, 1992).

John Kanca's Moist Bonding Technique[6]

Adhesive systems containing hydrophilic primer dissolved in acetone or ethanol, were found to produce higher bond strength when acid conditioning dentine was left visibly moist prior to bonding. Micromechanical retention is achieved by means of resin infiltration into the dematerialized collagen matrix to form a hybrid layer of resin impregnated dentin.

Dr. J. Perdigao has reported that the benefit of moist bonding is derived from the ability of water to keep the interfibrillar channels within the collagen network, from collapsing during resin infiltration. These channels which are about 20 mm wide when fully extended must be maintained open to facilitate optimal diffusion of resin monomers into the dematerialized intertubular dentin. An optimally infiltrated hybrid layer should contain about 70% collagen and 30% resin.

When demineralized dentin is dried reduction in the dimensions of these channels results in the collagen fibrils touching one another, thereby promoting interfibrillar hydrogen bonding. Besides stiffening of the collagen fibril, there is also a reduction in the sparse zone inside the hybrid layer, the hybriodoid region. This is a potentially weak zone that may be susceptible to degradation through hydrolysis of the weak, unsupported collagen. One the other hand, if water or a water based adhesive is added to dried dentine, the water reverses all the events, Water has a plasticizing effect on the collapsed, desiccated collagen fibrils, by breaking the intermolecular hydrogen bonds between them.

One must be aware that this process takes time and it is preudent to leave a water based adhesive on dried dentine for at least adhesive on dried dentine for at least 20 seconds before allowing it to polymerize. Similarly, adding a rewetting agent such as 30% HEMA to dried dentin works simple because water is present – the HEMA only serves to copolymerize with the subsequently applied adhesive resin.[5]

4th generation dentin bonding agents may be again described as,

E + nxP+B (Eth + Prime (n coats) + Bond

Examples are

All bound – 2 (BISCO), Scotch Bond Multipurpose (3M), Prime and Bond (PROBOND, DENTSPLY), Solid Bond (KULZER), Otpibond (SYBORN/KERR), Permaquick (ULTRADENT), Imperiva Bond (SHOFU).

Another unique 4th generation DBA system is Liner Bond – 2 (Kurary). This system introduced the concept of a no rinse self etching primer.

Self etching involves simultaneous total etching and priming of dentin and cut enamel. It is made possible by the use of primers that contain phosphate monomers. These monomers include as acid group that dissolves or converts smear layer, subsequently penetrates the denting tubules creating a uniform hybrid layer.

This system may be described as,

EP + B (a paradign shift)

The primer consisted of phenyl P. HEMA and a bonding resin containing MDP BIS GMA and colloidal silica. The advantages include gentle etching, elimination of water rinsing and also there is no need to worry about preventing collagen collapse.

5. Fifth Generation Dentin Bonding Agents:

In effort to simplify dentin bonding, manufacture introduced systems that combine the primer and adhesive agents. These systems have generally been reported to as "One-component systems" (Mason & others 1997, Kanca 1997). This technique also referred to as "One coat, one bond and one cure technology" (Stephen M Y Wei 2000).

These materials consist of hydrophilic and hydrophobic resins simultaneously dissolved in solvent like alcohol or acetone, displacing water and achieving an intimate contact to dentinal structures.

These materials also generally rely on residual moisture in the dentin and hydrophilic water chasing compositions to effect resin penetration into the dentin. Given the relatively high percentage of solvent, these formulations may be less forgiving to small changes in the dentin moisture content and may also require multiple application of primer/adhesive combination for successful bonding (Tay FR, 1996).

This system may be described as,

E + N x PB

These one bottle systems are sensitive to even mild desiccation of acid conditioned dentin leading to significantly reduced and strengths, indicating that the window of opportunity of optimal adhesion depends on keeping the demonetarized collagen network moist (MA Latta 1998). Few examples are – One step (BISCO), Single Bond (3M), Prime & Bond 2.0, 2.1 & NT, (DENTSPLY), Opti Bond Solo (KERR), Bond 1 (JENERIC EXCITE (1 VOCLAR), Clearfil (SE Bond (J.MORITA).

Ormocers (originally modified ceramics)

Admira Bond (Vocco) Claimed by manufacturer a world's first 'ormocer' based combination of primer and adhesive to achieve a one component resin. The Ormocers are special adhesives consisting of inorganic backhone build in SiO_2 to which polymerizable units are added. Special Ca+ complexing co-polymers reinforce that adhesive force of Admira Bond to dentin and enamel. This one component self priming system is reported to contain a BIS-GMA, HEMA, BHT acetone and organic acids.

Another example is Definite (Degauss)

Liner Bond 2V (Kuraray) enables bonding to metal and porcelain by the addition of a metal primer and saline coupling agent. Also, the bonding adhesive can be used for chemical cure resin composite because it is a dual cure type. MDP is utilized as a monomer in primer instead of phenyl P.

The mean shear bond strength are reported to be exceeding 20 MPa for 5th generation DBA.

Table 1 - 4th generation bonding agent

Adhesive System	Conditioner	Major component to primer	Major component to the adhesive	Mean shear bond strength
All bond-2 (Bisco)	P.A*	NTG GMA BPDM Acetone	BI-GMA, HEMA	21.1+7.8
Scotch bond Mutipurpose	10% Maleic acide or PA	HEMA, Vitrebond co-polymer	BIS-GMA, HEMA	23.1+2.6
Opti-bond (ybron/kerr)	P.A	HEMA, GPDM Ethanol, H2O	BIS-GMA, HEMA, GPDM, Baruim, glass, fumed silica	19.7+3.6
Pro-bond	P.A (enamel) Not required for dentin	PENTA, Acetone/Ethanol	PENTA, UDMA, Gluteradehyde	16.3+4.5
Liner-Bond-2 (Kuraray)	P. A (enamel)	No rinse, elf-Etching phenyl-p HEMA	MDP, BIS-GMA, colloidal silica	19.4 (enamel) 28.2 (dentin)

* Phosphoric acid

DISCUSSION

The basic differences between the 4th and 5th generation dentin bonding agent relate to the

Table 2 - 5th generation bonding agent

Adhesive	Conditioner	Primer + adhesive	Mean shear Bond strength
One step (Bisco)	PA	BIS-GMA BPDM HEMA < acetone	22.5+3.8
Single Bond	PA	HEMA, BIS-GMA, Dimethacrylate resin, polyacrylic acid, H2O, ethanol	30.0 + 5.5
Opti Bond (solo) (Sybron/Kerr)	PA	HEMA, GPDM, BIS-GMA, Ethanol/H_2O, fumedsillica Barium glass	23.0 + 3.4
Prime & Bond-2 (Dentsply)	PA	PENTA, TEGDMA UDMA, Acetone, cetylamine fluoride	21.2 + 5.0

number of basic components of bottles. The fourth generation bonding system contains two or more bottles. One consists of the primer and the other the adhesive. The fifth generation dentin bonding agents on the other hand, contain only one bottle. Although not a major advance in science, the concept was marketed on the basis that it would be simpler and faster than the fourth generation systems.[3]

On the basis of bond strengths, the to generations exhibit essentially the same values. Furthermore, no apparent differences could be detected in development and effectiveness of the hybrid zone.[4] The newest generation however exhibited a number of problems. First of all, since it contained no separate adhesive component, the operator is prevented from carrying out a number of procedures former considered routine with the previous generation.

Still another potential problem associated with the fifth generation dentin bonding agent is a higher incidence of reported postoperative sensitivity. Again, the exact reason for the problems has yet to be determined. However, it should be pointed out that as the number of ingredients (bottles) decreased, so also did the potential for controlling the variables by the clinician.[5] Essentially, the individual application of the primer first permitted the operator to be responsible for the degree in which the monomer penetration or diffused into the decalcified denti – Placing both the primer and the adhesive into a single container simply reducer the opportunity for what may be lack of critical control.[2a]

The newer generation dentinal adhesives actually reduced the potential for achieving certain objectives. For example, the bonding potential of the fifth generation agents to dual-cure core materials generally are appreciably diminished. The same can be said for the dual-cure luting agents.

The reason for the minimal bond strengths to self-cure or dual cure materials can be related to the reduced pH associated with the bonding agents. In essence the acidic nature of the 5th generation materials tie up the tertiary amines of the self-cured systems. As a result there is an interference with the interfacial chemical linkage between the bonding agent and the luting agent.[6]

The bond strengths associated with the self or dual-cured composite resins is appreciably less than those associated with the light-cured composite resins. There is a corresponding relationship between pH values and bond strength (self or dual-cure).[4]

The highest bond strength can be related to the pH value. The reduced bond strengths exhibited by many of the 5th generation adhesives can be related to an expenditure of the territory amine (self-cure component) by the acidic monomer.

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Source of Suppport : Nil
Conflict of Interest : None Declared

REVIEW

Accidental Injuries to the teeth: An over view

Murali Govind[1], A. Afzal[2]

ABSTRACT

Most traumatic dental injuries occur in children, but people of all ages can be affected. Whether the injury is a result of an automobile accident, a sports mishap, an altercation or a bad fall, the severity and type of injury will determine the treatment necessary. There are a number of common injuries that occur to teeth. Many of them affect the inner soft tissues of the tooth, known as the dental pulp. When the pulp becomes injured or inflamed, root canal treatment may be needed.

KEY WORDS : Accidental Injuries, teeth.

Most traumatic dental injuries occur in children, but people of all ages can be affected. Whether the injury is a result of an automobile accident, a sports mishap, an altercation or a bad fall, the severity and type of injury will determine the treatment necessary. There are a number of common injuries that occur to teeth. Many of them affect the inner soft tissues of the tooth, known as the dental pulp. When the pulp becomes injured or inflamed, root canal treatment may be needed.[1]

TRANSVERSE ROOT FRACTURE (TRF):[5]

- TRF: fractures that involve the dentin pulp, cementum and periodontal ligament.
- Account for approximately 6% of all dental trauma.
- More common in maxillary front teeth.
- Affecting anterior teeth by direct trauma
- Affecting posterior teeth by indirect trauma
- The coronal segment slightly placed palatally and extruded.

DIAGNOSIS

Clinical Examination:
Displacement – Mobility – Discoloration

Radiographic Examination:
Periapical bisecting angle exposure – Steep occlusal exposure

Determined by :
Location and number of fracture lines
Degree of fragment separation
Pressure and location of radiolucencies
Stage of root development
Root resorption

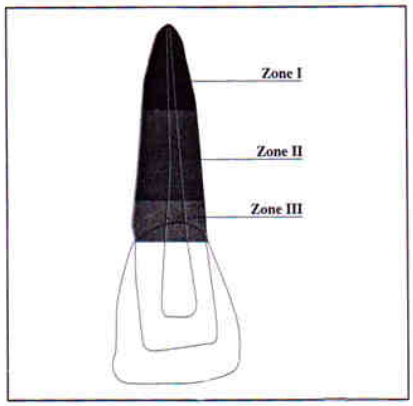

Fig. 1: Classification of transverse root fractures

CLASSIFICATION OF TRF (Fig. 1):

- Apical 1/3 fracture: zone I
- Middle 1/3 fracture: zone II
- Cervical 1/3 fracture: zone III

TREATMENT OF TRF

Treatment at the time of injury depends on the coronal extend of root fracture:

- If there is communication between root fracture and oral cavity, coronal segment must be

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extracted and apical segment either extruded or restored or extracted.

- If there is no communication, the tooth can be treated by reduction and reposition of displaced segment, stabilization and occlusal reduction.

The four important items in the treatment of TRF.

1. Position of the tooth after it has been fractured

Laterally luxated coronal segment must be repositioned after administration of local anaesthesia.

2. The mobility of the coronal segment.

If there is no or minimal mobility, no immobilization is necessary, but if there is excessive mobility, rigid immobilization is necessary, and the splinting period will be 2 – 4 weeks.

Types of Splints

a. Tooth-bonded composite resin splints or glass ionomer splints useful in short-term splinting. This is inadequate splint and often fracture across the interdental regions.

b. The use of wire plus an acid-etch composite splint provide relatively firm fixation for at least 8 weeks.

c. The use of fishing line and acid etch resin as a flexible splint, will maintain the physiological movement of the teeth.

d. Joining teeth across their contact points with pins and composite restoration as semi permanent splinting in certain cases.

e. Orthodontic band splinting is contraindicated because it adds additional injury to an area already traumatized.

f. Arch bar splinting is contraindicated, as it displaces the teeth and cause more trauma to the periodontium.

Maintenance of excellent oral hygiene is absolutely critical. Because poor oral hygiene can cause gingival inflammation and apical migration of the base of the gingival crevice, this will lead to the exposure of the fracture line and its communication with the oral cavity and the end result will be the loss of the coronal segment.

3. Status of the pulp

The actual state of vitality can be obtained for many months,

- If the pulp is vital no treatment is required
- If there is no vital signs, pain, sinus tract originating from the tooth, granulation tissue across the fracture line is present then an endodontic treatment for the coronal segment is required.

- Pulpal necrosis
- Root canal calcification or obliteration.
- Resorption:
  - * Inflammatory resorption
  - * Replacement resorption (Ankylosis)

4. Non healing root fracture:

Most of these determined primarily by:

- Severity of the injury: In severe injury, pulpal necrosis and no healing of the fracture line occur. In moderate injury, a subsequent revascularization and a connective tissue healing might occur. In minor injury, the pulpal tissues are intact and hard tissue reunion of both segments.
- Stage of root development.

TREATMENT OF NECROTIC PULP-INDUCED NON HEALING ROOT FRACTURE[2]

(In case of zone I and II fracture)

I. Root canal treatment of coronal segment only:
   - Radiographic examination.
   - Vitality test is negative.
   - Splinting of coronal segment using wire plus an acid-etch composite for 2 – 4 weeks.
   - Root canal instrumentation till the fracture line.
   - Intracanal dressing using Ca $(OH)_2$ to obtain closure of the coronal segment, repeated every month.
   - Radiographic control after 6 months and 1 year.
   - Result: Hard tissue formation (bridging), then root canal filling with gutta percha.

II. Root canal treatment of both coronal and apical segments:
- This is possible only if the apical fragment remains in alignment with coronal segment and there is periapical pathosis.
- Root canal preparation in both segments.
- It is preferable to seal the apical foramen with gutta percha (3-4 mm in apical portion of the canal) and prepare the remainder of the canal for fitting of intercanal splint to stabilize of fractured segments (using titanium alloy pin or post).

III. Root canal treatment of coronal segment and surgically removing of the apical segment:

Same procedure as in part I above and the apical segment can be left untouched and the pulp may retain its vitality, if not surgically removing of the apical segment as it is believed to be the source of pathology of the apical region.

(In case of zone III fracture)

The coronal segment must be removed and apical segment restored or removed: Treatment options available are :

1. Periodontal adjustment:

If the fracture line of apical segment supragingival liability, and subgingival palataly periodontal recontouring is a reasonable proposition either by:

- Apical reposition flap.
- Glingivectomy and alveolar recontouring and that may produce an unfavorable cosmetic result.

The periodontal adjustment will be followed by endodontic therapy of the exposed segment followed by a casted post and core then prosthetic crown.[2]

2. Orthodontic extrusion:

- Useful approach to the treatment of a fracture below the level of the crest of the bone
- Distance from the fracture level to the apex should be not less than 14mm. 2 mm will be exposed by extrusion and 12mm for root canal obturation and post.
- Endodontic therapy of the apical segment, temporarily filled with root filling material.
- Post cemented using temporary cement and adjust the post so that the distance between it and the orthodontic wire that affixed to adjacent teeth is equal to a distance that tooth is to be extruded with extra millimeter (2-3 mm)
- Using elastic traction (of 70-100 grams) to extrude the root for 5-7 days to reach the final position.
- The post I wired to the orthodontic wire and retained in this position for 8 – 10 weeks, then the root can be debonded.

IV. Position of the fracture line:

Zone I (Apical 1/3): Fracture extend from 5 mm below the alveolar bone. This type of fracture is the most troublesome type. The crown of the tooth must be lost, gingival recontouring and crown lengthening followed by endodontic therapy, finally a restoration with a casted post and core and prosthetic crown. Some of these cases require the exposure of the cementum using a forced eruption (orthodontic extrusion) technique.

SEQUELAE FOLLOWING INITIAL TREATMENT

1. Fracture line healing:

a. Hard tissue union occur when there is.

- A small amount of luxation of the coronal segment (concussion or extrusion).
- A mall amount of separation between both segments.
- If the fracture foramen of coronal segment is large.
- If the patient is young rather than elderly.
- When the tooth is splinted immediately after trauma.

b. Connective tissue union occur.

- When slight mobility exists during healing process.
- During growth spurts of the child.
- In young ages during their growth.

- Decrease if orthodontic band splinting of the tooth used.

c. Granulation tissue union occur.

- If infection exists in one of the segments.
- If the fracture line communicates with the oral cavity.
- Complete root canal obturation, final cast post, cervical colar and core and temporary crown.
- To create an esthetically pleasing result, the gingival tissue must be recontoured once the extrusive phase of treatment is completed and to avoid rapid relapse after removal of orthodontic appliance.

INTRA-ALVEOLAR TRANSPLANTATION OF FRACTURED TOOTH:

Treatment Proceedures :

A. Involved a flap operation with apical exposure – bony transplant positioned above the surgically extruded root.

B. Careful extrusion of the tooth by marginal luxation, interdental suturing and surgical dressing.

If the fracture is more apical on labial side than palatal, tooth can be rotated 180 degrees before fixation.[13]

VERTICAL CROWN-ROOT FRACTURE

This is the mot unfavorable type of fractures. The fracture line extend from the coronal segment to the middle of the root or to the apex, following the long axes of the tooth.

The treatment modality in this case is to extract the fractured tooth and an immediate implant placed to preserve the buccal bone or a prosthetic bridge can be another alternative, depending on the case and finance.

Every tooth fracture weakens the tooth. To protect teeth from further breakdown, especially in working dogs or animals with abnormal habits like cage biting, a prosthetic crown can be placed.[11]

All of the above mentioned treatment modalities show that a thorough and complete diagnosis needs to be established to be able to choose the correct treatment for fractured teeth. A diagram to help finding the right treatment option is shown(refer Fig-1).[12]

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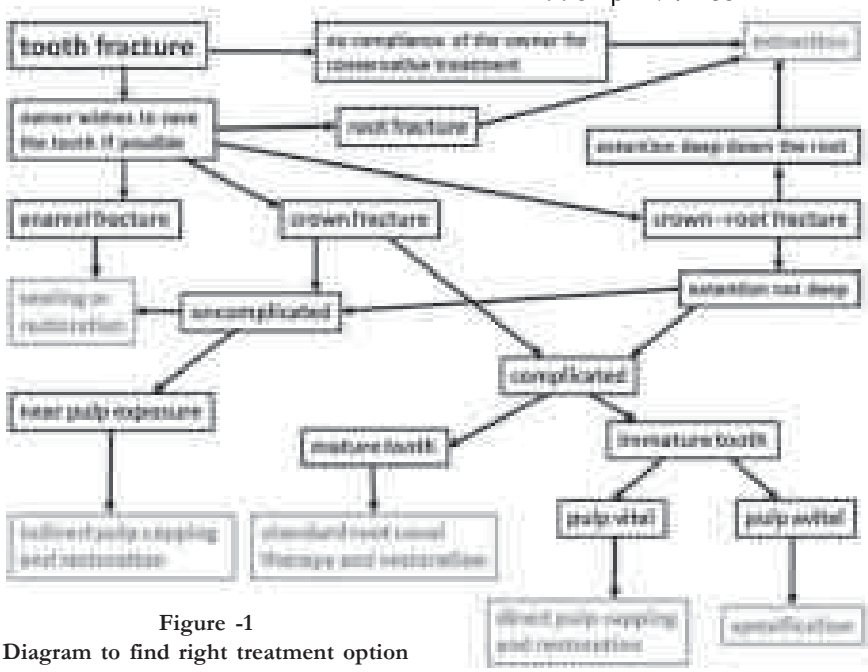

Figure -1
Diagram to find right treatment option

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Source of Suppport : Nil
Conflict of Interest : None Declared

REVIEW

Soft Tissue Recession Around Implants : A review

Jose Richard[1], A. Afzal[2]

ABSTRACT

A healthy soft tissue around an implant is of paramount importance for achieving good aesthetics after an implant procedure. There are many factors which can influence gingival recession around implants. Following proper protocol can go a long way in preventing alveolar bone loss and subsequent gingival recession following dental implant. This article attempts to review the certain criteria's to be followed to achieve optimum aesthetics and function pertaining an implant.

KEY WORDS : Soft Tissue Recession, Implants

Introduction:

Dental implant is the choice of today for restoration of edentulous areas. However best the restoration is made, the longevity depends on the prevention of loss of the peri implant tissues. Gingival recession around implants is a major concern especially in the aesthetic zone.[1]

There are many factors that interplay in preserving the implant aesthetics.[2] However, the best aesthetics result is achieved after implant procedure, the soft tissue recession around implant jeopardizes the outcome. Careful evaluation of the soft tissue profile at the implant site, Choice of the suitable implant design and careful surgical & prosthetic procedure are important in the final aesthetic outcome and its long term functional result.

Alignment of gingival margin and the presence of papillae are important for the implant aesthetics and these two soft tissue factors depends on the gingival biotype and the quality and quantity of the underlying alveolar bone. 1mm loss of alveolar bone in the first year, followed by 0.2mm per year is an acceptable equation in the implant procedure. In order to prevent alveolar bone loss more than acceptable level and subsequent gingival recession, many protocols have to be followed.[3]

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1. Flap design

Different flap designs for implant placement are (a) Mid crestal/ palatal crest incision with sulcular envelope flap (b) Sulcular incision around adjacent teeth raising the interproximal papillae and (c) punch flap design. If a large amount of keratinized gingival is present, punch flap design is the most suited one. This procedure is less traumatic to bone and soft tissue and the post operative discomfort is also minimal. Recession of gingiva during healing will be more in the flap design where the papillae is raised totally.

On healed site, limited flap design minimizes the loss of interproximal bone and papillae. Immediate implant placement after extraction of tooth is a flapless surgical procedure.[4] Pre-surgical diagnosis to evaluate the gingival and osseous parameters to determine the ideal time to extract the teeth and place the implant and to decide on the ideal time of loading the implant is important factors.

2. Implant Placement

Implant placement and restorations are important factors in the outcome of the architecture of the interdental papillae and gingiva – especially in the aesthetic zone.[5] The criteria to be followed in implant placement are:-

I **Mesiodistal** – 1.5 to 2mm between implant and adjacent teeth, 3.5 to 4mm between 2 implants

II **Bucco lingual** – 2.5 to 3mm from the cervical contour of the adjacent teeth to buccal surface of the implant platform.

III **Corono Apical** – 2.5 to 3mm apical to the buccogingival margin. This will again depend on the Biotype. Placement of implant platform 1.5mm above the crestal bone will minimize the bone loss because the biological space around the implant is established on the collar.

3. Implant Design

In order to stabilize the crestal bone, the roughened surface of the implant should be up to the platform and there should be no divergence of the collar walls. The abutment should be concave to provide maximum space to have maximum thickness of the soft tissue in order to avoid compression as well as to have more space for biological width.[6]

4. Grafts

Gingival Biotype determines the need for a graft during implant placement.[7] A thin biotype is very vulnerable for gingival recession. The use of Autogenous bone and Zenografts with a membrane will increase the thickness and will convert a thin gingival biotype to thick gingiva. This will prevent recession after implant placement. Tissue management during restorative phase will also be better in a thick gingival biotype.

5. Abutments

The abutment should be concave to create more space for the soft tissue thickness and development of biological width. A divergent abutment should be strictly avoided in thin biotype to prevent recession.[8] Abutments should be of Titanium or Zirconia because hemidesmosomes are shown to attach to them.[9]

Fixing abutment at the time of implant placement and if it is left in place undisturbed throughout the final restorative phase will be ideal for optimal aesthetic outcome. Repeated disconnection and reconnection of abutment will disturb the bone and soft tissue architecture, encouraging the junctional epithelium to migrate apically beyond the implant abutment junction. This will also induce marginal bone loss especially in thin biotype.[10]

Creating the 'O' ring connection tissue around the implant abutment connection will ensure long term stability of biological width and prevent recession. This can be achieved by placing a narrow and concave abutment.

Providing perfect seal at implant abutment junction is crucial for preventing bacterial colonization and subsequent perio-implantitis.[11] Locking tapered design of the abutment will ensure a perfect seal.[12]

6. Restoration

Design of final crown is also important in the aesthetic outcome. The emergence profile of the restoration should be flat or concave in order to prevent pressure on the gingival margin. Morphology of interdental papillae will depend considerably on the design of the crown of the final and the provisional restoration. Distance from the interdental crestal bone to the contact point of natural teeth and implant crown should be 4.5mm and that of two implant borne crown should be 3.4mm. The distance between the bony crest and the implant crown and the pontic connection should be 5.5mm.[14]

Occlusal trauma during function will cause alveolar bone loss.[15] This is true especially in the first month of implant loading. Excessive Axial and Trans axial force induces stress on the crestal bone causing bone loss and subsequent gingival recession.

CONCLUSION

Careful diagnosis, selection of implant and implant material, design of implants, implant abutments and crown, flap design and attraumatic procedure, precautions handling during restoration, preventing occlusal load are important in the aesthetic outcome of implant and prevention of loss of peri implant tissues.

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Source of Suppport : Nil
Conflict of Interest : None Declared

REVIEW

Ultrasonics – An invaluable aid in endodontics

Gibi Paul

ABSTRACT

Ultrasonic instruments play an ever increasing role in several aspects of endodontic treatment . The aim of this paper is to review the various applicatons of ultrasonics in endodontics.

KEY WORDS : Endodontics,Ultrasonics.

Introduction

The concept of using ultrasound in endodontic therapy was suggested in 1957 by Richman(1) who adapted an ultrasonic scaler for use in apicoectomies. A commercial system utilising the properties of ultrasonic energy for the preparation and cleaning of the root canal was intoduced by Martin in 1976(2).This ultrasonic and synergistic system of root canal instrumentation and debridement was termed endosonics by Martin and Cunningham(3).

Ultrasonic devices operate at 25- 30 kHz and are of 2 types- magnetostrictive- Cavi-Endo (Caulk/ Dentsply) and piezoelectric- ENAC(Osaka) and EMS Piezon Master(Electro Medical Systems. The piezoelectric device generates little heat and does not require a cooling system . Also it is more powerful. The stainless steel ultrasonic tips may be uncoated, diamond-coated or zirconium nitride coated and may or may not have built in water ports.

Since the operating field is so restricted, the use of high magnification and proper illumination is essential during the use of these instruments. The combination of ultrasonic instruments with the magnification and illumination provided by surgical operating microscope has been termed microultrasonics (4).

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Applications

The main applications of ultrasonics in endodontics (4,5,6)

- Access refinement, finding calcified canals, and removal of attached pulpstone
- Root canal preparation and irrigation
- Removal of intracanal obstructions
- Ultrasonic condensation of gutta-percha.
- Placement of mineral trioxide aggregate (MTA)
- Surgical endodontics: Root-end cavity preparation.

Access refinement, finding calcified canals, and removal of attached pulpstones

A straightline access to all the canals is a prerequisite of successful endodontic therapy . Quite often canal location may require access refining particularly MB2 in maxillary molars the orifice of which may be hidden under a mesial shelf of dentin. In these cases and in finding calcified canals or removing attatched pulp stones ulrasonics provide some advantages over rotary burs. Absence of a handpiece improves vision and since the tips are smaller than the smallest burs, the dentin can be brushed off in smaller increments and with greater control . Moreover they do not rotate, thus enhancing safety and control, while maintaining a high cutting efficiency.

Removal of intracanal obstructions

During root canal therapy especially in retreatment cases, clinicians frequently encounter obstructions in the form of separated instruments, silver points, metal or fiber posts,hard impenetrable pastes . The restorative material and luting cement around the

post is removed before application of the tip of an ultrasonic instrument to the post.At times troughing around the obstruction by using a modified Gates Glidden drill or an ultrasonic tip can create a table of dentine around the fractured instrument and allows better access for removal of the obstruction.The same procedure may be followed for removing other obstructions, including silver points, obturation carriers, pins, and broken files.

Root canal preparation and irrigation

Ultrasonics has not proved to be very effective in removing dentin from canal walls but when when used with an irrigant has improved the cleaning of the root canal space.During free ultrasonic vibration in a fluid, two significant physical effects are observed :cavitation and acoustic streaming.Cavitation consists of growth and subsequent violent collapse of bubbles.Although transient cavitation may theoretically occur while using an ultrasonic instrument, the more beneficial biophysical action of the file is likely to result from acoustic microstreaming. Acoustic streaming creates small, intense, circles around an object oscillating in a liquid.Large shear forces are capable of dislodging or disassociating clumps of material are produced which may play a useful role in reducing the number of bacteria in the canal. A freely oscillating instrument will cause more ultrasonic effects in the irrigating solution than one that binds to canal walls.

Condensation of gutta percha

Ultrasonically activated spreaders have been used to thermoplasticize gutta-percha in a warm lateral condensation technique resulting in a more homogeneous mass with fewer voids and hence a better three dimensional obturation of the root canal system It has several advantages over other warm lateral condensation techniques. Heat is generated only during ultrasonic activation, and the plugger appears to cool rapidly once activation ceases . The gutta percha does not stick to the ultrasonic file and the low temperature produced by the unit results in less volumetric changes of gutta percha upon cooling.

Placement of Mineral Trioxide Aggregate (MTA)

In canals with open apices and in perforation repair placement of MTA with ultrasonic vibration and an endodontic condenser improves the flow, setting, and compaction of MTA thus providing a better seal. Furthermore, the ultrasonically condensed MTA appears denser radiographically, with fewer voids. After depositing MTA at a site, vibrating with an activated ultrasonic tip helps it to flow precisely into place.

Surgical endodontics: Root-end cavity preparation

The development of ultrasonic retrotips has revolutionised root end therapy, The smaller size and the various angulations permit a smaller osteotomy for surgical access and a more parallel root end preparation. The retrotip design does not require a beveled root-end resection This decreases the number of exposed dentinlal tubules thus minimizing apical leakage .It also enables the removal of isthmus tissue present between two canals within the same root. Ultrasonic tips can also be used to polish root end material and apical surfaces.

Conclusions

The extended applications of ultrasonics in endodontics enable clinicians to meet the challenges faced during root canal treatment like hidden or calcified canals,pulp stones,broken instruments ,posts, silver cones.Cleaning of canals,obturation and,root end surgeries have also benefitted from this technology leading to a more predictable outcome particularly in retreatment cases.

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Source of Suppport : Nil
Conflict of Interest : None Declared

REVIEW

RECASTING ……a dangerous practice!!

N .Dinesh[1], Sheeba Gladstone [2]

ABSTRACT

Recasting is a practice of reusing once used metal for the fabrication of crowns and FPD .This practice has deleterious effect on the cytotoxicity of these materials atleast on sensitive individuals .This article reviews the various ill effects of recasting and their effect on elemental release of various casting alloys.

KEY WORDS : Recasting, Cytotoxicity, Dental casting alloys

Dentists have long been confronted with the problem of restoring or replacing the missing tooth structure by an ideal material. For decades, casting alloys with high and low noble metal contents are widely used in dentistry. Even with the advent of all ceramic restorations, base metal alloys with or without ceramic veneering is still the material of choice in many situations

Traditionally, precious noble metal alloys with a high content of gold and platinum or palladium have been used for dental castings as they are resistant to corrosion and tarnish in the oral cavity. They are highly biocompatible. The rise in the cost of noble metals led to a wide spread interest in base metal alloys

In an attempt to reduce the cost, previously used base metal alloys may be combined with the new metal by the laboratory personal to produce restorations with minimum cost .Used metals may be previously used sprues or defective castings. This recasting of metal can have deleterious effect on the cytotoxicity

Base metal alloys containing Ni-Cr and Co-Cr alloys are used instead of high noble alloys for dental cast restorations. But these alloys are liable to get corroded depending on the alloy composition and the oral environment.

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Biocompatibility is one of the major factors that influence the dentist decision while selecting a dental casting alloy

Biocompatibility of base metal alloys is of concern considering the amount of elements it releases into the oral cavity. Local adverse tissue reactions such as gingivitis and periodontitis adjacent to the dental cast alloys are thought to be related to the effects of released elements[1]

Elements that are released from dental casting alloys have been detected in tongue scrapings, saliva and in cell culture media after incubation. So the release of elements determines the cytotoxic effect of the alloy[2].

Further, recasting of base metal alloys would change the chemical properties of the alloys and thus affect the elemental release and subsequently, the cytotoxicity of these alloys.

Many studies has investigated the effect of recasting of Ni – Cr alloys on cytotoxicity and elemental release into culture media

- AHMAD S.AL-HIYASAT et al (2005)[3] studied the effects of recasting on the cytotoxicity of base-metal alloys. The results suggest that recasting of base-metal alloys markedly increased their cytotoxicity effect. The Co-Cr alloy was more adversely affected by the recasting procedure than the Ni-Cr alloy.
- RD WOODY in 1977[4] had compared the cytotoxic potential of three alloys and Fe-Cr alloy and found out that cultures containing

Ni-Cr alloy showed prominent zones of cell lysis and alterations

- MURILO B.LOPES et al(2005)[5] studied the influence of recasting palladium-silver alloy on the fit of crowns with different marginal configurations. the results suggest that recasting procedures for crown fabrication should not be used with the silver-palladium alloy tested.

- RONALD G.PRESSWOOD IN 1983[6] tested the castablity of a Ni-Cr alloy at multiple recast and concluded that the alloy can be sucessively recast six times with out losing the stability of the alloy.

- CRAIG RG in 1988[7] has studied the cytotoxicity of dental casting alloys in the as-cast and polished conditions and found that crown and bridge alloys and a Ni- and a Co-base alloy were biocompatible in polished condition. But less so in as-cast condition.

- NORIKO HORASAWA et al in 2004[8] studied the effect of recasting on corrosion of a silver-palladium alloy and found that recasting had little effect on the corrosion susceptibility of Ag-Pd-Cu-Au alloy in artificial saliva, but severe degradation of properties was observed after fifth cast

- M.A.AMEER et al in2004[9] studied the electro chemical behavior of recasting Ni-Cr and Co-Cr non-precious dental alloys. The results suggest that the used non –precious alloys have high corrosion resistance and Co-Cr-Mo alloy exceeds corrosion resistance that of the other alloys containing Ni-Cr-Mo in artificial saliva.

A study of Ni- Cr alloys observed an increase in the Ni release from the alloys into lactic acid and Nacl solution when the 50 % recast alloy was compared to 100 % new cast alloy.

Even though, the severity of the problem varies from study to study, there is a common consensus that recasting of Cu-Cr and Ni- Cr alloys decreases its biocompatibility. The presence of Cr and Mo in these alloys makes them more corrosion resistant by formation of a surface oxide layer[10] .It has been reported that Ni-Cr alloys containing 16 % to 27 % Cr develop adequate protective oxide layer.[11,12] Mo also has an active role in the formation of this protective layer. Thus, an increasing concentration of Cr and Mo on the surface layer may synergistically lower dissolution rates of metals which may subsequently reduce the cytotoxicity of the alloys. However, when the alloys were recast the cytotoxicity was increased significantly owing to increased elemental release when compared with new alloy.

This difference may be related to the composition of the alloy and thus the elements released from them.[12,13]This could be due to some effect on the chemical composition of these alloys which may increase the dissolution rate of the alloys and thus the elements released from them will be increased, The increase in cytotoxicity of recast alloys is attributed to increased nickel ion release as found in the ICPAES analysis.[13,14] The latter requires further investigation for complete under standing of the mechanism that caused the increase in the element release from the recast alloys

CONDITIONING

It has been found that conditioning of cast dental restorations before placing them intraorally might reduce the release of elements inside the oral cavity[15,16]. Several studies have used various conditioning times and types of conditioning media. The release of elements into conditioning media varies among alloys and elements. The pattern of elemental release also varies with time.

This is explained by the fact that conditioning of casting alloys result in the removal of leached elements which in most cases leads to decrease in cytotoxicity.

Conditioning of alloy in distilled water for 72 hr is the most acceptable and easier technique to follow routinely in our clinical setup[16]. However, conditioning of recast alloy was found to be little effect on cytotoxicity

Therefore, selecting a quality lab that strictly adhere to the laboratory principles is very important for the safety of patients we treat.

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Source of Suppport : Nil
Conflict of Interest : None Declared

REVIEW

Gingival tissue management : A necessity or a liability?

Karunakar Shetty

ABSTRACT

The oral cavity is a difficult area to treat in restorative dentistry because of the constraints of the lips, tongue and cheeks, challenges for access to visualize and manipulate instruments, as well as the position of the teeth that are being treated relative to the gingival tissues — which bleed if improperly managed. While for operative dentistry and single-tooth restorations, the use of the dental dam provides control of the field and access to tooth preparation and restoration, there are many times in restorative dentistry that use of the dental dam is precluded. There are times that caries or non-carious cervical lesions are at or below the free margin of the gingiva — as well as, for fixed prosthodontics, crown or inlay/onlay margins are at or below the free margin of the gingiva and access to them for preparation, impressioning and cementation is impossible without additional techniques to displace the gingival tissues and control gingival hemorrhage and sulcular fluids.

The present review is an attempt to highlight the merits and demerits of various gingival tissue management methods although the ideal technique is still elusive.

KEY WORDS : Gingival tissue management, fixed prosthdontics, implants.

INTRODUCTION

Several impression techniques are used in implant dentistry, and some require gingival displacement while making impressions. Others, such as the pickup impression technique, do not require any gingival retraction. For screw retained

implant restorations, most systems use mechanical components (impression copings) that can be adapted accurately and directly to the fixture head on the abutment shoulder. With cement-retained prostheses that use customized abutments, the pickup impression technique cannot be used owing to the unique contour of the abutments. Therefore, clinicians must use another technique such as the conventional crown

and bridge impression or optical impression.

Current gingival retraction agents are not without undesirable side-effects; there appears to be no ideal gingival retraction agent. Several sympathomimetic amines, capable of producing local vasoconstriction with minimal systemic side-effects, are available as non-prescription nasal decongestants and eye washes.According to Benson et al. (1986)[1],gingival retraction measures fall into one of four major categories: (1) simple mechanical methods, (2) chemo-mechanical methods, (3) rotary gingival curettage,and (4) electro-surgical methods.

Of these four categories, the chemo-mechanical method of gingival retraction is the most widely used, as was found in a survey by Donovan et al. (1985)[2].Good tissue management requires that four conditions are met when the impression is made [3,4]

1. soft tissue covering subgingival margins and axial walls must be retracted horizontally(laterally) to provide space for sufficient bulk of impression material.

2. soft tissue at the gingival margin must be displaced vertically(apically) to expose the margin.

3. hemorrhage in the soft tissue must be arrested.

4. the hard and soft tissues to be reproduced in the impression must be clean and dry.

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One of the most challenging aspects of crown and bridge is management of the gingival tissues when making an impression. Tissue management includes placing the gingival tissues away from the preparation margins so they can be impressed, combined with providing for hemostasis when the gingival tissues are susceptible to bleeding. [5,6] The rationale for tissue management is a critical aspect of impression making,whether the impression is made with a conventional impression material or by a digital impression technique so that all tooth preparation margins are captured in the impression to assure an excellent marginal fit of a laboratory fabricated restoration.[5,7]From this, the final restoration will be well adapted to the tooth preparation so that when cemented, the restoration will prevent recurrent caries, tooth sensitivity and gingival irritation.

No matter what the circumstance for soft tissue management for restorative dentistry, the goal for management of gingival tissues requires that the periodontium be in a state of health. As part of any comprehensive treatment plan, especially if a restorative intervention is required and there is need for control of the gingival tissues, that the teeth be cleaned and the periodontium brought to a state of health. With this accomplished, restoration will be more easily accomplished.

For all impression procedures, the gingival tissues must be displaced to allow the subgingival finish lines to be registered. An effective management of the sulcular environment is needed for successful subgingival impression. It involves 2 key aspects: the force that comes to bear on the gingival tissues and contaminants that may be present or generated in the sulcus.[8]Gingival retraction, hemostasis and sulcular cleansing are frequently combined and closely related procedures but they have specifically separate objectives. Retraction is the temporary displacement of the gingival tissue away from the prepared teeth [9]

A gingival retraction agent should be

(1) effective for its intended use,

(2) safe-both locally and systemically, and

(3) the effects should be spontaneously reversible, wearing off in a short time, leaving no permanent tissue displacement.

AVAILABLE TECHNIQUES FOR GINGIVAL RETRACTION

A 0.2mm sulcular width is mandatory for enough thickness of the material to be there at the margins of impressions so that they can withstand tearing or distortion on removal of the impression [10]

1. Mechanical
2. chemical
3. mechano-chemical
4. surgical

Mechanical

Among the first techniques developed and available to clinicians for displacement of gingival tissues, especially for crown and bridge impressions, were mechanical displacement. Mechanical displacement refers to physically moving the gingival tissues aside from the tooth/tooth preparation margins to allow for visualization and access for treatment.[1,5,6,11] One of the earliest techniques for mechanical displacement of gingival tissues for restoration was the use of the dental dam. Specialized gingival retraction retainers (clamps), when placed, displace the gingival tissues to allow for access for tooth preparation and restoration.[12].The use of gingival retraction clamps has also been described to provide access for scaling and root planing.[13]

Among the most popular methods of gingival displacement is the use of gingival retraction cord.[1,5,6,11,14,15,16] Gingival retraction cords can be woven, braided or twisted in a variety of configurations to provide for different diameters and thicknesses. They are typically dispensed from containers or bottles and cut to length. The cord is usually dispensed by pulling the cord from a bottle using a cotton pliers and cutting with a scissors. These techniques have the risk of contamination of the retraction cord. Some recent innovations have addressed this shortcoming of cord dispensing. Unit dose dispensing of retraction cords has been introduced where the chemically treated braided cord is pre-cut and individually packaged in 2-inch lengths. Of issue is that there is the need for different lengths of cord for different clinical situations and for the various diameters of teeth. There have been no measuring tools as part of the dispensing system, so it is not uncommon to

dispense too short a cord, or too long a cord, for the clinical indication. The shortcoming in cord dispensing and cutting has been addressed with the introduction of an all-in-one delivery system that combines convenience, efficiency and effectiveness in gingival retraction cord dispensing and cutting.[17]Many manufacturers have a range of options of non-impregnated and chemically impregnated cords. Some clinicians prefer twisted cords so they can hand-twist the cord to be tighter when placed in the sulcus — and, as the cords untwist; they expand, creating a physical effect of expanding the sulcus for access. The preference for braided cords relates to their tight and consistent weave. They provide two benefits: First, braided cords for many clinicians are easier to place in the gingival sulcus with packing-placement instruments, both serrated and smooth, nonserrated, because they are solid and can be pushed into place. Some braided cords are not only impregnated with astringent- hemostatic agents but are covered with a gel of that reagent . A braided cord wrapped around an ultrathin copper wire is described as being more stable in the sulcus once placed. Some recent improvements in braided cords (e.g., GingiBraid+) have a modified weave with a unique cotton yarn to allow the cord to have less memory.

Knitted cords have increased in popularity. Among the major benefits of knitted cords is their unique knitted weave, which minimizes unraveling and fraying after cutting and during cord placement.Knitted cords offer easy placement, and they expand when wet, opening up the sulcus greater than the original diameter of the cord.[5,6] The knitting and yarn selection allows for a greater range of knitted cotton cord diameters/sizes. When using knitted cord, a smooth, non-serrated placement instrument allows for precise placement without pulling the cord out of a gingival sulcus. Also, the range of sizes/diameters allow for placement in both the easy-to-access gingival sulcus and the tighter, healthier gingival sulcus.

When describing mechanical displacement of gingival tissues with gingival retraction cords, one would be remiss if there were no mention of retraction cord placement packing instruments. Key to placement of cord with instruments is that the end of the cord packer be thin enough to be placed in the gingival sulcus without damaging the gingival tissue and potentially causing bleeding; and that the angle of the instrument allow for orientation so that cord placement can be accomplished around all surfaces of the tooth. The use of standard off-angle plastic filling instruments (PFI) is inappropriate due to the thickness of the blade. Also, there is variation in the size, length and shape of the end of the blade of the cord-packing instrument. Most commonly, the clinician will use double-ended instruments. Recently a novel double-ended instrument with multiple orientations of a dual-packing blade (TN010 Double Cord Packer, Garrison Dental Solutions) has been introduced so that the instrument does not need to be twirled to get the end orientation needed.This design maintains the instrument in the field of view while packing cord around the tooth. For braided and twisted cords, both serrated and smooth cord packers work well; for knitted cords, smooth cord-packing instruments are less likely to pull the cord from the sulcus during placement.

One other method of mechanical displacement for gingival retraction includes making

the impression at the same time. The use of copper tubes or copper bands to displace

soft tissue for impressions for crown preparations requires that a fitted copper band be cut to shape, contoured and fitted to beyond the crown preparation margins [1,11,18]. The fitted band is filled with an elastomeric impression material, compound or a combination of acrylic resin and then relined with rubber base to simultaneously displace the gingival tissue and make the impression.

Disadvantages:
1. Rapid collapse of sulcus after removal.
2. trauma to epithelial attachment
3. no hemostasis
4. time consuming
5. risk of sulcus contamination
6. painful

Mechanochemical methods

The use of chemical substances to cease bleeding of a gingival tissue ulcerated during dental preparation or to obtain gingival retraction during impression procedures has been extensively investigated[1,19-26]. The main points assessed in these works are the influence of the use of epinephrine

and astringents, the behavior of the impression materials when set in contact with chemical substances and the quality of gingival retraction. A variety of chemical solutions and gels have been recommended for use with gingival retraction cords because of the properties as drugs to act as an astringent or hemostatic agent[1,5,6] In most cases, these drugs are both astringent, causing contraction-retraction of the gingival tissues,and hemostasis, constricting blood flow through coagulation. When these reagents are placed on a retraction cord, they cause a transient ischemia, shrinking the gingival tissue and blood vessel coagulation. Common astringent-hemostatic agents include ferric sulfate, aluminum chloride and racemic epinephrine. As previously stated,gingival retraction cords are available unimpregnated or impregnated with the aforementioned astringent-hemostatic agents, as well as aluminum potassium sulfate, aluminium sulfate, racemic epinephrine and zinc phenolsulfonate/racemic epinephrine, among others. Chemically impregnated cords offer greater sulcus displacement with the combined physical and chemical effect.[5] Also, cord diameter, astringenthemostatic agent and cord type have a direct effect on the physical properties of the cord.[27] In some cases, both solutions and gel formulations are recommended for direct placement into the gingival sulcus with specialized tips to achieve a hemostatic effect with some ischemic effect before cord placement. A 20–25% aluminum chloride and 15.5– 20% ferric sulphate are among the most popularly used chemical reagents. When used for durations within the gingival sulcus of less than 10 minutes, they cause minimal tissue damage.[5,6,28] There has been concern over the use of an 8% racemic epinephrine impregnated cord.[1, 29-32]It has been reported that epinephrine-impregnated cords should be used with care. It has been reported that an 8% racemic epinephrine cord can cause elevation in blood pressure and tachycardia, especially if the gingival tissue is bleeding due to laceration.[30]In fact, it has been demonstrated that no clinical benefit in gingival retraction could be recognized between an epinephrine-containing cord and other cords.[31] A systematic review of the dental literature of cardiovascular effects of epinephrine-containing anesthetic agents and epinephrine-impregnated cords was done to identify any additional risks of adverse cardiovascular outcomes to hypertensive individuals.[32] Of special note, the solutions that are used as astringents and for hemostasis are acidic. There has been evidence demonstrating that the use of these products removes the smear layer.[33,34] There is concern that if the root surfaces beyond the crown preparation margins are exposed to these solutions, there may be an increase in postoperative sensitivity.

Cordless retraction

In most cases, gingival retraction cord is the most effective method for retracting tissue to the depth of the sulcus. Unfortunately, many times on the day of the tooth preparation, gingival bleeding is difficult to control — or, when packing a cord into the sulcus, the tissues start to bleed, making impression difficult or impossible. For this reason, a new class of gingival retraction materials have been introduced. These cordless retraction materials provide for excellent hemostasis and some gingival retraction. Some of the materials incorporate the use of a compression cap to enhance the retraction effects of the material.

GingiTrac (Centrix) was an improvement over the first-generation cordless retraction and tissue-management material.[35] The technique for Gingi-Trac is the use of a heavy-viscosity matrix combined with a light-body retraction/ hemostasis paste for single and multiple tooth preparations gle teeth with a compressible closed foam cap [36] Clinical studies evaluating Magic Foam Cord and Expasyl demonstrated their effectiveness in cordless retraction and control of bleeding during and after the retraction.[37,38] Expasyl was found to cause slightly more inflammation than Magic Foam Cord and UltraPak knitted cord, and Expasyl had a higher rate of postoperative dentin hypersensitivity.[37] Also, both products caused less histologic damage than a retraction cord technique.[39]

Using these cordless retraction techniques provide for a non-traumatic, non-invasive tissue management of the sulcus for fixed prosthodontic impressions. Expasyl offers the additional advantage of hemostasis for routine restorative procedures. These materials and techniques can be used by themselves or in combination with the use of gingival retraction cord, electrosurgery or laser tissue sculpting when bleeding is difficult to control.

Surgical Methods of Gingival Retraction

The use of specialized devices to reshape and remove gingival tissue to control bleeding and to create access to preparation margins has been shown to be successful.[40-42]

The surgical method for gingival retraction and exposure of the margins of the tooth preparation has been referred to as "troughing" or "tissue dilation." [40,41] The first use of this technique was with electrosurgery.[40,41,43]

Advantages:

1. efficient

2. precise hemostasis while incising the tissues.

Disadvantages:

1. contraindicated in patients with pacemakers.

2. cannot be used concomitantly with nitrous-oxide oxygen sedation as nitrous oxide is a flammable agent.

3. cannot control hemorrhage once it starts.

4. adequate band of healthy attached tissue is necessary.[44]

In recent years, the use of laser tissue sculpting for gingival retraction has been described.[42] The trough, soft tissue excision, extends from the height of the free margin of the gingiva to a point 0.3–0.4mm apical to the finish line margin of the tooth preparation.The displacement of the soft tissue is accompanied by hemostasis. Unlike other techniques that provide retraction without removal of the gingival tissue, this technique removes gingival tissue and requires soft-tissue healing. It may be problematic in the esthetic zone where the healing and height of the gingival margin has a direct impact on the esthetics of the gingival tissue. Most manufacturers of lasers have specialized tips and settings for this technique.

Advantages:

1. excellent hemostasis: carbon dioxide laser

2. reduced tissue shrinkage

3.relatively painless

4.sterilises sulcus.

Disadvantages:

1. Er- YAG laser is not as good at hemostasis as CO2 laser.

2. CO2 laser provides no tactile feedback, leading to risk of damage to junctional epithelium.[45]

Gingival tissue displacement around implants:

The peri-implant fiber structure does not provide the same level of support as periodontal structures and is not able to prevent the collapse of retracted tissues to the same extent, and hence attempts to successfully make impressions become all the more difficult. Owing to the inherent potential of mechanical retraction techniques of damaging the gingival epithelial tissues, the use of this approach may be contraindicated around implants, except in situations in which the patients sulcus depths are shallow, their mucosal health is good, and a robust, thick periodontal biotype is present.[46] Serrated packing instruments, if not handled properly, may increase the probability of damaging the implant collar and may create microscopic scratches on the surface. Increase in surface free energy and surface roughness will further facilitate biofilm formation on dental implant and abutment surfaces.[47]

Deeply placed implants often are associated with an increased sulcus depth compared with that found around natural teeth. Electrosurgery is contraindicated with implant as there is risk of arcing.

Unlike other lasers, prime chromphore for CO2 laser is water. Hence, it reflects off metal surfaces. CO2 lasers absorb little energy near metal implant surfaces, with only small temperature increases(< 30C) and minimal collateral damage. Also, these lasers do not alter the structure of the implant surface. Their use in anterior applications, where esthetics play a critical role is also questionable[48] although injectable matrix technique sounds promising for implant situations, further development is needed[46]

Summary and conclusion

The literature concerning gingival retraction for impressions in fixed prosthodontics is extensive. The importance of accurate reproduction of the gingival marginal tissue cannot be overemphasised.The selection of method and gingival retraction cords frequently depends on the clinical situation.[49] The extent of hemorrhage influences the preference for a specific retraction cord.Some retraction cords have also shown to

have an influence on the tensile strength and polymerisation properties of certain rubber based impression materials. [50] At the end of the day, nothing is more important to crown longevity and health of surrounding periodontium than good marginal fit.

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Source of Suppport : Nil
Conflict of Interest : None Declared

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The Trivandrum Dental Journal, the official publication of the Indian Dental Association , Trivandrum Branch, is intended to be a research periodical that aims to inform its readers of ideas, opinions, developments and key issues in dentistry - clinical, practical and scientific - stimulating interest, debate and discussion and an opportunity for life long learning ,amongst dentists of all disciplines. All papers published in the TDJ are subject to rigorous peer review by our excellent review board. We have tried to design the journal in such a way that the readers can find the relevant information fast and easily.

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The cover page design

The shanku or the conch was considered as one of the common emblems of majority of Kerala feudal kingdoms of the past, including Travancore. The official Kerala state emblem also symbolises two elephants guarding the imperial conch and its imperial crest. The graphical representation of the conch (' shanku') is adapted to be the design on the cover page of the TRIVANDRUM DENTAL JOURNAL.

The Cover Photograph : Leukoplakia is the most common precancerous lesion. The term Leukoplakia simply means a "white patch". The prevalence of leukoplakia in India varies from 0.2% to 4.9%. Men are affected more frequently than women, and a vast majority of leukoplakia occur in the age rage of 35-45 years. Tobacco use is the most important etiologic factor for leukoplakia. Other factors such as alcohol, nutrition, and viral agents, namely HPV, play only a contributory role. Less than 1.3% of leukoplakias in India are idiopathic, i.e., with no discernible causative agent. In 1978 definition of Leukoplakia was modified by the WHO as "a white patch or plaque that cannot be characterized clinically or pathologically as any other disease; this definition does not carry any histologic connotation". The cover photograph shows leukoplakia of left buccal mucosa.
(*photo courtesy Dr (Capt) V.Vivek*).

Edited by : Dr. (Capt) V. Vivek on behalf of Indian Dental Association - Trivandrum Branch, Printed and Published by Dr. Gins Paul, Secretary,
Indian Dental Association, Triandrum Branch A-7, Innu Apartments, Kuravankonam, Kowdiar P.O., Trivandrum - 695003. Printed at : Vijaya Press, Trivandrum - 14. Ph : 2320562