

The reliability of Rickett's analysis using cephalometric tracing on Iraqi sample aged 8-10 year

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Abstract

Cephalometric radiographs were taken for (48) subjects with class I occlusion ; (25) females and (23) males , which selected on the standarization of the radiographs. Sample ages range 8-10 years . cephlometric tracing are carried out using the same points, lines, angles and axis of Rickett's analysis.

On comparing the results of this research which is carried out on Iraqi sample with Rickett's analysis on Caucasian people of the same age appears that there are differences in most of these measurements and this due to racial factors and ethnic variations which play a great role in differences between each ethnic group .

The results of Iraqi measurements (mean values) as fallows:-

facial axis (Y-axis) =91.3°; facial depth angle =81.2° ; Frankfort-mandibular plane angle=30°; convexity of point A (mm)=2.7mm; lower incisor to A-pog =1.8mm;angle =26.1° and finally ANS-Xi-Pm angle (lower facial height) = 45.8°.

key wards: Cephalometric X-rays , cephalometric tracing, Rickett's analysis, points, planes, angles.

Introduction

Cephalometric radiographs can be used to diagnose the location and the severity of dentofacial discrepancies , since the original purpose of cephalometric radiography was to assess the growth pattern in the craniofacial complex and also to provide a clinical tool for study of malocclusion and underlying skeletal disproportion ⁽¹⁾ , vertically and horizontally of a jaw to a cranial base and to each other , and the relationships of the teeth to their supporting bone ⁽²⁾ .

Knowledge of the normal dentofacial patterns of each ethnic group concerning the age , information of both gender are very important since morphologic features of different races and ethnic groups are not randomly distributed , so the development of cephalometric norms and analysis in an attempt to define the skeletal

characteristics of a "good face" and "good occlusion"⁽³⁾ .

Cephalometric was introduced to orthodontic society by Broadbent ⁽⁴⁾ .

Rakosi ⁽⁵⁾ has reported that more than one hundred method of cephalometric tracing have been developed . Each method has its aims, advantages and limitations. Some of them were very simple as Tweed's analysis⁽⁶⁾, and others were relatively complicated as Bjork's analysis ⁽⁷⁾ and Sassounis analysis ⁽⁸⁾ .

While Brown ⁽⁹⁾ estimate about fifty different methods of analysis. The most common methods of analysis include:

Down's analysis ; Riedel analysis; Steiner analysis; Wit's analysis, East man's analysis, Mills. Sassouni analysis, Harvold analysis, McNamara analysis, Enlow's counterpart analysis; template analysis, finally the computerized cephalometric analysis.

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Where Rickett's analysis^(10,11,12,13) : which is one of the most commonly used cephalometric analysis who proposed to use points , planes and axes in addition to the traditional landmark for specific analysis , to analyze the chin in space , facial convexity , teeth position and facial profile . On young caucasian children aged 9 years of age and records his findings in a table having the mean values of the facial axis, facial depth, mandibular plane ; convexity of point A on the maxilla and lower incisors inclination , also he study the shape of the mandible and locate Xi point to explain the corpus axis which extend from Xi to Pm and use it to describe the morphology of the mandible (Skeletal and orthopedic conditions) . Before treatment to know the lower facial height which describes the vertical relation of the maxilla to the mandible and horizontally , the maxilla and mandible of the normal caucasian profile are in perfect alignment , and both falling along the facial plane .

Many Iraqi studies concerning cephalometric analysis like Odeh⁽¹⁴⁾ who reported that there was no Iraqi cephalometric data which were needed urgently .

Odeh⁽¹⁵⁾ carried out another cephalometric study on Iraqi orthodontic patients 10-17 years old giving the norm values for Iraqi patients using Eastman method of compensation for orthodontic patient only and not for general population , which may not be applied to general population . Normative cephalometric data growth prediction require thorough information concerning the age , for both gender and for each race .

Ali F. A.⁽¹⁶⁾ designed his study to analyze some skeletal facial and dental characteristics for both gender including 11 angular and 7 linear measurement by using cephalometric

radiography for 9-10 years old Iraqi children .

Also Al-Sahaf N.H.⁽¹⁷⁾ she carried a cross-sectional study of cephalometric standards and associated growth changes on a sample 9-17 years .

Her sample was classified into three skeletal groups based on the facial angles differences , age and genders ; concluded that there were no severe skeletal variations among Iraqi population since they possessed mild to moderate skeletal class II and relatively mild skeletal class III .

Al-Kannaq M.R.⁽¹⁸⁾ carried a cephalometric study of class II division I aged 11-14 years (growth study). Also he carried another cephalometric study in (2000) to determine the angulation and the distance of the centrals to their basal bones.

Many other Iraqi cephalometric studies carried out like Al-Sarraf⁽¹⁹⁾ in Mosul city: AlSayaph N.M.⁽²⁰⁾ ; Al-Hamdany A. K.⁽²¹⁾; Al-taani M.M.C.⁽²²⁾; Amasha H.F.⁽²³⁾

But no one have apply Rickett's analysis on Iraqi sample, therefore this study is done to assess the validity and reliability of Rickett's analysis on Iraqi sample aged 8-10 year in order to obtain the following:-

- 1.To obtain the mean values of cranial base, mandible & maxilla measurement in Iraqi sample.
- 2.To study these measurement in both genders.

Materials and Methods :

Cephalometric radiographs were taken for (48) subjects with class I occlusion ; (25) females and (23) males , which selected on the standardization of the radiographs . sample ages range 8-10 years .

The cephalometric radiographs were taken for each subject with the teeth in centric occlusion , based on the

Broadbent technique (1931) and as adopted by Odeh (1979) .

The film was placed on the viewer Houston⁽²⁴⁾ with image facing to the right Jacobson⁽²⁵⁾. Trace the external and internal contour of cranium and frontal sinus the out line of orbital bone, pituitary fossa (Sella tursica) , maxilla and nasal bone , pterygomaxillary fissure , finally the lower border of the mandible Krogram⁽²⁶⁾ or intermediate line when double image appeared Nanda⁽²⁷⁾.

The following cephalometric landmarks (points) were used as described by Ricketts (Fig. 1).Point (A); ANS; Point (B); Gonion (Go) Menton (Me) ;Nasion (N);Orbital (Or); Pogonion (Pog); Porion (Po); Sella (S); Pm (Protuberance menti).

The lines or planes which are used by Rickett's analysis as follows (Fig.2): SN line; Mandibular plane;Facial plane;Pt.v (pterygoid vertical);Basio-Nasion plane& A-pog line.

The most widely used axis by Ricketts analysis are (Fig 2).

§ Facial axis: A line extending from the foramen rotundum (Pt.v to Gn).

§ Corpus axis: Extends from Xi to Pm which is used to describe the morphology of the mandible to evaluate dentition changes.

Xi a point located at the geographic center of the ramus. Its location is keyed geometrically to Po-Or (F.H) and (Fig. 3) perpendicular through PT (Pt.v) in the following steps:

- 1- By constructing a plane perpendicular to FH and Pt.v.
- 2- These constructed planes are tangent to points (R1, R2, R3, R4)* on the borders of the ramus.
- 3- The constructed planes will form a rectangle enclosing the ramus.
- 4- Xi is located in the center of this rectangle at the intersection of diagonals.

The measurement includes five (5) angular measurements and three (3) linear measurements; as described by Rickett (Fig. 4) they are as follows:

1- Facial axis angle: This angle is formed by the intersection of the Basion - Nasion line and the facial axis . On the average and according to Rickett's analysis it's 90° with clinical variation of $\pm 3^{\circ}$ degree . (It's a modification of y axis) which joins the center of sella tursica to gnathion point , this axis gives the general direction of the facial growth in addition to the facial height .

2- Facial (Depth) angle : This measurement is the angle formed by the intersection of the facial plane (N.pog) and the frankfort horizontal plane . This angle gives an indication of the antero – posterior (Horizontal) position of the most anterior point of the mandible (pogonion). It 87° according to Ricketts measurement with clinical variation of ($\pm 3^{\circ}$) degrees.

3- Mandibular plane angle :This angle is formed by the intersection of the mandibular plane and the frankfort horizontal plane. This angle gives the clinician an indication of the cant of the mandibular corpus. it's 26° according to Rickett's measurement and decreases approximately 1° every 3 years.

4- Convexity:

Convexity at point A: (subspinale). It represent anterior Limit of maxilla or the convexity of middle face.

It's the distance in millimeters from point A to the facial plane (N-pog) measured perpendicular to that plane.

It gives an idea about the growth of maxilla; it's 2mm according to Rickett's measurement with a clinical deviation of 2mm. It decreases 1° every 5 years.

5- Lower incisor to A- pog (mm)(Lo.inc-A.pog): "Ideally" the

lower incisor should be located 1.0mm ahead of the A – pog line (Rickett's analysis). This measurement is used to define the protrusion of the lower arch .

6- Upper molar to Pt.v (Up.Mo-Pt.v)

: It is the distance in mm from the pterygoid vertical (Back of the maxilla) to the distal of upper molar(mm) . On average this measurement should equal the age the patient +3.0 mm according to Rickett's analysis; it assists in determining whether a malocclusion is due to the position of upper or lower molar. Its also useful in deciding whether extraction are necessary .

7- Lower incisor to A-pog (Lo.inc- A.pog):

The angle between a long axis of a lower incisor and the A pog plane. it's 22° according to Rickett's measurement this measurement provides some idea of lower incisor procumbency) .

8- ANS –Xi-Pm:

This angle is formed between the anterior nasal spine to the Xi (on the corpus of mandible) and to the protuberance mentalis on the inner surface of the symphysis of mandible (fig5). This describes the divergence of the oral cavity.

Rickett's measurement of this angle in 9 years caucasian children was 45° with clinical deviation 4.0 degree.

It referred to the lower facial height skeletally as it describes the vertical relation of the mandible and maxilla , so low values indicative of skeletal deepbite and high values indicative of skeletal open bite .

Result &Discussion :

1- Facial axis (Y-axis)

From table (1) (total) shows that the mean of the facial axis (Y) was found to be (91.3°) with standard deviation (2.1°) for all the sample (male and female) which is coincide with Rickett's analysis ^(11,12) table (2) which is found to be (90°) with standard deviation (3.5°) this finding coordinate with finding of Ali F.A. ⁽¹⁶⁾ who study Iraqi sample aged 9-10 years.

Table (3)&(4) shows no significant difference between the mean Y-axis angle of female and male. Since Y axis refers to the growth pattern diagonally relative to the cranium or base of the skull (point N. Ba) and the gnathion point (Gn) tip of the chin .

So its decrease means retroposition of the chin which means tendency toward class II skeletal pattern while its increase or greater than (90°) suggest a protrusive or forward growing chin or skeletal class III .

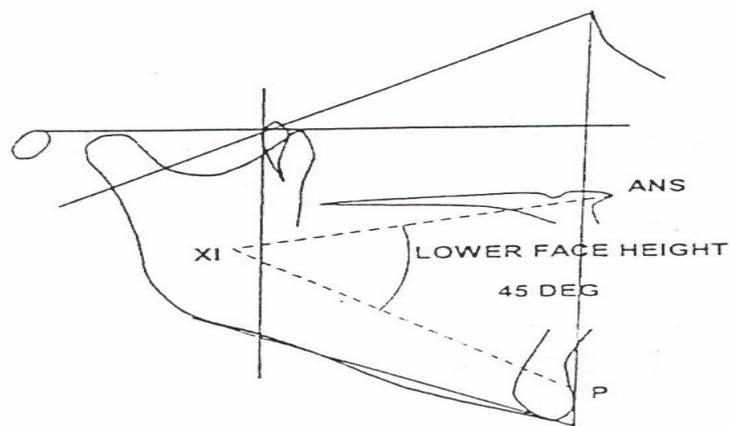
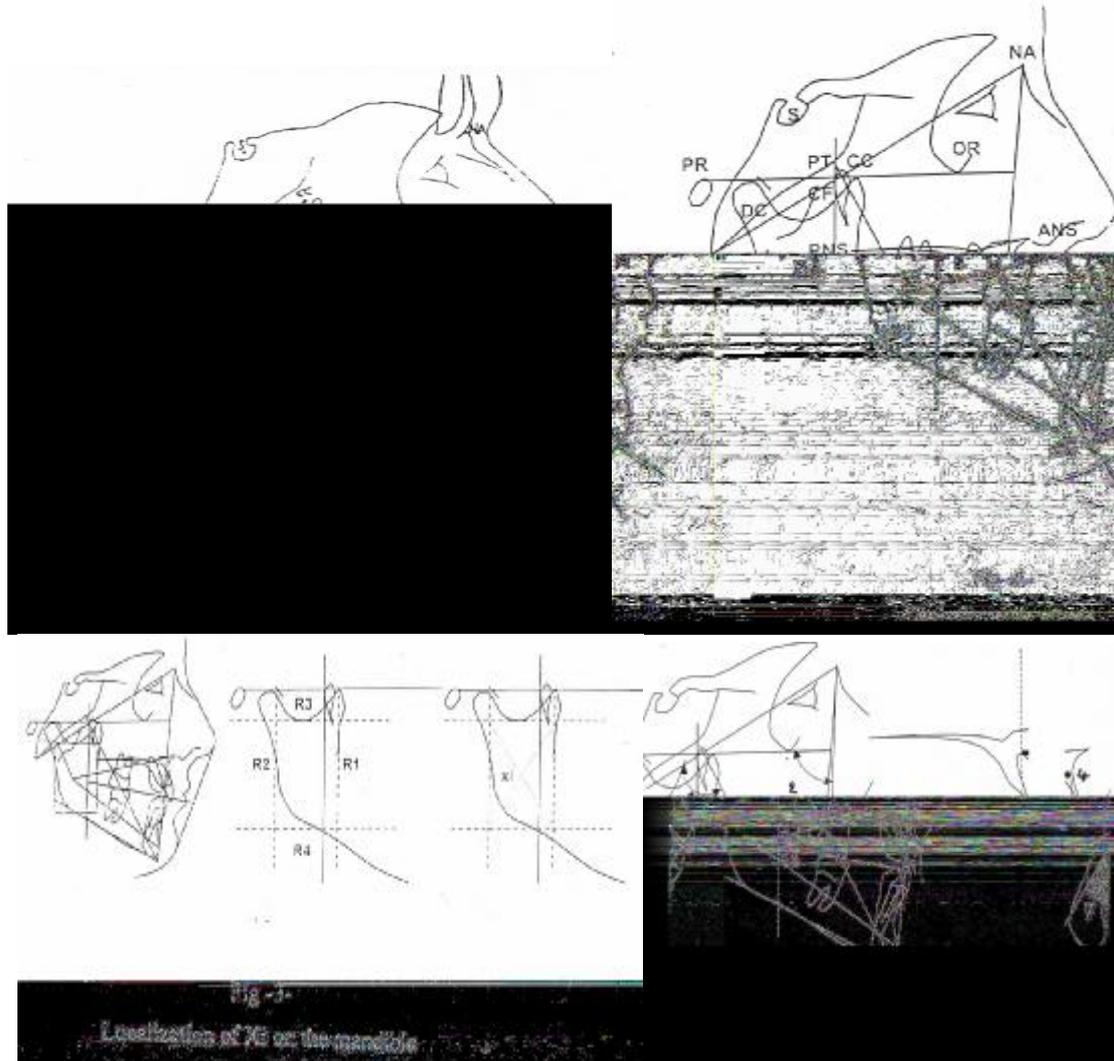


Fig -5-
Determination of Lower facial height (ANS-Xi-Pm)

2- Facial depth (F. angle) :

From table (1) total shows that the mean statistical description for the facial depth angle (81.27°) with standard deviation of ($\pm 4^\circ$) in comparison with the sample of Rickett on caucasian people aged 9-10 year table (2) which was 87° with S. D. ($\pm 3^\circ$).

This angle which measured between the facial plane (N-pog) and the Frankfort horizontal which provide indication of the horizontal position of the chin this angle was changed due to the change in position of N point during growth at age 8-10 years and this finding coordinate with the discussion of Ali F.A.⁽¹⁶⁾ about the point N. for Iraq , sample of 9-10 years old .

From table (3)&(4) which shows that this angle was less in male than female due to the anterior position of point N during growth period in males which was reported by knot et al⁽²⁸⁾ and Williams et al⁽²⁹⁾.

3- Mandibular plane angle (Fr-M-angle):

This angle which formed between the mandibular plane and frankfort plane Rickett's analysis shows that this angle will decrease 1 degree every 3 years.

Table (1) shows that the mean degree for this angle is (30°) with S.D. of (± 4) in comparison with Rickett's table (2). Shows higher degree in Iraqi sample than Rickett's sample (Caucasian people) aged 9 years. this result is coordinate with Odeh⁽¹⁴⁾ and Al-Sahaf⁽¹⁷⁾ , Odeh reported that the international cephalometric values might not necessary applied to Iraqi people which related to racial variation and genetic differences.

Also Al-Sahaf reported that there is significant increase from 9-11 years but it decreases after that.

From table (3) & (4) measurement there are no differences between male and female.

4- Convexity of point A:

As point A refers to the convexity of the middle face which is linear measurement from point A on the maxilla to the facial plane (N-pog). This distance describes the skeletal relationships (i.e) relation of the maxilla horizontally to the mandible.

From table (1) shows that the mean for this distance in Iraqi sample approximately (2.7mm) with S.D. (1 mm) .

Table (2) shows that this linear measurements slightly higher than Rickett's measurement and this may be due to ethnic variation and racial differences Odeh⁽¹⁴⁾ .

Table (3)&(4) shows this linear measurements was more in female than male and this may be due to the position of point N. in males as this point (N) comes more anterior in males due to greater measurement in males during growth Knot et al.⁽²⁸⁾ ; Williams et al⁽²⁹⁾ ; and Ali⁽¹⁶⁾ .

5- Lower incisor to A pog :(Lo.inc-A.pog)

As the A-pog line or plane called denture plane so its important for the position of anterior teeth .

This measurement is used to define the protrusion of lower arch .

From table (1)&(2) this linear measurement shows higher than that of caucasian people which measured by Rickett's and this due to more proclined lower incisor in Iraqi people and this in accordance with Al-Kanaqi⁽¹⁸⁾ .

This also due to ethnic variation and from table 3 and 4 shows that there is no difference between male and female .

6- Upper molar Pt.v : (Up.Mo-Pt.v)

As this linear measurement denotes to the distance from the pterygoid vertical (back of the maxilla) to the

distal of the upper molar . On the average this measurement equal to the age of the patient +3.0mm according to Rickett's analysis . Its an indicative measurement for the position of the upper molar to the back of the maxilla to the (Pt.v) fissure which is difficult to be locate in young growing child and super imposed with the other structure .

Iraqi people results table (2) shows its slightly lower than that of Ricketts measurement on caucasian children aged 9 years and this may be due to ethnic variation and racial differences which get faster growth in hot areas .

7- Lower incisor inclination to A-pog angle:(Lo.inc-A.pog angle)

This angular measurement formed between the lower incisor and the A-pog plane.

A cording to Rickett's analysis its (22°) with S.D. of (±4°) for caucasian children aged 9 years but for Iraqi children at the same age group its greater as shown in table (1) and table (2) this fact indicative that the lower central incisors are more proclined in

Iraqi people and this in accordance with (Ali F.A.⁽¹⁶⁾ and Al-Kanaqe⁽¹⁸⁾) .

8-ANS-XI-Pm (Lower facial height)

Maxillo-mandibular relationship: Horizontally the maxilla and mandible of the normal caucasian adult profile are in perfect alignment, both falling along the facial plane.

Vertically, the relation of the maxilla to the mandible is described by the lower facial height, (the intersection of two planes, ANS-XI and XI-Pm). The norm for this measurement is (45°) degrees according to Rickett's analysis in young 9 years old caucasian child with S.D. (4.0°) degree.

Table (1) show this angle in Iraqi sample is (45.8°) with S.D. (3.6°) which is approximately smiller to Richett's analysis (table 2) there is no difference between both gender table (3) and table (4) .

Corpus axis : Extends from Xi to Pm :used to describe the morphology of the mandible and to evaluate dentition changes (Fig. 5) .

Table 1 Total descriptive statistics measurements for Iraqi sample (male & female aged 8-10year)

| Descriptive Statistics | | | | | |
|------------------------|----|---------|---------|---------|----------------|
| | N | Minimum | Maximum | Mean | Std. Deviation |
| F-angle | 48 | 86.00 | 95.00 | 91.3750 | 2.1100 |
| Fr-M_angle | 48 | 70.00 | 90.00 | 81.2708 | 4.1088 |
| CONVEXITY OF A | 48 | 23.00 | 37.00 | 30.0833 | 4.2015 |
| Lo-Inc. A-linear | 48 | .50 | 5.00 | 2.7812 | 1.0258 |
| Up-Mo-ptv-Linear | 48 | -2.00 | 4.00 | 1.8021 | 1.0455 |
| Lo-Inc.A-pog-angle | 48 | 8.00 | 13.00 | 10.2917 | 1.4434 |
| ANS-XI-pm angle | 48 | 17.00 | 35.00 | 26.1042 | 4.3479 |
| Valid N (listwise) | 48 | 39.00 | 55.00 | 45.8125 | 3.6650 |

Table 2 comparison between Iraqi sample & Caucasian sample (Rickett's analysis) aged 8-10 year

| Measurements | Iraqi sample | | Caucasian sample (Rickett's analysis) | |
|-----------------------|--------------|---------------|---------------------------------------|---------------|
| | mean | Std.deviation | mean | Std.deviation |
| Y-axis | 91.3750 | 2.1100 | 90 | 3.5 |
| F-angle | 81.2708 | 4.1088 | 87 | 3 |
| Fr-M-angle | 30.0833 | 4.2015 | 26 | 4.5 |
| Convexity (mm) | 2.7812 | 1.0258 | 2 | 2 |
| Lo-inc.A-linear (mm) | 1.8021 | 1.0455 | 1 | 2 |
| Up-Mo-ptv linear (mm) | Age+2 | | Age +3 | |
| Lo-inc.A-pog angle | 26.1042 | 4.3479 | 22 | 4 |
| ANS-xi-pm angle | 45.8125 | 3.6650 | 46 | 4 |

Table 3 Female descriptive statistical measurement for Iraqi sample aged 8-10 year

Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|--------------------|----|---------|---------|---------|----------------|
| Y-axis | 25 | 86.00 | 95.00 | 91.200 | 2.3804 |
| F-angle | 25 | 75.00 | 90.00 | 81.9600 | 4.0258 |
| Fr-M-angle | 25 | 23.00 | 37.00 | 29.7200 | 4.7039 |
| CONVEXITY | 25 | 1.00 | 4.00 | 3.0000 | .8292 |
| Lo-inc.A-Linear | 25 | .00 | 3.00 | 1.7400 | .6633 |
| Up-Mo-ptv_Line | 25 | 8.00 | 13.00 | 9.8800 | 1.7156 |
| Lo-Inc.A-angle | 25 | 17.00 | 35.00 | 25.8800 | 4.9271 |
| ANS-XI-Pm angle | 25 | 39.00 | 51.00 | 45.240 | 3.6162 |
| Valid N (listwise) | 25 | | | | |

Table 4 Male descriptive statistical measurement for Iraqi sample aged 8-10 year

Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|---------------------|----|---------|---------|---------|----------------|
| Y-axis | 23 | 88.00 | 95.00 | 91.5652 | 1.8047 |
| F-angle | 23 | 70.00 | 90.00 | 80.5217 | 4.1546 |
| Fr-M-plane | 23 | 23.00 | 36.00 | 30.4783 | 3.6415 |
| CONVEXITY | 23 | .50 | 5.00 | 2.5435 | 1.1766 |
| Lo-Inc.A-Linear | 23 | -2.00 | 4.00 | 1.8696 | 1.3586 |
| Up-Mo-ptv-Linear | 23 | 9.00 | 12.00 | 10.7391 | .9154 |
| Lo-Inc. A-pog-angle | 23 | 17.00 | 35.00 | 26.3478 | 3.7125 |
| ANS-XI-Pm angle | 23 | 39.00 | 55.00 | 46.4783 | 4.0099 |
| Valid N (listwise) | 23 | | | | |

Conclusion

On comparing the results of this research which is carried out on Iraqi sample with Rickett's analysis on Caucasian people of the same age, using the same points, lines, angles and axis of Rickett, appears that there are differences in most of these measurements and this due to racial factors and ethnic variations which play a great role in differences between each ethnic group.

The measurements of this research as follows:

- 1- **Facial axis angle:** The mean of it (91°) with S.D. ($\pm 2^{\circ}$) which is approximately near to the Rickett's reading and there is no difference bet both genders.
- 2- **Facial depth angle:** The mean of this angle is (81.5°) with S.D. ($\pm 4^{\circ}$) which is less than Rickett's analysis and the male reading is slightly less than female.
- 3- **Frankfort mandbular plane angle:** The mean of it (30°) with S.D. ($\pm 4^{\circ}$) and this Iraqi reading is higher than Rickett's analysis and there is no differences between both genders.
- 4- **Convexity point A:** The mean of this distance in Iraqi sample is (2.7mm) with S.D. (± 1 mm) which shows slightly higher than Rickett's analysis. This linear measurement is more in female than that in male.
- 5- **Lower inc to A-pog. :** The mean of this linear measurement is (1.8mm) with S.D. (1mm) and this linear measurement shows slightly more than Rickett's reading. There is no difference between both genders.
- 6- **Upper molar to Pt.v.:** The mean of this distance is (10.5°) with S.D. (1.4) which referred to the age (+ 2 mm), which is less than Rickett's analysis and there is no differences between both genders.
- 7- **Lower incisor inclination angle to A.pog:** The mean of this angle in Iraqi sample is (26°) with S.D. ($\pm 4^{\circ}$). This result shows higher than Rickett's analysis.
- 8- **ANS-Xi-Pm:** The mean of this angle (45.8°) with S.D. (3.6°) which is approximately similar to that of Rickett's analysis. There is no difference between both genders.

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الخلاصة

اجري هذا البحث لمعرفة مدى امكانية تطبيق طريقة قياسات (Rickett) باستخدام اشعة جانبية للرأس والفكين على الواقين الذين تتراوح اعمارهم من 8-10 سنوات باخذ ٤٨ عينة من نوع الاطباق الاول (٢٥) اناث و (٢٣) ذكور باستخدام ذات النقاط والخطوط و الزوايا والمعايير التي استخدمها Rickett.

واضهرت النتائج ان هناك اختلافات واضحة لقياسات هؤلاء الاشخاص العراقيين من القوقازيين من الفئة العمرية ذاتها، نتيجة الاختلافات العرقية، الوراثية و البيئية

The Influence of Composite Type and Shade Selection on Depth of Cure of Light-activated Composites

Isra'a A. Al- Aubi B.D.S., M.Sc.*

Abstract

Background: This study investigated the influence of composite type and shade on depth of cure of light- activated composites.

Materials and methods: This study investigated the depth of cure of two composite materials using two different shades. Parameters included two shades (A1 and C3) of two different light-activated composites(Helio Progress and King Dental) cured for 40 seconds.

Results: Statistical analysis of the data by using the one-way analysis of variance revealed that, both composite type and shade significantly affect composite depth of cure.

Conclusion: This study indicated that, Although, both composite type and shade were significantly affect depth of cure but the effect of composite type on composite depth of cure is much more than that of composite shade.

Key words: Resin composite, composite shade, composite depth of cure and composite photo-activation.

Introduction

A common problem associated with photocuring is that the amount of light available to excite the photoinitiator dramatically decreases from the top surface inward as a result of light absorption and scattering ⁽¹⁾. This decrease in light intensity (attenuation) results in what is referred to as the “*depth of cure*” problem. Knowing the depth of cure of a particular shade of light-activated composite material would guide dentists in regard to the thickness of a composite layer that could be adequately cured clinically and provide them with a valuable baseline information about the specific depth of cure of different light-activated composite materials used by dentists. The ISO depth of cure (scraping) test ensured adequate polymerization of most resin-based composites ⁽²⁾. The International Standardization Organization, or ISO ⁽³⁾, defined

“Depth of cure” as 50% of the length of the cured composite sample after the soft, uncured portion has been scraped away manually. The length of the cured portion is measured with a micrometer to an accuracy of 0.1 mm, this value is divided by two (in compliance with ISO CD4049: 2000), and recorded as depth of cure. This method was also recommended by Morrow *et al.*, ⁽⁴⁾ and Manhart *et al.*, ⁽⁵⁾ in composite depth of cure determination. The objective of this research was to investigate the influence of composite type and shade on composite depth of cure.

Materials and Methods

A conventional Quartz tungsten halogen light-curing unit Astralis-3 (Ivoclar, Vivadent, Schaan/Liechtenstein) with an 8 mm diameter curing tip and 530mW/cm² curing light intensity was used for all the curing procedures in this study.

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Two different light-activated resin composite materials of A1 and C3 Vita shades were selected: Helio Progress (microfilled composite) (Ivoclar, Vivadent AG 9494 Schaan/Liechtenstein.Lot: F65176) and King Dental (microhybrid midifilled composite)(King Dental Corp., West Palm Beach, Florida. U.S.A. Lot: FD296). Forty specimens of light- activated composite were prepared and assigned into 4 groups, each group consisted of 10 samples:

Group 1: 10 specimens prepared using Helio Progress light-activated composite of A1 Vita shade.

Group 2: 10 specimens prepared using Helio Progress light-activated composite of C3 Vita shade.

Group 3: 10 specimens prepared using King Dental light-activated composite of A1 Vita shade.

Group 4: 10 specimens prepared using King Dental light-activated composite of C3 Vita shade.

For the preparation of each cylindrical specimen, a two-piece aluminum mold with a diameter of 4-mm and a height of 8-mm (Iraqi construction) was used as a mold for the composite specimens (Figure 1). A Transparent celluloid strip band (Hawe-Neos Dental, CH-6925 Gentilino, Switzerland) was placed on a flat glass slide (Blue star glass industries, Delhi, India) (Blue star glass industries, Delhi, India) on top of a white filter paper (England) then, the mold was placed over the transparent celluloid-strip and slightly overfilled it in one increment with the composite materials being tested then, a second transparent celluloid-strip was placed on top of the mold and overlaid it with a second glass slide, then a finger pressure was applied to the glass slide to extrude excess material.

The exit window of the curing light was placed over the second glass slide

(the light tip in contact with the glass slide) and each composite specimen was cured, through the transparent celluloid strip and the glass slide, with Astralis-3 light-curing devise for 40 seconds.

After completing curing, the composite specimen was removed from the mold and the uncured material at the bottom of the sample, was removed by scraping it away manually with a plastic spatula.

The height of the cylinder of cured material was measured with a micrometer (Hommel Werke, England) to an accuracy of 0.01 mm (Figure 2). This value was divided by two (in compliance with ISO CD4049: 2000), and recorded as depth of cure for that composite specimen.

Mean and standard deviation were calculated for each specific depth of cure. The results were analyzed with one-way ANOVA, Least Significant Difference (LSD)-test and Student t-test, all at significance level 0.05.

Results

Mean depths of cure (in millimeters) and standard deviations of the four groups were listed in Table I. Figure 3 represents mean depths of cure (in mm) of the four groups.

Statistical analysis of the data by using the one-way analysis of variance test (ANOVA) revealed that, there was statistically very high significant difference ($p < 0.001$) of depth of cure of the four groups as shown in Table II.

Least significant difference (LSD) test was carried out to examine the differences between the subgroups (1 X 2 & 3 X 4) and indicated that, there was statistically very high significant difference ($p < 0.001$) of depth of cure for the subgroups as shown in Table III.

Student t-test was carried out to compare between each pair of groups separately, also revealed that, there was statistically very high significant

difference ($p < 0.001$) of depth of cure for each pair of groups as shown in Table IV.

| | Group | N | Minimum | Maximum | Mean/mm | Std. Deviation |
|--------------------|-------|----|---------|---------|---------|----------------|
| Helio A1 | 1 | 10 | 2.050 | 2.280 | 2.17800 | 0.065115 |
| Helio C3 | 2 | 10 | 1.900 | 2.050 | 1.98300 | 0.044485 |
| King A1 | 3 | 10 | 3.000 | 3.090 | 3.04100 | 0.026541 |
| King C3 | 4 | 10 | 2.850 | 3.025 | 2.94250 | 0.055340 |
| Valid N (listwise) | | 10 | | | | |

Table I: Mean depths of cure (in mm) and standard deviations of the four groups.

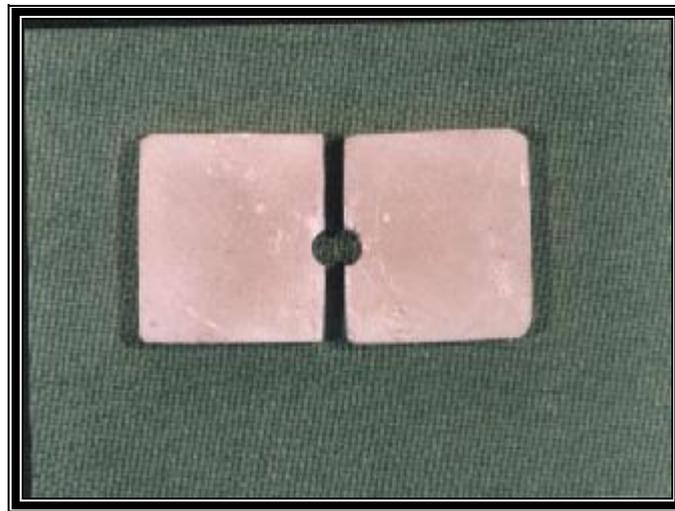


Figure 1: An aluminum mold of 8-mm in height and 4-mm in diameter was used as a mold for the composite material for measuring the depth of cure.

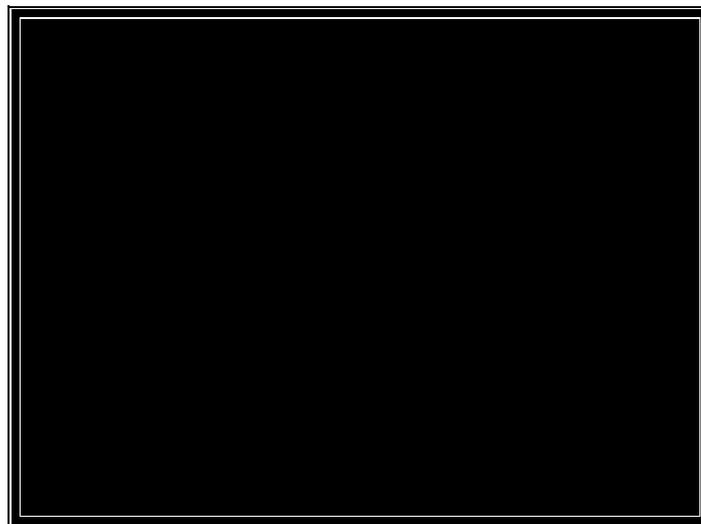


Figure 2: The micrometer device for measuring the depth of cure.

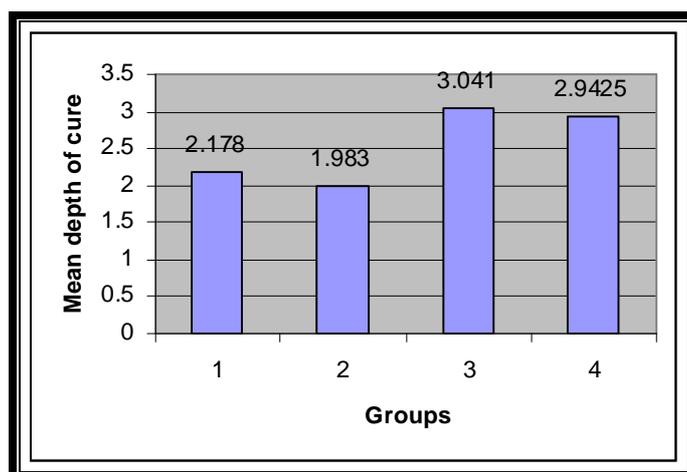


Figure 3: Mean depth of cure (in mm) of the four groups.

| | Sum of Squares | df | Mean Square | F | Sig. |
|----------------|----------------|----|-------------|----------|------|
| Between Groups | 8.542 | 3 | 2.847 | 1140.603 | .000 |
| Within Groups | 8.987E-02 | 36 | 2.496E-03 | | |
| Total | 8.632 | 39 | | | |

Table II: One-way analysis of variance test (ANOVA) of the four groups.

| Subgroups | Sig. | |
|-----------|------|-----|
| 1 x 2 | .000 | *** |
| 3 x 4 | .000 | *** |

***:Very highly significant difference

Table III: LSD test of depth of cure for the subgroups.

| | Groups | Sig. | t | df | Sig. |
|-------|---------|------|---------|----|------|
| VALUE | 1 and 2 | .299 | 7.819 | 18 | .000 |
| VALUE | 3 and 4 | .041 | 5.075 | 18 | .000 |
| VALUE | 1 and 3 | .035 | -38.811 | 18 | .000 |
| VALUE | 2 and 4 | .454 | -42.734 | 18 | .000 |

Table IV: t-test of the differences between different pair of groups.

Discussion

In this study, although both composite type and shade were significantly affect depth of cure but (Figure 3) demonstrated that, the effect

of composite composition on the depth of cure is much more than that of composite shade and this finding is in agreement with the finding of DeBacker & Dermaut ⁽⁷⁾ who found that, the most important factor

affecting the polymerization depth are the composition and the physical properties of the composite. Regardless of the composite shade, King dental light-activated composite exhibited higher depth of cure values than Helio Progress light-activated composite (Figure 3).

Depth of cure of light activated resin-based composites is a function of the material's filler composition and resin chemistry, its shade and translucency, the intensity of the light source, and the length of the radiation exposure⁽⁸⁾. The data of this study is in agreement with the findings of Jain & Pershing⁽⁹⁾ in that microhybrid resin-based composites had significantly greater depth of cure values than microfilled resin-based composites. In this study, King dental light-activated composite is a microhybrid midfilled composite with average particle diameter of 1.4 micron (manufacturer's data) while Helio Progress light-activated composite is a microfilled composite with average particle diameter of 0.01-0.1 micron (manufacturer's data). It is believed that microfills exhibit this reduced depth of cure because their small filler particles cause light scattering, which decreases the effectiveness of the curing light⁽¹⁰⁾. In this study, high contrast shades (A1 & C3) for both types of composites were selected to examine the effect of shade selection on the depth of cure. The results of this study also indicated that, the dark shade (C3) of both composite types significantly reduced depth of cure values in comparison with the light shade (A1). This finding was in agreement with the finding of Bayne *et al.*⁽¹¹⁾ who found that; pigments and colorants associated with composite

darker shades minimize light penetration through the composites.

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scientific and Radiographical Evaluation of Amalgam and Mineral Trioxide Aggregate as a Retrograde Filling in Periapical Surgery By Using Ultrasonic Device

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Abstract

Background: This study is to compare between Amalgam and Mineral Trioxide Aggregate as retrograde filling in the healing process of periapical surgery by clinical and radiographical evaluation.

Material and method: A follow up study of twenty patients, eleven were females, nine were males, of average age (12-36) years old, with forty upper central incisors involved with chronic periapical lesions, each patient has two central incisors with two separated periapical lesions, the right side was apically filled with Zinc free Amalgam and named as a control group (Group A), and the left side was filled with MTA as a study group (Group B). All patients were recalled within three months and six months, and subjected to clinical and radiographical examinations, to evaluate the healing process of both groups.

Results: Clinically the study shows three failure cases (7.5%), one case (2.5%) was objectively failure which shows sinus formation in Amalgam group and two cases (5%) were subjectively failure, which shows pain and tenderness, one case in each group. Radiographically, the study reported a remarkable bone formation 27 cases (67.5%), fifteen cases in MTA group and twelve cases in amalgam group after six months. While 10 cases (25%), showed delayed bone formation, four cases were in MTA group and six cases were in Amalgam group, and three cases (7.5%) were showed enlargement in the size of radiolucency, one case in MTA group and two cases in Amalgam group. According to the follow up during the six months, the MTA group showed higher successful rate than Amalgam group, and the failure cases in group A was 10% and 5% in group B.

Conclusions: The study shows that the best results are in those patients who have failure in root canal filling, and in those patients who did not have labial sinus formation and labial cortical bone perforation. MTA group, shows decreased in (Mesio-Distal, Superio-Inferior dimensions and cavity surface area), faster than the Amalgam group.

Key words: Endodontic surgery, Ultrasonic device, Mineral Trioxide Aggregate, Amalgam.

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Introduction

Root canal treatment is generally a successful procedure if the problem is accurately diagnosed and careful technique is used, if conventional root canal treatment fails, surgery is indicated for correction in some cases. Trauma, or caries are common causes of periapical pathosis, the pulp cavity and canal become repositories for necrotic pulp tissue, this degenerating tissue produces periapical irritation through the apical foramina or even through the accessory canals from periodontal tissues⁽¹⁾.

The body attempts to combat this irritation by means of an inflammatory response which could be either acute or chronic stages, according to the virulence of the bacteria⁽²⁾. Some of the chronic cases indicated for apical surgery to eliminate the source of periapical irritation emanating from the root canal which perpetuates apical infection. In addition to that it is important to allow reformation of cementum around the apex, to re-establish the function of periodontal ligament, and to allow alveolar bone regeneration⁽³⁾.

Many attempts and several materials have been tested to find an ideal material that used to establish a seal between the root canal space and the periapical tissue⁽⁴⁾.

According to Gartner and Dorn in (1992)⁽⁵⁾, a suitable root-end filling material should be:

- 1- Able to prevent microleakage of micro-organisms and their products into the periradicular tissue.
- 2- Non-toxic.
- 3- Non-carcinogenic.
- 4- Biocompatible with the host tissues.
- 5- Insoluble in tissue fluid.
- 6- Dimensionally stable.
- 7- Unaffected by moisture during setting.

- 8- Easy to manipulate and use.
- 9- Radiopaque.
- 10- Do not stain the tissue (tattoo) as recorded by Ingle, (2002).

Mineral Trioxide Aggregate (MTA) has been developed by Mahmoud Torabinejad and associates, at Loma Lind University in California (USA), it is one of several materials that attempted to provide an acceptable endodontic seal to prevent microbial insult⁽⁶⁾.

It has numerous exiting clinical applications in endodontic, several studies in vitro and in vivo showed that MTA prevent microleakage, biocompatible, and stimulate hard tissue formation⁽⁷⁾.

This study try to use MTA as retrograde filling material in comparison to the ordinary zinc free Amalgam filling, and evaluate its success clinically and radiographically.

Materials and Method:

During six months follow up, periapical surgery treatment were performed on Twenty patients with forty upper central teeth, each patient had two separated cavities being affected by periapical lesions were selected for this study, these teeth were divided into two groups according to type of material used as a retrograde filling.

- **Group A (Control group):** Apicoectomy + retrograde filling by using Zinc Free Amalgam, (right side).
- **Group B (Study group):** Apicoectomy + retrograde filling by using MTA, (left side).

All patients subjected to extra and intra oral examinations clinically, and also radiographically. Including clinical and radiographical

examinations after three months, and six months after surgery, the following information were recorded.

Inspection; To observe and detect if there is any variation at the site of surgery, such as swelling, inflammation or pus discharge.

Palpation; To observe and detect if there is tenderness of the periapical area of the treated teeth to percussion, and the grade of mobility.

These were recorded either (+) which mean that with sign and symptoms, and (-) which mean successful (without sign and symptoms).

Radiographical examination;

Periapical radiographs were taken immediately after surgery, three month, and six months, it is important to detect the followings:

- The size and extent of the periapical radiolucency, which was recorded from immediately post operative radiograph and considered as a guide for either decrease or increase in the size of the radiolucency by using vernier and transparent tracing paper.
- The results of healing process of each tooth including continuity of the lamina dura, root resorption, and the state of bone depositing over the area of the apical region, the criteria for the evaluation were (remarkable bone formation, no bone formation, or increase in radiolucency size).

Periapical surgery; Anesthetic solution is deposits throughout the entire surgical field in the alveolar mucosa at the level of root apex, canal preparation and enlargement are performed before the incision is done. Three sided flap is accomplished by two vertical and one horizontal incisions and full mucoperiosteal flap was reflected. Surgical access was made through the labial cortical bone to the apex

of the affected root by using straight low speed hand piece with coolant liquid, any pathological lesion should be removed from the bony cavity by using various sizes of curettes. Root apex is resected at 30 to 45 degree with the long axes of the root. Gutta percha cones would be placed and condensed inside the canal. Class I cavity preparation was done at the apex of each root by using ultrasonic generator with diamond bur and saline path, after heavy irrigation and dryness the right cavity was filled with Amalgam by special Amalgam carrier and the left cavity was filled with Mineral Trioxide Aggregate using malleting gun, then soft-tissue repositioned and sutured.

Follow up examinations and criteria for healing assessment; The follow up examinations based upon clinical and radiographic findings.

- A.** In clinical examination, two important factors that determined success or failure in periapical surgery, the objective signs, and the subjective symptoms⁽⁸⁾.
1. The objective signs are recorded by examining the condition of the surrounding tissue, it is positive if the accused tooth shows a sinus, mobility or swelling, otherwise it is considered objectively successful.
 2. The subjective symptoms are recorded positive if the accused tooth was sensitive to percussion and palpation, or any feeling of discomfort, it is regarded subjectively unsuccessful. Otherwise, it is registered subjectively symptomatic.
- B.** In radiographical examination, each patient had periapical radiographs pre-operative, immediately post

operative, after three months and after six months, to evaluate the healing after the surgery, the radiographs were taken by the same operator who performed the surgeries, on the immediately post operative radiographs, the mesio-distal distance at the cemento-enamel junction and the crown length served as standard in the measurement of the next radiographs to evaluate the ratio of elongation or the shortage of the objects on the film ⁽⁹⁾. All the radiographs were examined by two observers (one of them was oral radiologist, and the other was oral and maxillofacial surgeon), by the use of viewer, a black sheet laid to cover the illuminating area around the radiograph to prevent passage of light beside the film. The radiographs were examined in a dark room, by naked eye or by the use of magnifying glass lens, each observer interprets the radiographs separately and the readings were matched together. The diameter of the periapical radiolucency was measured in millimeters by vernier, the extent of the cavity was considered as the largest diameter when it was recorded from the

radiograph taken immediately after surgery. Another method was used to measure the surface area in square millimeters, by using a transparent tracing paper (each unit equal to one square millimeter mm^2). Units that overlap the radiolucent periapical area were counted, even when a part of unit was involved, it would be considered as a complete one. (Fig.1) The radiographic classification and criteria of healing results were classified by Lehtinen and Aitasalo in (1972) ⁽¹⁰⁾ in to:

- 1.Successful healing: when there was re-formation of a periodontal space which means the lamina durra is well formed around the apex, the bone cavity shows decrease in size, and signs of new bone trabecular formation.
- 2.Delay healing: when there was very slow decrease in the size of the radiolucency, but without clinical symptoms.
- 3.Unsuccessful or failure cases: when there were no bone regeneration, an increase in radiolucency and any Resorption on the root surface.

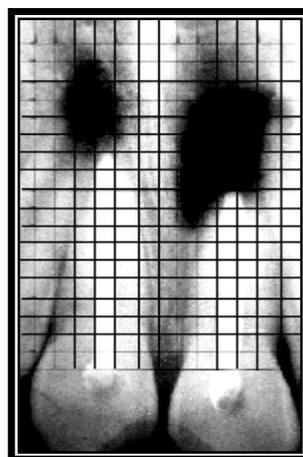


Fig.1: Transparent tracing paper over the radiograph

Results

The success rates of the operated teeth which obtained from the radiographical examination were recorded in table (1):

It was found that in both groups, after six months, 27 teeth (67.5 %) shows remarkable bone formation, while 10 teeth (25%) shows delay in bone formation, and three teeth (7.5%) showed enlargement in the lesion size radiographically.

A Chi-square test was used to detect significance differences in healing between Amalgam and MTA. The results revealed that there were no significant differences between the two groups, fifteen from twenty teeth (75%) that treated by MTA showed remarkable bone healing in comparison with amalgam cases that shows 12 out of 20 cases (60%), Amalgam shows higher records in the delay healing (6 cases 30%) than what were recorded by the MTA cases (4 cases 20%), also Amalgam was higher in failure cases (2 cases 10%) as compared with MTA (1 case 5%).

The effect of various factors on the healing process:

Gender:

Regarding the relation between genders and healing in general demonstrated in table (2), which indicated that there was no significant relation between male (13 of 20, 32.5%) and female (14 of 20, 35%) in the healing rates, this could be seen also in the delay healing, concerning the failure cases, that was a difference between male (0 %) and females (7.5 %)

Age group:

A Chi-square test was done to detect significance correlation of healing process in relation to the aging process in both groups which were demonstrated in table (3). The results

showed that there was no significant difference between age groups on the healing process of both materials.

Etiological factors of periapical lesions and relation to healing process:

Under circumstances of this study, it was found that the causes of periapical lesions could be categorized into three groups:

Group I (Trauma): patient had previous trauma with chronic inflammation.

Group II (Failure): Patients subjected to unsuccessful previous endodontic treatment and showing symptoms.

Group III (Caries): Patients referred by endodontists, with necrotic pulp because of extensive carious lesion, when they were unable to gain a negative culture from the root canal system after several visits.

A Chi-square test was done to detect significance of relation of healing between causes of periapical lesion and both groups were demonstrated in table (4). The results showed that there were no significant differences between etiological factors and healing results in both groups.

Presence of preoperative labial sinus:

Chi-square test in table (5), shows that was no significant difference between the presence of sinus and healing rates in both groups.

Presence of cortical bone perforation:

In this study, and after flap reflection, it was found that, 21 teeth (52.5%) out of 40 teeth were recorded to have cortical bone perforation (+), while the rest 19 teeth (47.5%) shows intact cortical bone(-).

There was no relation between the presences of cortical bone perforation in the healing process in both groups as shown in table (6).

Follow up period:

Table (7) shows that there were no significant relations between the healing process in both groups, during the periods of three and six months.

Surgical cavity dimensions and surface area:

The mesio-distal (M-D) and superio-inferior (S-I) dimensions of each surgical cavity was measured by vernier immediately after operation, after three months and six months by radiographs. The mesiodistal dimensions of immediately post-operative radiographs were ranged

from (2-6mm) with a mean of (4mm). While the superio-inferior dimension of immediately post-operative radiograph ranged from (3.1-7.8mm) with a mean of (5.2mm).

The surgical cavity surface area was measured by transparent tracing paper, Out of 40 periapical cavity, the largest cavity was measured (45 mm²) the smallest one is (5mm²). No significant differences between MTA and Amalgam in the different follow up period concerning mesiodistal dimension, superio-inferior, or cavity surface area. Table (8).

Table 1: Chi-square test shows healing results obtained from radiographical findings

| Results | MTA | | Amalgam | | Total % | | Chi.sq. | p value | Sig. |
|------------|-----|-----|---------|-----|---------|------|---------|---------|------|
| | No. | % | No. | % | No. | % | | | |
| Successful | 15 | 75 | 12 | 60 | 27 | 67.5 | 1.067 | 0.587 | NS |
| Delay | 4 | 20 | 6 | 30 | 10 | 25 | | | |
| Failure | 1 | 5 | 2 | 10 | 3 | 7.5 | | | |
| Total | 20 | 100 | 20 | 100 | 40 | 100 | | | |

p > 0.05 non-significant.

Table 2: Chi-square test shows the relation between gender and healing results in both groups.

| Gender | Results | | | Total | | Chi.sq. | p value | Sig. |
|--------|---------|---------|----|-------|-------|---------|---------|------|
| | MTA | Amalgam | | No. | % | | | |
| Male | S | 6 | 7 | 13 | 32.5% | 1.062 | 0.599 | (NS) |
| | D | 3 | 2 | 5 | 12.5% | | | |
| | F | 0 | 0 | 0 | 0 | | | |
| Female | S | 9 | 5 | 14 | 35% | 3.276 | 0.194 | (NS) |
| | D | 1 | 4 | 5 | 12.5% | | | |
| | F | 1 | 2 | 3 | 7.5% | | | |
| Total | | 20 | 20 | 40 | 100 | | | |

S: successful healing D: delay healing F: failure

Table 3: Chi-square test shows the relation between Age group and healing.

| Age groups | Results | | | Total | | Chi.sq. | p.value | Sig. |
|------------|---------|---------|---|-------|-------|---------|---------|------|
| | MTA | Amalgam | | No. | % | | | |
| 10-19 | S | 3 | 2 | 5 | 12.5% | 0.533 | 0.766 | NS |
| | D | 4 | 4 | 8 | 20% | | | |
| | F | 1 | 2 | 3 | 7.5% | | | |
| 20-29 | S | 9 | 7 | 16 | 40% | 1.022 | 0.134 | NS |
| | D | 0 | 2 | 2 | 5% | | | |
| | F | 0 | 0 | 0 | 0% | | | |
| 30-39 | S | 3 | 3 | 6 | 15% | / | / | / |

S: successful healing D: delay healing F: failure

Table 4: Chi-square test shows the relation of healing causes.

| Cause | | MTA | Amalgam | total | % | Chi.sq. | p.value | Sig. |
|---------|---|-----|---------|-------|-------|---------|---------|------|
| Trauma | S | 6 | 4 | 10 | 45.4% | 0.844 | 0.656 | NS |
| | D | 4 | 5 | 9 | 40.9% | | | |
| | F | 1 | 2 | 3 | 13.6% | | | |
| Failure | S | 5 | 5 | 10 | 100% | / | / | / |
| | D | 0 | 0 | 0 | 0% | | | |
| | F | 0 | 0 | 0 | 0% | | | |
| Caries | S | 4 | 3 | 7 | 87.5% | 0.997 | 0.287 | NS |
| | D | 0 | 1 | 1 | 12.5% | | | |
| | F | 0 | 0 | 0 | 0% | | | |
| Total | | 20 | 20 | 40 | | | | |

S: successful healing D: delay healing F: failure

Table 5: Chi-square test shows the relation between the presence of sinus and healing in both groups.

| Patients with sinus | | MTA | | Amalgam | | Total | | Chi.sq. | p.value | Sig. |
|---------------------|---|-----|----|---------|----|-------|-------|---------|---------|------|
| Sinus | | + | - | + | - | No. | % | | | |
| Results | S | 2 | 13 | 3 | 9 | 5 | 12.5% | 0.601 | 0.438 | NS |
| | D | 3 | 1 | 2 | 4 | 5 | 12.5% | 1.667 | 0.197 | NS |
| | F | 1 | 0 | 1 | 1 | 2 | 5% | 0.750 | 0.393 | NS |
| Total | | 6 | 14 | 6 | 14 | 12 | - | - | - | - |

S: Successful healing. D: Delay healing. F: Failure.
 (+) Presence of sinus. (-) Not present p >0.05 non-significant.

Table 6: Chi-square test shows the relation between the presence of cortical bone perforation and healing in both groups.

| Patients with perforation | | MTA | | Amalgam | | Total | | Chi.sq. | p.value | Sig. |
|---------------------------|---|-----|----|---------|---|-------|-------|---------|---------|------|
| Perforation | | + | - | + | - | No. | % | | | |
| Results | S | 6 | 9 | 5 | 7 | 11 | 27.5% | 0.008 | 0.930 | NS |
| | D | 3 | 1 | 5 | 1 | 8 | 20% | 0.104 | 0.743 | NS |
| | F | 1 | 0 | 1 | 1 | 2 | 5% | 0.750 | 0.393 | NS |
| Total | | 10 | 10 | 11 | 9 | 21 | 52.5% | - | - | - |

S: Successful healing. D: Delay healing. F: Failure.
 (+) Presence of perforation. (-) Not present. p >0.05 non-significant.

Table 7: Chi-square test shows the relation between the two periods follow up and the healing results in both groups.

| Periods | | MTA | Amalgam | Total | % | Chi.sq. | p.value | Sig. |
|----------|---|-----|---------|-------|-------|---------|---------|------|
| 3 Months | S | 9 | 5 | 14 | 35% | 1.867 | 0.393 | NS |
| | D | 10 | 13 | 23 | 57% | | | |
| | F | 1 | 2 | 3 | 7.5% | | | |
| 6 Months | S | 15 | 12 | 27 | 67.5% | 1.067 | 0.587 | NS |
| | D | 4 | 6 | 10 | 25% | | | |
| | F | 1 | 2 | 3 | 7.5% | | | |

S: successful healing D: delay healing F: failure

Table 8: t-test showing means of cavity dimensions and surface area in different periods in both materials.

| Measurements | Periods | Material | | | | t | p. value | Sig. |
|------------------------|-----------|----------|-------|---------|-------|-------|----------|------|
| | | MTA | | Amalgam | | | | |
| | | Mean | SD | Mean | SD | | | |
| M-D (mm) | Immediate | 3.91 | 1.3 | 3.69 | 1.13 | 0.584 | 0.563 | NS |
| | 3 Months | 3.26 | 1.53 | 3.38 | 1.32 | 0.255 | 0.8 | NS |
| | 6 Months | 2.36 | 1.68 | 2.77 | 1.58 | 0.805 | 0.426 | NS |
| S-I (mm) | Immediate | 5.24 | 1.4 | 5.3 | 1.43 | 0.134 | 0.894 | NS |
| | 3 Months | 4.39 | 2.12 | 4.73 | 1.69 | 0.552 | 0.584 | NS |
| | 6 Months | 3.14 | 2.46 | 3.74 | 1.97 | 0.852 | 0.4 | NS |
| Area(mm ²) | Immediate | 19.25 | 10.33 | 18.95 | 9.85 | 0.094 | 0.926 | NS |
| | 3 Months | 15.85 | 12.52 | 16.85 | 10.61 | 0.272 | 0.787 | NS |
| | 6 Months | 10.45 | 12.61 | 12.35 | 11.13 | 0.505 | 0.616 | NS |

Discussion

Many root end filling materials have been tested in vitro to demonstrate their sealing ability, effectiveness and biocompatibility by histopathological examination; few materials have been tested in vivo in human.

The healing results could be evaluated by clinical and radiographical examination, especially after the first 6 months post operatively.

Generally, the successful result for this study was (75%) in the MTA group and (60%) in amalgam group. The overall success in both groups were (67.5 %), this results were nearly the same as that obtained by Oginni and Olvisilem, (2002) ⁽¹¹⁾ who recorded (71.9%), and Rappl et al., (1991) ⁽¹²⁾ who recorded (65%).

Clinical and radiographical healing results of success cases were independent on the type of the material used whether MTA or Amalgam, In the current study Amalgam shows (60%) successful healing, this result was in agreement with Matilla and Altonin, (1968) ⁽¹³⁾ ; and Dorn and Gartner, (1990) ⁽¹⁴⁾, while delay cases (30%) are higher than the MTA, this is because the Amalgam produces

chronic inflammatory process on the first three months after application and gradually regresses as recorded by Bhargava et al., (1999) ⁽¹⁵⁾. Also, the use of the bone wax in the bony cavity during the application of Amalgam filling and numerous authors have reported the presence of persistent inflammation, foreign-body giant cell reactions, and delayed healing at the surgical site following the use of bone wax. ^(16,17)

A retrospective study compared MTA with IRM and Super- EBA. , and shows no significant difference in the success rates ⁽¹⁸⁾.

From this point of view, it can be conclude that there is no significant difference between MTA and Amalgam when it is used clinically.

In this study, MTA shows (75%) successful cases than group A. Delayed cases were less (20%) than the other group, because MTA is biocompatible and bioactive in bone formation, this was in agreement with Chong et al., (2003) ⁽¹⁸⁾; and Grossman et al., (2003) ⁽¹⁹⁾.

Mineral Trioxide Aggregate (MTA), shows higher successful rates than Amalgam, and the delay healing cases were less, but statistical analysis shows there were no significant difference in the success rates between

the two groups. That is to say the healing was independent on the material used, which was agreed with Chong et al., (2003).⁽¹⁸⁾

The effect of various factors on the success rates in group A and B:

Gender statistical analysis shows no significant difference were found between male and female in the healing process in both groups, which was agreed with Harty et al., (1970)⁽²⁰⁾; and Wang et al., (2004).⁽²¹⁾

Age group: Statistical analysis shows no significant difference in the healing rate concerning age groups and material used. This was agreed with Rappl et al., (1991).⁽¹²⁾

Etiological factors of periapical lesion: surgical treatment done on teeth with failed root canal therapy and caries shows good result in both groups, this was in agreement with Sjögren et al., (1998)⁽²²⁾, and Zulou et al., (2000)⁽²³⁾, who considered that the root canal system if it was pretreated and disinfected, would show (90 %) success. Statistical analysis shows no significant difference of the materials and healing process according to the etiological factor of the lesion

Presence of preoperative labial sinus: The relation in healing in both groups were not significant, thus the healing rates in both groups were independent upon the presence of preoperative labial sinus which was in agreements by Oginni and Olvisilem (2002)⁽¹¹⁾.

Presence of labial cortical bone perforation: The healing process were delayed in those who have labial cortical bone perforation more than the other, and this may be due to alveolar bone resorption and the presence chronic lesion. Statistical analysis shows that there were no significant difference between the presence of perforation and healing rate in both groups which was in agreement with

Abdulla (1989)⁽²⁴⁾; and Al -Tae (1992)⁽²⁵⁾, this may be due to the fact that during the surgical procedure, a created opening through the cortical bone to reach the lesion and root apex, this is true even with intact cortical bone, that create an iatrogenic bone perforation.

Follow-up periods: Within three months examination, the success rate of cases were (35%) of all cases, which raised up to (67.5%) within six months. The delay healing were (57%) in 3 months and decreased to (25%) after six months, this shows highly significant difference between the two periods

Cavity dimensions and surface area: In this study the mean value of mesio-distal dimension of the bony defect decreased from (3.91 mm) to (2.36 mm) in MTA, and from (3.69 mm) to (2.77 mm) in Amalgam. While, the superio-inferior dimension, the mean value was decreased from (5.24 mm) to (3.14 mm) in MTA, and from (5.3 mm) to (3.74 mm) in Amalgam group.

The mean value of surface area was decreased in MTA group from (19 mm²) to (10.45 mm²), and from (18.95 mm²) to (12.35 mm²) in Amalgam group, statistical analysis shows no significant difference between the two groups.

Conclusions

- 1- The clinical evaluations of the successful rate are not an indication for the complete success cases, but have to be combined by radiographical evaluation.
- 2- The study shows there is no significant difference in the healing results between the Amalgam group and MTA group.
- 3- The study shows that the best results are in those patients who have failure in root canal filling,

while the delayed and failure cases are in those exposed to trauma.

- 4- Higher success rate were reported in those patients who did not have labial sinus formation and labial cortical bone perforation.
- 5- MTA group, shows decreased cavity surface area (Mesio-Distal, Superio-Inferior dimensions), faster than that of amalgam group during the follow up period.

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The effect of denture cleaners on Tensile Strength and Indentation hardness of denture base materials

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Abstract

Background: Denture cleaner solutions are used extensively for the cleaning of prosthesis both plastic and metallic component. The chemical composition of cleaner solution are virtually important in defining their adverse effect on properties of acrylic part of prosthesis

Aims of the study The present study carried out to study the effect of some cleaning solution on tensile strength and indentation hardness of both types of acrylic resin (hot and cold cured) and compare the effect on different types of denture materials.

Materials and methods: Specimens of hot and cold cured acrylic resin were prepared according to ADA specification for both indentation hardness and tensile strength test. The specimen were immersed in distilled water for seven days then were left in containers containing one of the following denture cleaners, Staradent 1% H₂O₂, 5% HCL & vinegar solution. Each container contained five specimens of either heat cure or cold cure with one type of denture cleaners and they were left for seven days. Specimens were then tested for indentation hardness and tensile strength test.

Results: The results showed that Vinegar solution has an deleterious effect on tensile strength and indentation surface hardness of hot cured acrylic resin as compared with control while for cold cure all specimens affected by all cleaning solutions.

Key ward: Denture cleaners, tensile strength, indentation hardness

Introduction

Denture cleanliness is essential to prevent malodour, poor aesthetic and the accumulation of plaque and calculus effect on mucosa 1,2,3. Clean denture surfaces must be done efficiently because the fungi grow on denture surface infect and reinfect soft tissue.(4_11). Knowledge of constituents of denture cleaners, their efficiency, adverse effect and safety would aid in dispensing appropriate information to the patients (12). Prolong use of such denture cleaner may affect the fit of the denture and rough surface produced makes the maintenance of clean surface most difficult, the patient should be warned accordingly.(13)

Several studies were carried out to study the effect of denture cleaners (disinfectant) on acrylic Resin. Surface roughness and Transverse deflection testes were made to study the effect of cleaners. (14_16)

The present study was carried out to study the change in tensile strength and indentation hardness after immersion in one type of denture cleaner [Staradent tablet, 1% Hydrogen peroxide, 5% Hydrochloric acid and Vinegar] and the difference between two types of acrylic resin in respect to the properties after immersion.

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Materials and Methods

Indentation hardness test

Rectangular wax plate (65x55x3mm) was used for the preparation of a mould for both types of acrylic resin (hot & cold cure)*. The wax plate was fixed into the lower half of the flask. Then stone was poured in the lower half of flask, and then the stone in the lower half of flask was left to harden so the level of wax plate was kept with the level of stone. After complete setting of the stone wax elimination was done and was coated with separating medium, then the surface of mould was ready for packing the acrylic dough. The manufacturer instructions were followed for packing and curing of both type of acrylic resin as explained in Table -1

After complete processing of acrylic resin the cured plate of both types of acrylic resin were hand finished for one surface using ray wheel with continuous water cooling, the specimen were then polished using rag wheel with pumice in dental lathe for two minutes, A wet soft mop on dental lathe was used at low speed (15 rpm) with continues water cooling to avoid over heating of specimen. Each plate of acrylic resin was finished to obtain the final measurements of (65x50x2.5 -0.03 mm) length, width, & depth respectively. These measurements were done using Micrometer Starreit Company, Massussets USA. The specimens were tested for indentation hardness for both heat and cold cure acrylic resin after being conditioned in distilled water at room temperature for one week in order to reach nearly a state of saturation. Specimens were left in a container containing one of the following denture cleaners, Staradent

tablet, 1%hydrogen peroxide** (H₂O₂),5%hydrochloric acid and vinegar*** for seven days .Each container contains five specimens of either heat cure or cold cure with one type of denture cleaners and left for seven days. For staradent tablet the solution needed to be changed 12hrs while for the remaining solution had to be changed every day.

The shore hardness tester **** was used in this study for measuring the indentation hard ness of the specimen .The test load was set to 50N for Shore (D) Which is suitable for acrylic resin materials. In order to prevent errors in measurement the contact surface of the shore hardness tester must be parallel to specimen support of the stand before carrying out the test ,A distant of 5-12mm was set between the specimen surface and the indenter of the hardness tester , The contact period between the specimen and the indenter was 6 second. The measurement was then taken directly from the scale reading. Five measurements were obtained from different areas of each specimen and an average reading was calculated.

Tensile strength test

Fifty Dumbbell-shaped specimens were prepared by cutting wax blocks fixed on a glass plates according to the ready made Dumbbell-shaped wax block. The measurements were done using Micrometer starett at different area to be sure that the same width was duplicated from plastic specimen. The flasking and curing process were preceded as described in table (1) and specimens were finished as prescribed previously in the indentation hardness test. The specimens were tested on an

* Heat & cold cure Qualy Dental Ltd., Dentor House Dominion Way West Sussex BNI 480Nengland.

** H₂O₂ Original concentration 6% ,Iraq Pharmaceutical Industry Co.

*** Al-Badawe Industry

**** Instron Universal Testing Machine , Model 1190,Limited concentration Rd.,High Wycombe Backs ,U K

instron*** testing machine set at cross head speed 10 mm/min in 100mm chart speed. The load cell used was tensile load cell maximum capacity 100kn. The tensile strength is calculated by the following equation:

$$T.S = F/A$$

$$F = \text{force (N) and } A = \text{Area (mm)}^2$$

Note: The final measurements of the specimen for both tests (surface indentation & tensile strength test) were made according to the ADA specification⁽¹⁷⁾

Note: the specimens were tested for tensile strength test after treatment with denture cleaner in a manner similar to the indentation hardness test

Results

Tensile strength

Table (2) showed the mean values, standard deviation (S.D) and coefficient of variance of the tested specimens of heat and cold acrylic resin and it appeared that the lowest mean value of tensile strength observed were those specimen immersed in vinegar solution as compared with the control.

Indentation hardness test

Table (3) showed the mean values, standard deviation (S.D) and coefficient of variance of the tested specimens of heat and cold cured acrylic resin and it appeared that the lowest mean values of indentation hardness was observed with the specimens immersed in vinegar solution as compared with the control.

The effect of cleaning solution on tensile strength of acrylic resin denture base material appeared in table 4. In this table a non significant different effect of all cleaning solutions on heat cure acrylic resin as compared with the control except vinegar solution had a significant different effect. While for cold cure acrylic resin, all solutions showed a highly different effect.

Regarding the effect on indentation hardness table 4 showed that only vinegar solution showed a significant different effect on heat cure acrylic resin, while the effect on cold cure showed significant and highly significant different as compared with the control

Discussion

Denture cleaning solution have been routinely used for maintains of clean and sterile denture without damaging the base material. This study was conducted to evaluate the effect of some solution of denture cleaners for seven days immersion time which is a relatively long period to know the worst behavior and the possible effect that may take place on repeated short immersions of dental prostheses on denture cleaners. The result of the present study showed that only vinegar solution had an undesirable effect on both tensile strength and indentation hardness, This deleterious effect on both tests might be due to the high acidity of vinegar solution that causes a reduction in tensile strength and surface hardness of acrylic resin This result was similar to the result obtained by Jassim 2001⁽¹⁶⁾ which revealed that vinegar solution affects the transverse strength but still within the ADA specification No.12⁽¹⁷⁾

Regarding the effect of cleaning solution on cold cure acrylic specimens ,it was appeared that cold cure acrylic resin affected by all cleaning solution .This might be due to the high amount of residual monomer present in the cold cure acrylic resin, This result was similar to the result obtained by Faraj and Jassim2000⁽¹⁵⁾, Jassim 2001⁽¹⁶⁾ and Faraj 1977⁽¹⁸⁾ who studied the effect of HCL on surface of heat cure acrylic resin materials after 12 hrs, These findings may be due to that those studies were done using

SEM and photograph, while the results of the effect of disinfectant solutions on the hardness of acrylic resin denture teeth showed that non of the following solutions (4% chlorhexidine, 1% sodium hypochlorite and 3.78% sodium perborate) on acrylic denture teeth⁽¹⁹⁾. On the other hand the result obtained by Asad et al⁽²⁰⁾ showed that various disinfection solutions (0.5% chlorhexidine, 2% glteraldehyde and alcohol) did not affect the surface hardness of acrylic denture base materials.

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Table-1-The manufacturer instruction of packing and curing of heat cure and cold cure acrylic resin

| Materials | QD Qualy heat cure | QD Qualy cold cure |
|------------------|---|---|
| Powder/Liquid | 2.5/1 (weight) | 2.1/1 (Volume) |
| Dough Time | 15min | 5min |
| Working Time | 15min | 15min |
| Room Temperature | (23C+5) | (23C+5) |
| Curing Time | Immersed the flask in boiling water and allow to regain boiling temperature and cure for 20 minutes | Leave flask under clamp pressure an over night period |

Table-2- Effect of cleaning solution on Tensile strength of acrylic resin denture base materials

| COLD CURE | | | | HEAT CURE | | |
|-----------|-------|------|------|-----------|-----|------|
| Solutions | Mean | S.D | C.V% | Mean | S.D | C.V% |
| Control | 63.46 | 7.4 | 11.5 | 52.6 | 4.4 | 8.3 |
| Staradent | 58.53 | 5.93 | 10.1 | 52.78 | 2.9 | 5.4 |
| 1%H2O2 | 59.33 | 5.62 | 9.4 | 52.47 | 4.8 | 9.1 |
| 5%HCl | 55.58 | 6.05 | 10.8 | 51.06 | 4.4 | 8.6 |
| Vinegar | 52.03 | 5.03 | 9.6 | 43.67 | 3.7 | 8.4 |

S.D= standard deviation , C.V= coefficient of variance

Table -3 - Effect of cleaning solution on Indentation Hardness of acrylic denture base materials

| Heat cure | | | | Cold cure | | |
|-----------|------|------|------|-----------|------|------|
| Solutions | Mean | S.D | C.V% | Means | S.D | C.V% |
| Control | 85.6 | 1.55 | 1.8 | 88.1 | 2.08 | 2.36 |
| Staradent | 82.2 | 0.89 | 1.0 | 88.8 | 0.68 | 0.7 |
| 1%H2O2 | 82.2 | 1.13 | 1.3 | 88.5 | 8.39 | 9.4 |
| 5%HCl | 79.2 | 0.67 | 0.8 | 87.6 | 11.9 | 13.5 |
| Vinegar | 75.9 | 1.14 | 1.5 | 70.9 | 5.0 | 7.1 |

S.D= standard deviation , C.V= coefficient of variance

Table-4- ANOVA Test for the significant different between group of denture cleaners for heat and cold cure

| Tensile strength | | |
|----------------------|-----------|-----------|
| Solution | Heat cure | Cold cure |
| Staradent +control | N | S** |
| 1%H2O2+control | N | S** |
| 5%HCL+control | N | HS**** |
| Vinegar +control | S** | HS**** |
| Indentation hardness | | |
| Solutions | Heat cure | Cold cure |
| Staradent +control | N | S** |
| 1%H2O2+control | N | S** |
| 5%HCL+control | N | HS**** |
| Vinegar +control | HS*** | HS**** |

*One star indicate significant different

**Two star and more indicate significant different between group and increase in number star means increase in significant different

Alveolar Bone Loss in Adult Young Patient Seeking Periodontal Treatment (Radiographic Study)

Dr. Sana'a Jamal Al-Qassab *

Abstract

Thorough clinical and radiographic examination is necessary to detect, evaluate and diagnose periodontal disease. The aim of present study is to evaluate interdental bone loss in patients with chronic adult periodontitis radiographically. One hundred eighty sites (for maxillary anterior teeth only) were examined for type and severity of alveolar bone loss. The results reveal that 80% of all examined sites had different severity of bone loss. Mild bone loss was more frequent than Moderate or Severe and horizontal more than vertical or angular bone loss. Interdental bone between central and lateral incisors was the most affected site in this study.

Key words: bone loss, periodontal, interdental, horizontal, vertical, angular, radiographic

Introduction

Periodontal disease refers to a group of diseases that affects the tissues that invest and support teeth (1)

Thorough clinical and radiographic examination is necessary to detect, evaluate, and diagnose periodontal disease. The clinical examination alone may not provide enough information about supporting bone, so the radiographic examination is mandatory. (2) In addition to that radiographs can be used to document periodontal disease and determine the success or failure of periodontal therapy (3).

Also interpretation of periodontal disease on dental radiographs should include an evaluation of the alveolar bone. The bony changes can be described in terms of pattern (horizontal, vertical or angular), distribution (localized or generalized) and severity (Mild, Moderate and Severe) with considering that (Mild refers to only crystal bone loss, while moderate refers to bone loss of 10-33% and severe bone loss is 33% or more)

(4). Radiographs can also be used to detect local irritants, such as calculus and defective restorations specially over hung, that contribute to periodontal disease as they may be considered as plaque retentive factors(5).

Finally radiographs can be used in the classification of periodontal disease, based on the amount of bone loss. (6).

Many studies were carried out on radiographic assessment of periodontal disease.

Comparative studies were carried out on different radiographic procedures to evaluate the most accurate radiographic procedure for assessment of alveolar bone loss in Periodontitis cases, so some authors concluded that the periapical and panoramic radiography are in great agreement for assessment of alveolar bone level in periodontal disease(7-10).

While others used series of digital periapical radiograph for assessment of the relation of (alveolar bone height/root length) which is in disagreement with others who

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concluded that digital radiographs are not a substitute for conventional radiographs in evaluating alveolar bone levels (11,12).

The aim of present study is to evaluate bone loss in patients with chronic adult periodontitis radiographically.

Material and methods

Sample in this study was selected from patients attending periodontal clinic complaining from bleeding on brushing, dentin hypersensitivity, or just discomfort on eating.

The population sample was selected depending on following criteria

1. Site of periodontitis was confined to maxillary anterior teeth.
2. The patient is systematically fit.

Patients out of these criteria were excluded from this study. Total sites number was 180 site. X-ray using (bisecting angle technique) was taken for the affected teeth for each patient.

Then the type of bone loss (horizontal, vertical and angular) was recorded in each of the following sites: between centrals, between central and lateral (both sides), and between lateral and canine (both sides).

The severity of bone loss (Mild, Moderate and Severe) was also estimated depending on the amount of bone loss.

Finally the resultant data was arranged in tables according to site, type and severity of alveolar bone loss.

Results

Results of this research revealed that 80% of all examined sites (144 out 180) had different severities of bone loss.

Horizontal bone loss seems to be more than vertical and angular types; it

constitutes 39.58% of total bone loss in comparison to 37.48% for vertical and 22.99% for angular bone loss.

On the other hand it was found that the interdental bones between central and lateral incisors were more affected by vertical bone loss (22.90%) than horizontal (12.50%) and angular (6.95%) types.

Horizontal bone loss seems to affect all sites in comparable percentages, while the angular bone loss affect the interdental bone between the central incisors (12.52%) more than other sites. Table 1.

Regarding the severity of interdental bone loss, it was found that majority of sites had undergone mild bone loss (58.33%) in comparison to moderate (34.02%) and severe (7.64%) bone loss. The interdental bone between central and lateral incisors were affected by all types of bone loss (41.66%) more than other sites. Table 2.

In more detailed figure the mild vertical bone loss was found to affect the interdental bone between central and lateral incisors (25%) which is more than the other sites, while the interdental bone between lateral and canine is the least site to be affected by all types of bone loss especially mild angular type (1.19%). Table 3.

In regard to moderate bone loss, one can see that this type of bone loss affect the interdental bone between the central and lateral incisors more (42.86%) than the other sites. Table 4

Findings related to the severe bone loss showed that as the bone loss become sever the percentages in differences between the affected sites become smaller. Table 5.

Discussion

This study shows that 80% of examined sites were affected by interdental bone loss that may give an

idea that the alveolar bone loss is a common finding in patients with periodontal disease and may indicate that seeking of periodontal treatment may be slightly delayed the matter that can be explained by painless progression of periodontal disease. Fortunately most of this bone loss was mild (58.33%) which give us a chance for carrying out a successful periodontal treatment. The results also showed that horizontal type of bone loss was more than the other types and this finding also can be explained by the nature of periodontal disease, where the upper most part of interdental bone seems to be firstly affected by microbial dental plaque action, as it is growing downward in the sub gingival area.

Vertical bone loss tend to affect the interdental bone between central and lateral incisors more than the other sites, may be due to anatomical configuration of interdental bone in this area, or due to occlusal trauma or abnormal occlusion specially when we know that bone loss may enhanced by occlusal trauma.

The interdental bone between lateral incisor and canine was the least affected site by alveolar bone loss, may be due to dense bone that found around the canines (canine eminence).

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Table 1 bone loss by type and site

| Site of bone loss | Between centrals | | Between central and lateral | | Between lateral and canine | | Total | |
|-------------------|------------------|-------|-----------------------------|-------|----------------------------|-------|-------|-------|
| | No | % | No | % | No | % | No | % |
| Horizontal | 19 | 13.20 | 18 | 12.50 | 20 | 13.88 | 57 | 39.58 |
| Vertical | 9 | 6.25 | 33 | 22.90 | 12 | 8.33 | 54 | 37.48 |
| Angular | 18 | 12.52 | 10 | 6.95 | 5 | 3.47 | 33 | 22.94 |
| Total | 46 | 87.97 | 61 | 42.35 | 37 | 25.68 | 144 | 100 |

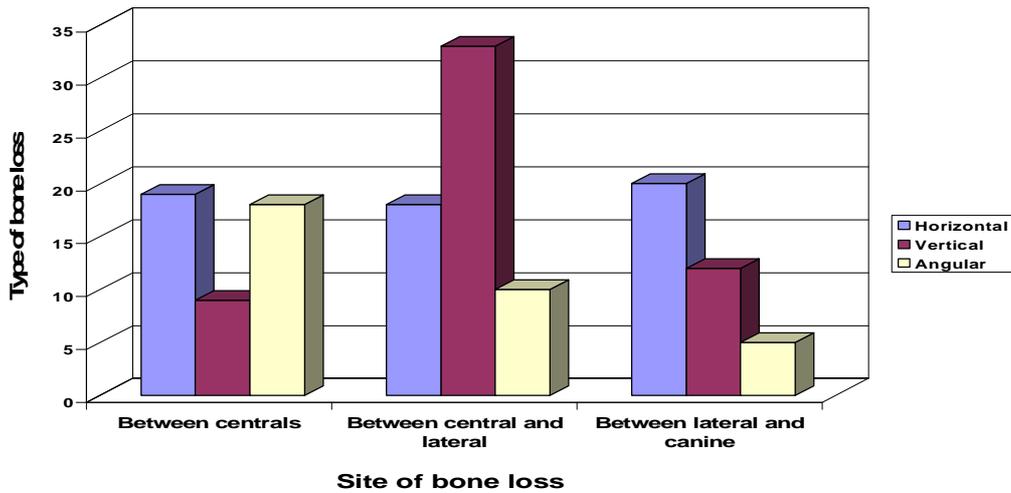


Table 2 bone loss by severity

| Site of bone loss | Between centrals | | Between central and lateral | | Between lateral and canine | | Total | |
|-------------------|------------------|-------|-----------------------------|-------|----------------------------|-------|-------|-------|
| | No | % | No | % | No | % | No | % |
| Mild | 31 | 21.53 | 35 | 24.30 | 18 | 12.50 | 84 | 58.33 |
| Moderate | 14 | 9.72 | 21 | 14.58 | 14 | 9.72 | 49 | 34.02 |
| Severe | 2 | 1.39 | 4 | 2.78 | 5 | 3.47 | 11 | 7.64 |
| Total | 47 | 32.64 | 60 | 41.66 | 37 | 25.69 | 144 | 100 |

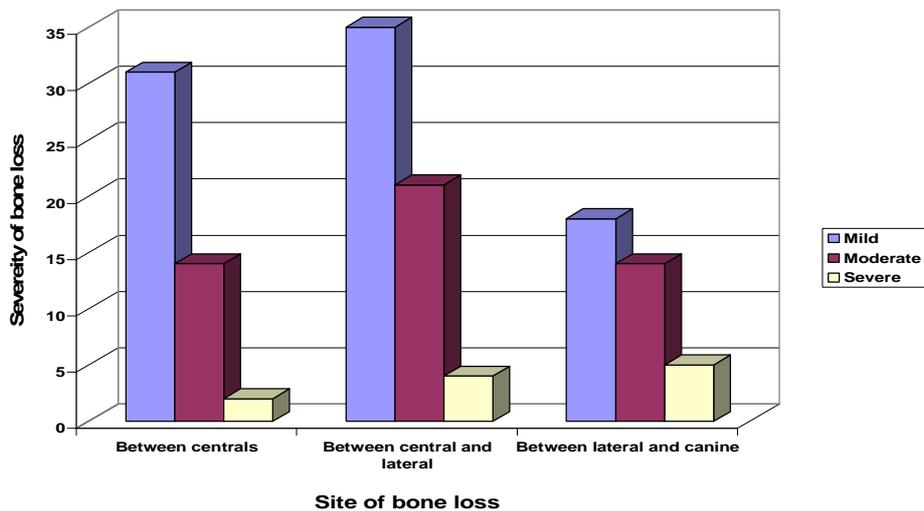


Table 3 Mild bone loss by type and site

| Site of bone loss | Between centrals | | Between central and lateral | | Between lateral and canine | | Total | |
|-------------------|------------------|-------|-----------------------------|-------|----------------------------|-------|-------|-------|
| | No | % | No | % | No | % | No | % |
| Horizontal | 17 | 20.24 | 11 | 13.10 | 13 | 15.48 | 41 | 48.82 |
| Vertical | 6 | 7.14 | 21 | 25 | 4 | 4.76 | 31 | 36.90 |
| Angular | 8 | 9.52 | 3 | 3.57 | 1 | 1.19 | 12 | 14.28 |
| Total | 31 | 36.90 | 35 | 41.67 | 18 | 21.43 | 84 | 100 |

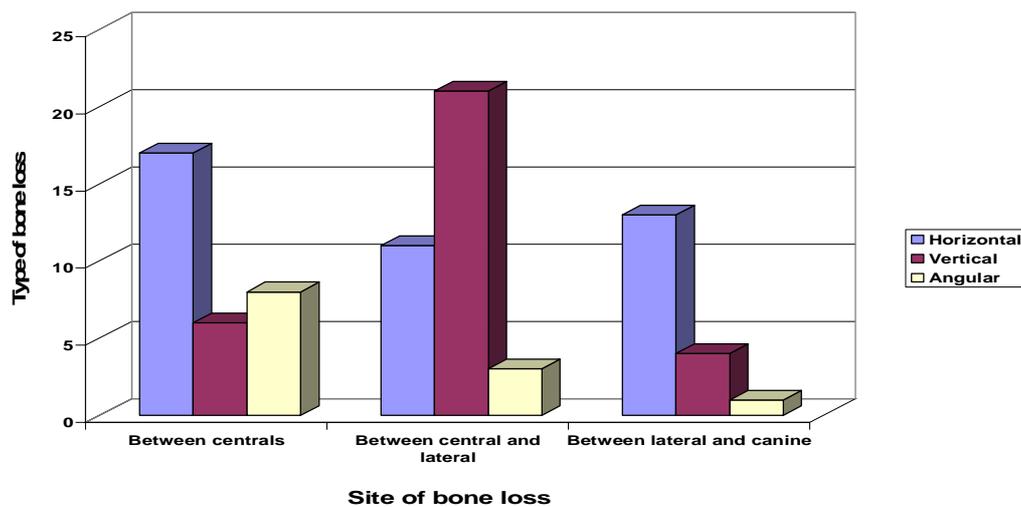


Table 4 Moderate bone loss by type and site

| Site of bone loss | Between centrals | | Between central and lateral | | Between lateral and canine | | Total | |
|-------------------|------------------|-------|-----------------------------|-------|----------------------------|-------|-------|-------|
| | No | % | No | % | No | % | No | % |
| Horizontal | 2 | 4.08 | 5 | 10.20 | 5 | 10.20 | 12 | 24.48 |
| Vertical | 3 | 6.12 | 10 | 20.41 | 6 | 12.25 | 19 | 38.78 |
| Angular | 9 | 18.37 | 6 | 12.25 | 3 | 6.12 | 18 | 36.74 |
| Total | 14 | 28.57 | 21 | 42.86 | 14 | 28.57 | 49 | 100 |

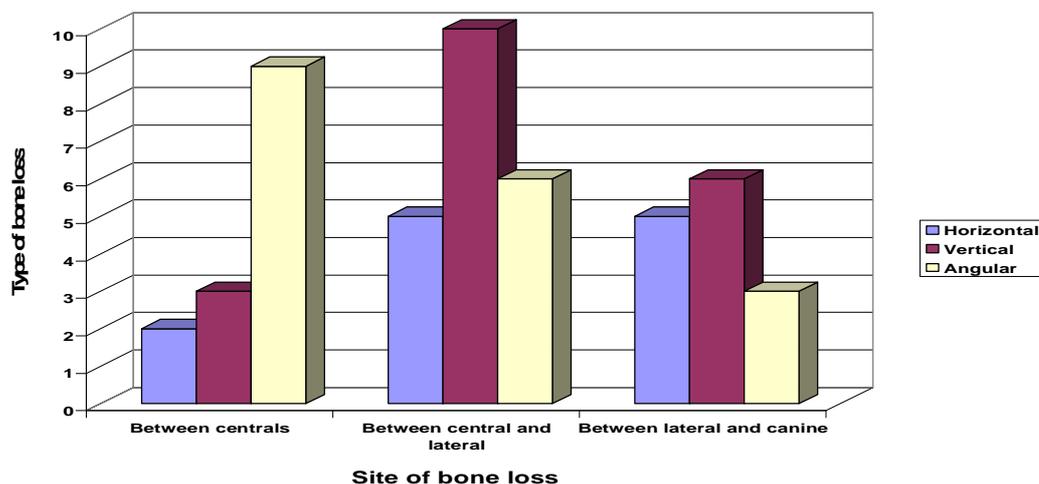
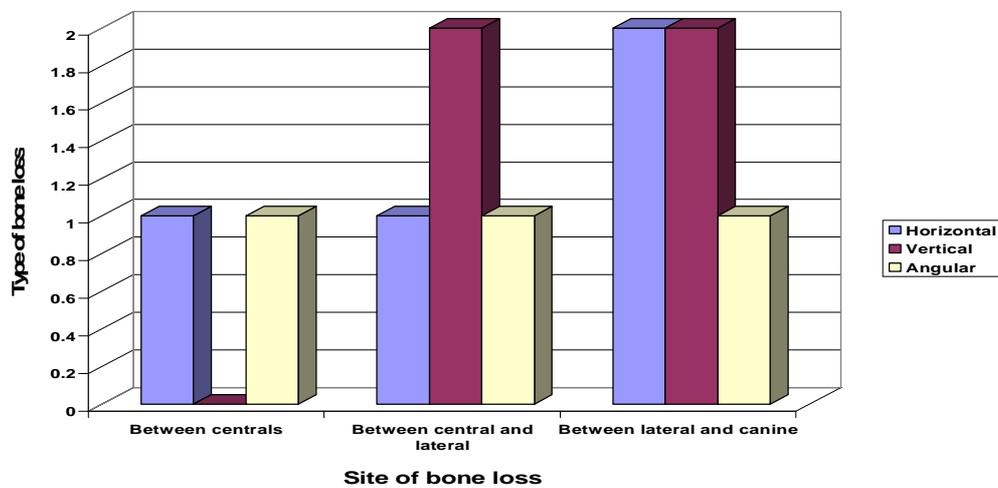


Table 5 Severe bone loss by type and site

| Site of bone loss | Between centrals | | Between central and lateral | | Between lateral and canine | | Total | |
|-------------------|------------------|-------|-----------------------------|-------|----------------------------|-------|-------|-------|
| | No | % | No | % | No | % | No | % |
| Horizontal | 1 | 9.09 | 1 | 9.09 | 2 | 18.18 | 4 | 36.36 |
| Vertical | 0 | 0.0 | 2 | 18.18 | 2 | 18.18 | 4 | 36.36 |
| Angular | 1 | 9.09 | 1 | 9.09 | 1 | 9.09 | 3 | 27.28 |
| Total | 2 | 18.18 | 4 | 36.36 | 5 | 45.46 | 11 | 100 |



Evaluation of the effectiveness of newly designed motor-driven fiberglass burs versus hand instrumentation in open root planing

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Abstract

The present study was performed to evaluate the effectiveness of newly designed motor-driven fiberglass burs in root planing and compare it to manual instrumentation using universal curette. Twelve patients complaining from periodontitis with deep periodontal pockets were involved in this study. A total number of 139 pocket sites received root planing by motor-driven fiberglass burs and 131 pocket sites were planed manually by curette.

The root planing procedure was opened type; it was performed by modified widman flap operation. The clinical parameters that were used in this study are (plaque index, bleeding on probing, probing pocket depth and relative attachment level). They were recorded in 4 periodic visits 2 of them before treatment and 2 after treatment to assess the improvement and to make a comparison between the two methods of treatment.

The results revealed that there was a significant improvement in all of the clinical parameters after treatment with fiberglass burs.

Also the results showed that that there was no significant difference between the improvement that was implemented by the two methods of treatment.

Key word: Fiber glass bur, Hand instrumentation, Open root planing.

Introduction

Periodontal disease is a generalized term for a range of pathological conditions affecting the supporting and investing structure of the teeth ⁽¹⁾. Bacterial plaque products have been shown to be the main etiologic factor that is involved in the initiation and persistence of inflammatory periodontal disease ⁽²⁻⁴⁾.

Supragingival and subgingival calculus play a major role in the development of periodontal disease ⁽⁵⁾. However, calculus is not pathogenic by itself, but its surface irregularity and roughness provide an ideal foundation for plaque retention ⁽⁶⁾.

The pocket is a haven for bacterial activity, it contains concealed speckles of calculus covered by plaque which propagates inflammatory process and promotes the deepening of the pocket, Obviously elimination of deposits is a basic requirement for therapy, scaling and root planing together with plaque control constitute the major means by which the disease of the gingival tissue can be healed ^(7, 8).

Root planing is a technique of instrumentation by which the softened cementum is removed and the root surface is made hard and smooth. Subgingival scaling and root planing are performed as either closed or opened procedure under local anesthesia.

Two of the most widely used mechanical methods for elimination of subgingival microflora and calculus are by hand and ultrasonic instrumentations⁽⁹⁻¹²⁾.

Many studies found no consistent differences in calculus and plaque removal between ultrasonic scalers and hand curettes^(13, 14), while other studies were reported that ultrasonic were inferior to hand instruments⁽¹⁵⁾, and leave a roughened root surface⁽¹⁶⁻¹⁸⁾.

Earlier studies used older ultrasonic tips which were large and bulky. Recently thinner and more delicate tips that are designed to improve the subgingival debridement have been available. Recent studies that used the newly designed tips revealed that the use of ultrasonic scalers for periodontal debridement will result in improvement in clinical and microbial parameters at a level equal to or superior to hand instrumentation^(19, 20).

Recently, carbon fiber covered with quartz fibers was used in dentistry, used as prefabricated passive fiber post⁽²¹⁻²⁴⁾, and also fiber glass burs were introduced for root debridement.

The present study was conducted to evaluate the effectiveness of the newly designed fiber glass burs in root debridement and compare it with hand instrumentation by using curettes based on clinical parameters of periodontal disease (plaque index, bleeding on probing, probing pocket depth and relative attachment level).

Materials and Methods

The sample selections for the study were patients attending the periodontics department at the college of dentistry, AL-Mustansiria University, for treatment of periodontitis.

Twelve patients (7) males and (5) females with an age range of (37-48 years), the mean age was (45.09). All the patients have good health, free from any systemic diseases, not taken any medication that had an effect on periodontal health, had not received any periodontal treatment (scaling or root planing) in the preceding 2 years and he was not taken any systemic antibiotic for the last 3 months.

The patients selected for the study should have chronic periodontitis involving both sides jaws for a similar extent at least one pair of periodontal pocket depth (4-7) mm in contra lateral teeth.

Before baseline examination any defect restoration, overhang restoration, or caries proximally or near gingival third was treated and restored with permanent fillings. Also an alginate impression was taken and an occlusal stent was constructed by using cold cure acrylic for measurement of relative attachment level.

A split mouth randomized study was carried out before baseline examination; all patients received a supragingival debridement consisting of scaling and polishing, in addition to instruction in an effective oral hygiene regimen of daily brushing and use other dental aids. Plaque control was reinforced depending on individual needs in series of visits before baseline and clinical parameters recording.

When oral hygiene conditions were improved and mean plaque index score reached below (0.5) for selected teeth, this was considered the visit of baseline examination and the clinical parameters were recorded. The teeth in the right and left sides of the jaw were randomly assigned for either hand instrumentation or fiberglass bur use.

At first visit all the clinical parameters were recorded and considered as prebaseline visit (V0)

prior to plaque control and improvement of the oral hygiene of the individuals. The clinical parameters were recorded at day (0) (baseline visit, V1) prior to surgical operations and repeated at the third week after operations (V2), and (6-8 weeks V3) after (V2) examination.

The following clinical parameters were recorded; Plaque index, bleeding on probing, probing pocket depth and relative attachment level. All parameters were registered using periodontal probe with Williams graduate having 0.4 mm tip diameter.

For the oral hygiene measurement, the plaque index by Sillness and Loe⁽²⁵⁾ was used, for bleeding on probing, the selected site is gently probed with periodontal probe to the deepest point, if bleeding occurs within 30 seconds after probing; the site was given a positive score and negative score for non bleeding site. The probing pocket depth were measured as the distance from the gingival margin to the most apical extent of probe inserted into the gingival crevice as close as possible to the long axis of the tooth recorded to the nearest millimeter, and the probe had been allowed to fall by its own weight, each tooth was probed at four sites.

The measurement of the relative attachment level was done by the occlusal stent which was adjusted to fit to the teeth, then a vertical grooves corresponding to the probed sites were made using a fissure bur, these grooves provided a fixed reference mark probe insertion and angulations. The relative attachment level was the distance from the lower periphery of the stent to the base of the pocket, the measurement made to the nearest millimeter.

After baseline clinical parameters recording, first instrumentation procedure was done in the same visit for both treatments. The average time

of instrumentation per tooth required for each method of instrumentation was calculated. The instrumentation of periodontal pocket was performed by one experienced operator. The procedure that was performed to the working sites in both methods is opened root planing by using a modified widman flap under local anesthesia, the same procedure was used for both sides, and the only difference was in the step of root planing. This step was performed by using universal curettes in the side of conventional instrumentation while in the other side the root planing was done by using the newly designed motor-driven fiberglass burs (figure 1&2). These burs were used with an ordinary slow hand piece with continuous irrigation of the root surface with normal saline as a coolant to prevent excessive heat generation so as not to induce any harmful effect on the dentine and pulp tissue. The procedure ended until the operator felt that root surfaces were debrided and planed by using of explorer felt hard and smooth root surfaces.

Statistical analysis to compare the mean score at baseline visit (V1) and their value at each subsequent visits(V2,V3) were undertaken using the student t-test paired samples (inter- group comparison), also the differences between the two methods of instrumentation were assessed by using student t-test. Chi-square test used for comparing the percentages of bleeding on probing.

The differences were considered significant when the probability (P) level is equal to or less than 5% ($P < 0.05$) and when the probability (P) was more than 5% ($P > 0.05$) it was regarded as non significant (N.S), while values less than 0.01 were regarded as highly significant ($P < 0.01$).

Figure (1): Shows the newly designed fiberglass burs.

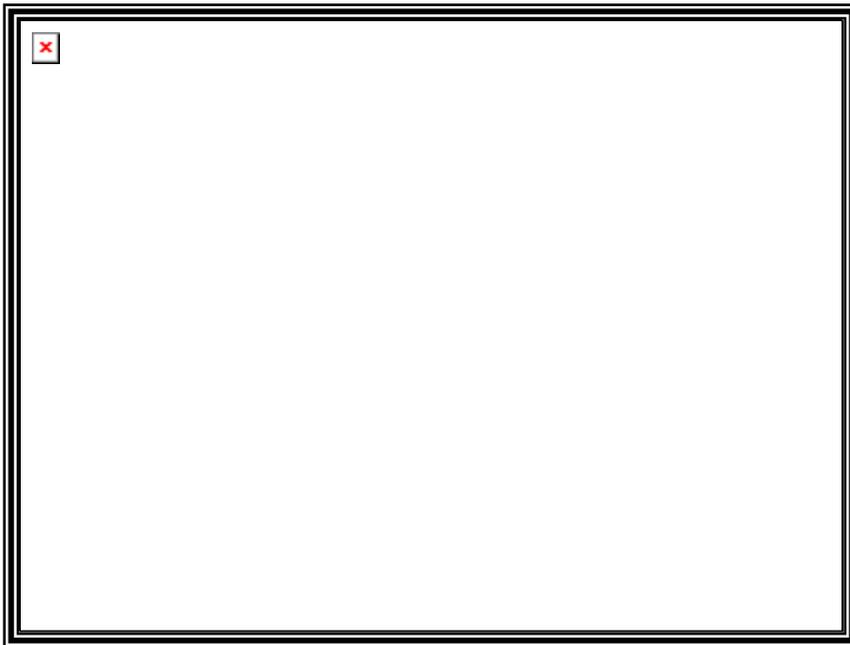


Figure (2): Shows the open flap root planing with newly designed motor-driven fiberglass bur.



Results

Twelve patients participated in this study, each patient received root planing by using fiber glass burs and hand instrumentation by curette for each working site. A total of (139) sites received root planing by fiberglass burs and (131) sites received root planing by curette. All patients completed the trial and attended all the recall visits as initially designed.

The results indicated that the mean plaque score for the patient was high in the prebaseline examination (Table 1), the mean plaque score was reduced significantly before the root planing procedure to reach a mean score below (0.5), and there was no significant difference between the two methods of treatment at all visits (Table 2).

The mean plaque score for both methods of treatment were maintained with slight decrease for fiberglass group than curette group.

The study indicated that all sites bled on probing at prebaseline examination. At the baseline examination there was significant reduction for both groups with no significant differences between them (Table 3).

After root planing there was continuous significant reduction in percentage of bleeding sites at (V2) and (V3) when compared with baseline examination (V1), with no significant differences between the two methods of treatment at all visits.

Table (4) shows the distribution of the total pocket sites (270 sites) by initial probing pocket depth in both types of treatment methods. The results

indicated that more than 2/3 of pocket depths are 5 and 6 mm.

The mean pocket depth at prebaseline examination was (7.99mm) and (8.08mm) for fiberglass bur and curette method of treatment respectively.

After the root planing procedure for the two methods of treatment, there was significant reduction for both groups of treatment at (V2) and (V3) examination (Table 5). When comparing between the two methods of treatment there was no significant difference between them at all visits.

Table (6) demonstrates the mean relative attachment level for both treatments at all visits. The study showed that the mean relative attachment level at the prebaseline and baseline examination were almost same with no significant difference between the two types of treatment. At (V2) examination after root planing, there was a significant reduction in the mean for both groups and there was continuous reduction in the mean relative attachment level at (V3) examination for both groups with significant difference from the baseline examination (V1), while there was no significant difference between the two methods of treatment at (V2) and (V3) examination. The results also indicated that the meantime required for root planing with fiberglass burs was (2.37) minutes per tooth, while in hand instrumentation (5.05) minutes per tooth with a highly significant difference between them.

Table (1): Mean plaque index for the two methods of instrumentation at different visits

| Type of instrumentation | Visits | Mean | SD | * Sig. |
|-------------------------|--------|-------|-------|------------|
| Fiberglass | V0 | 2.043 | 0.186 | N.S N.S |
| | V1 | 0.370 | 0.058 | |
| | V2 | 0.356 | 0.055 | |
| | V3 | 0.328 | 0.034 | |
| Curette | V0 | 2.032 | 0.109 | N.S N.S |
| | V1 | 0.373 | 0.056 | |
| | V2 | 0.367 | 0.057 | |
| | V3 | 0.358 | 0.058 | |

Significant: Comparison with baseline examination (V1).

NS: Not significant differences $P > 0.05$

Table (2): Comparison in mean plaque index between the two methods of instrumentation.

| Visits | Fiberglass | | Curette | | Sig. |
|--------|------------|-------|---------|-------|------|
| | Mean | SD | Mean | SD | |
| V0 | 2.043 | 0.186 | 2.032 | 0.109 | N.S |
| V1 | 0.370 | 0.058 | 0.373 | 0.056 | N.S |
| V2 | 0.356 | 0.055 | 0.367 | 0.057 | N.S |
| V3 | 0.328 | 0.034 | 0.358 | 0.058 | N.S |

NS: Not significant differences $P > 0.05$

Table (3): Percentage of bleeding on probing for the two methods of instrumentation at different visits.

| Visits | Fiberglass | Curette | Sig. |
|--------|------------|---------|------|
| V0 | 100 | 100 | N.S |
| V1 | 71.94 | 67.93 | N.S |
| V2 | 29.49* | 30.53* | N.S |
| V3 | 6.47* | 12.21* | S |

*: High significant difference from the baseline examination (V1) $P < 0.01$.

NS: Not significant

Table (4): Frequency distribution of sites according to initial probing depth among the two methods of instrumentation.

| Initial pocket depth/ mm | Fiberglass No. of pockets | Curette No. of pockets |
|--------------------------|---------------------------|------------------------|
| 5 | 39 | 43 |
| 6 | 57 | 55 |
| 7 | 33 | 26 |
| 8 | 10 | 7 |
| Total | 139 | 131 |

significant $P > 0.05$

S: significant differences $P < 0.05$

Table (5): Mean probing pocket depth for the two methods of instrumentation at different visits.

| Visits | Fiberglass | | Curette | | Sig. |
|--------|------------|-------|---------|-------|------|
| | Mean | SD | Mean | SD | |
| V0 | 6.100 | 0.891 | 5.977 | 0.860 | N.S |
| V1 | 5.981 | 0.882 | 5.950 | 0.853 | N.S |
| V2 | 3.351* | 0.768 | 3.549* | 0.814 | N.S |
| V3 | 2.950* | 0.738 | 3.103* | 0.782 | N.S |

*: High significant difference from the baseline examination (V1) and (V2) $P < 0.01$.

NS: Not significant $P > 0.05$

Table (6): Mean relative attachment level for the two methods of instrumentation at different visits.

| Visits | Fiberglass | | Curette | | Sig. |
|--------|------------|-------|---------|-------|------|
| | Mean | SD | Mean | SD | |
| V0 | 7.992 | 1.653 | 8.076 | 1.201 | N.S |
| V1 | 7.823 | 1.584 | 7.954 | 1.172 | N.S |
| V2 | 5.887* | 1.091 | 6.013* | 1.033 | N.S |
| V3 | 5.457* | 1.169 | 5.752* | 1.194 | N.S |

*: High significant difference from the baseline examination (V1) and (V2) $P < 0.01$.

NS: Not significant $P > 0.05$

Discussion

This is the first study carried out to evaluate the effectiveness of using motor-driven fiberglass burs in treatment of periodontal disease (root planing).

A split mouth design was used in this study gives an advantage in that all working sites can be compared under the same conditions such as the oral hygiene of the patients, host immunity and the presence microflora.

All procedures and the type of periodontal treatment were directed towards removal of plaque which is considered as a primary etiological agent and removal of plaque retentive factors like calculus⁽²⁶⁾.

In prebaseline examination, prior to carry out the root planing all patients were subjected to supragingival scaling, professional tooth cleaning and received instructions in oral

hygiene, which were reinforced when necessary, thus a high standard of oral hygiene was maintained through out the study, so from the finding of the study there was a significant improvement in mean plaque score and it was maintained below (0.5) at all visits and for both methods of root planing.

There was no significant difference between the two methods in mean plaque score.

All examined surfaces showed bleeding on probing at prebaseline examination. After scaling, polishing and oral hygiene instructions there was significant reduction in bleeding sites. At (V2) visit there was a marked reduction in the percentage of sites that bled on probing for the two methods of instrumentation compared with the baseline examination (V1). This was in accordance with other studies that used hand and ultrasonic instrumentation⁽⁹⁾.

10, 20). There was a continuous improvement in gingival bleeding at (V3) examination with no significant differences between the two types of treatment.

The findings of the study indicated that there was a marked reduction in probing pocket depth for both types of treatment at the end of the study (V3) visit. There was no significant difference observed between the two methods of root planing. Also there was a marked improvement in relative attachment level for both methods of root planing with no significant differences between them at all visits.

The results of our study demonstrated that both methods of root debridement lead to a marked improvement in all clinical parameters.

From the findings of this study it is obvious that the use of fiberglass burs in root planing is effective in removal of calculus and detoxification of the root surfaces similar or even better than hand instrumentation, while many laboratory studies showed that ultrasonic instrumentation remove less calculus and necrotic cementum and leave rougher surface than hand instruments^(16,17,27), and other studies reported that more calculus were remained after scaling with ultrasonic devices than hand instrumentation^(28,29).

The most important difference between the two methods was in the time of instrumentation, there was a highly significant difference in the time necessary for debridement with use of fiberglass bur comparing to the use of curette. From this finding, the study indicated that the proper and effective root debridement is easier to perform and time saving with fiberglass burs which is the same finding as when use an ultrasonic scalers when comparing to hand instruments^(9, 10, 30).

We suggest further studies to compare the clinical and microbiological parameters in patients having advanced forms of periodontitis, in addition to carry out a long term studies to evaluate the treatment out come.

In conclusion during 3 months period of the study, it appeared that the use of power-driven fiberglass burs in root debridement was effective as the treatment with hand instrumentation.

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The possible numbers of repair can be Carried on the same light-cured Composite resin surface (*In vitro* study)

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Abstract

This study was done to determine the possible number of repair that can be carried out on the same light-cured microfilled composite resin (Helioprogress, vivadent, Germany). 40 specimens were prepared, stored in deionized distilled water at 37°C for 24 hours and divided into 4 groups.

Group 1: The repair procedure done once.

Group 2: The repair procedure done twice.

Group 3: The repair procedure done for three times.

Group 4: The repair procedure done for four times.

All the specimens stored in deionized distilled water at 37°C for 24 hours before testing. A universal zwick testing machine with a special designed chisel was used to evaluate the shear bond strength of the repaired composite resin. The results showed reduction in mean shear bond strength value from group 1 to group 4, furthermore a significant difference was found between group 1 Vs group 3 and group 1 Vs group 4.

Introduction

As the esthetic aspect of dental care becomes increasingly important to patients, the dental practitioner should aware of the application and the limitation of various tooth colored restorative system⁽¹⁾.

The wider use of composite resin in dentistry has necessitated repair of fractured, discolored and worn restoration. Laboratory investigation has demonstrated that new composite resin can be bonded to previously cured composite resin⁽²⁾. Therefore the adhesive ability of dental restorative material is both desirable and valuable, thus defects in a composite restoration and failures in reconstituting the correct contour could be repaired simply by adding resin without replacing the entire restoration⁽³⁾.

One measure of reparability is the development of excellent bond at the interface between the initial and repaired surfaces of the restoration which usually referred to as the interfacial bond strength. For brittle plastic materials such as dental composite resin the bond strength should be evaluated in shear^(1,4), as it prefers by the majority of authors and suggested by Robbins et al⁽⁵⁾ and was used in this study by the aid of a specially designed stainless steel chisel.

The purpose of this study was to determine the possible numbers of repair that can be carried out on the same light cured composite resin surface.

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Materials & Methods

Forty acrylic block of (25x23x10mm) were constructed from self cure acrylic resin, contain a cylindrical hole of (6mm diameter and 3 mm depth) in the center of one of its square faces. After complete polymerization of acrylic resin, the acrylic blocks were placed in boiling water for 1/2 h to get rid of the free monomer.

The micro filled light cured composite resin was applied in each hole according to the manufacturer instruction using plastic instruments and light cured through plastic strip that covered with glass slide for 40 sec. Figure (1).

All the specimens stored in deionized distilled water under constant temperature oven at 37°C in 24h for aging. The whole samples divided into 4 groups according to the numbers of repair procedure that was done on each specimen:

Group 1: Repair procedure done once.

Group 2: Repair procedure done twice.

Group 3: Repair procedure done three times.

Group 4: Repair procedure done four times.

Repair Procedure:

Involve roughness of the composite surface with coarse sofex disc, rinsed for 20sec, then a 37% phosphoric acid gel applied for 15sec., rinsing with compressed air-water spray for 15sec, dried with oil free air for 10sec. Heliobond applied and activated with light for 10 second, then a (3 diameter and 6 mm height) cylindrical piece of standardized translucent plastic straw filed with helioprogres composite resin directly applied on the composite surface in a vertical position and light cured for 40 second in four direction after removing the excess material from the periphery with probe(Fig 2,3).

Debonding Procedure:

From group 2 up to group 4, the debonding procedure carried out manually by hand followed by repair procedure again. All the specimens stored in deionized distilled water in a constant temperature oven at 37°C for 24 hours before testing.

Testing Procedure:

For the shear bond testing, a special designed chisel shaped stainless steel rod was made, and a universal zwick testing machine used with displacement speed of 5 mm/min. The resultant force obtained in Newton was divided on the surface area (7.065 mm²).

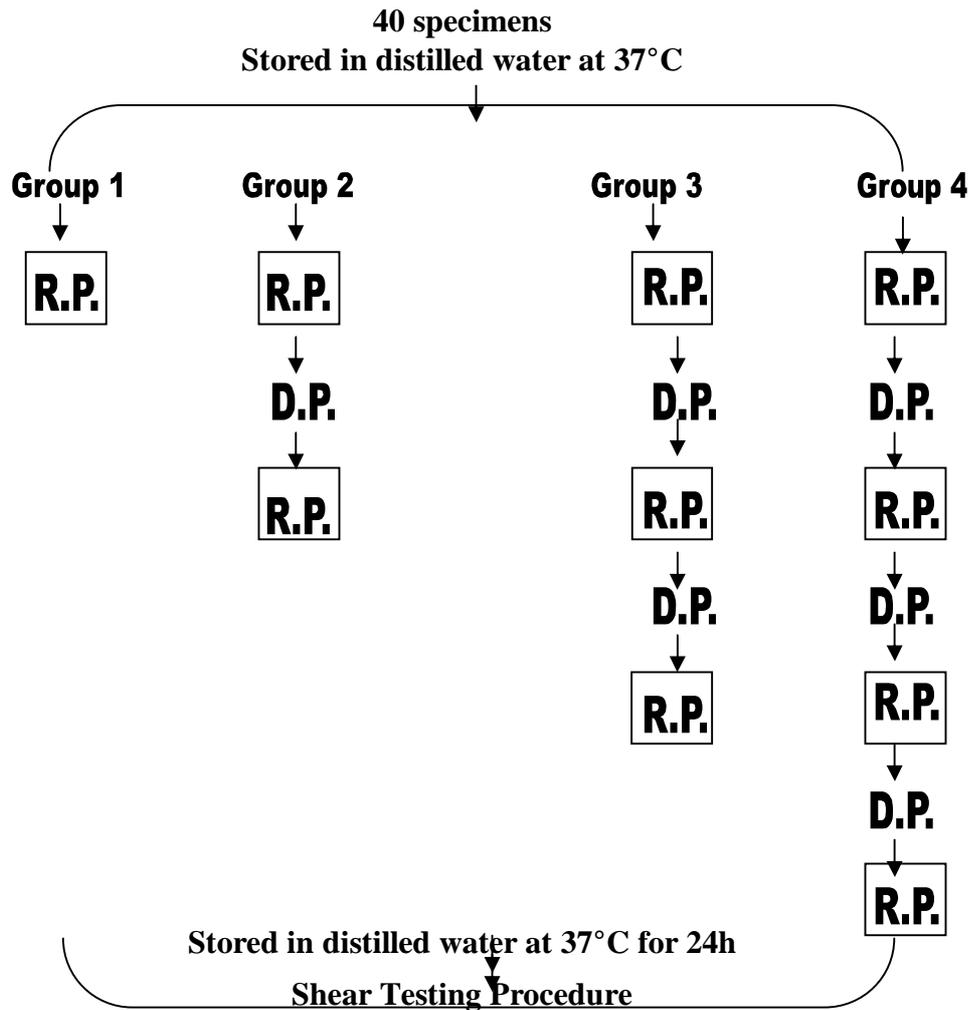


Fig. 4 Summary of the Methodology

R.P. = Repair Procedure
D.P. = Debonding Procedure

Result

The shear bond strength (mean values) of all groups are decrease as the number of repair carried on the composite surface increase (Table 1 & figure 2).

ANOVA test for all groups showed statistically not a significance

difference at $P > 0.05$ level (Total $F = 1.738$).

T test between groups showed a statistically significant difference between:

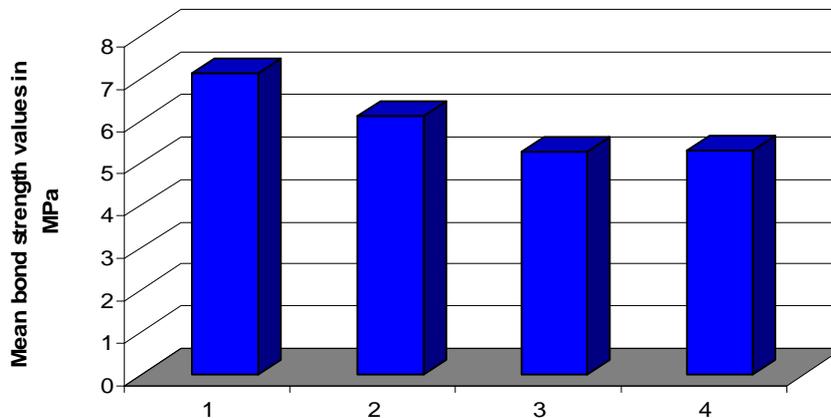
Group IVs group 3

Group I Vs group 4

But these was no statistically significant difference between the other groups

Table (1): Shear bond strength mean values in Mpa for all the tested specimens.

| Specimen No. | Group No. | | | |
|--------------|-----------|--------|--------|--------|
| | 1 | 2 | 3 | 4 |
| 1 | 9.059 | 6.59 | 8.676 | 5.307 |
| 2 | 7.82 | 8.56 | 10.415 | 7.36 |
| 3 | 4.031 | 4.74 | 7.36 | 3.255 |
| 4 | 5.667 | 6.297 | 5.817 | 5.506 |
| 5 | 8.602 | 7.278 | 4.632 | 4.049 |
| 6 | 7.293 | 5.451 | 3.381 | 8.005 |
| 7 | 8.912 | 6.625 | 6.547 | 2.112 |
| 8 | 6.939 | 8.021 | 3.025 | 7.801 |
| 9 | 8.053 | 5.375 | 5.501 | 3.727 |
| 10 | 4.566 | 5.962 | 7.22 | 5.698 |
| Mean | 7.099 | 6.0899 | 5.257 | 5.2820 |
| SD \pm | 1.7866 | 1.5773 | 2.2498 | 2.0110 |

**Figure (5): Bar chart show the difference in mean bond strength values between the groups.****Table (2): Analysis of variance (ANOVA test)**

| Source of variation | SS | df | MS | F-test | P-value |
|---------------------|---------|----|-------|--------|-------------------------|
| Between groups | 17.034 | 3 | 5.678 | 1.7381 | 0.182 P > 0.05 NS |
| Within groups | 88.205 | 27 | 3.266 | | |
| Total | 105.240 | 30 | | | |

SS = Sum of square , df = Degree of freedom , MS = Mean square , NS =Not significant

Table (3): T test between groups

| Group | t | df | P-value | Sig. |
|--------|-------|----|---------|------|
| 1 Vs 2 | 1.640 | 9 | 0.135 | NS |
| 3 Vs 4 | 0.062 | 9 | 0.952 | NS |
| 1 Vs 3 | 1.758 | 9 | 0.049 | S |
| 2 Vs 4 | 1.056 | 9 | 0.318 | NS |
| 1 Vs 4 | 2.049 | 9 | 0.049 | S |
| 2 Vs 3 | 0.697 | 9 | 0.503 | NS |

S = Significant , NS = Not Significant

Discussion

There are three possible mechanisms during composite repair:

- A - Chemical bond to the matrix, this bond depends on the degree of polymerization of the adhered surface^(3,6).
- B - Chemical bond to the exposed filler particle, this bond depends on the amount and quality of the remaining saline coupling agent of these fillers^(4,6).
- C - Micromechanical bonding, this bond resulted from penetration of the monomer compound in the matrix that has been resulted from the polishing disc, and phosphoric acid forming a resin tag⁽⁷⁾.

Tyys micromechanical loading considered tyý most important and stronger mechanism^(6,7) this fact explain the non-significant affect of the multiple repairing of the same light cured composite resin surface, while the chemical bond can explain why mean bond strength value decrease as number of repair procedure increase, due to the reduce in the available amount of un reacted double bond^(4,6).

Conclusions

- 1 - At reduction in mean shear bond strength values with the increase number of repair.
- 2 - Unlimited number of repair can be carried out on the same light-cured composite restoration but still the first repair produce the strongest bond.

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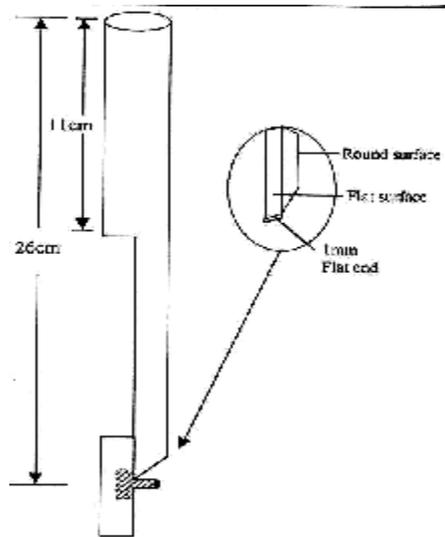
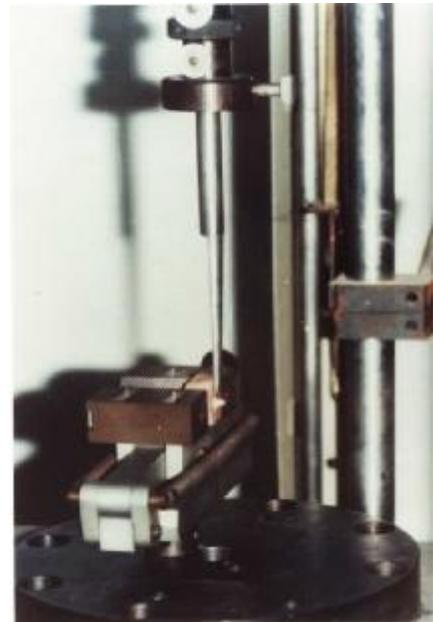
Fig.1



Fig.2



Fig.3



Effects of Prenatal metallic mercury vapor exposure on the developing teeth of rats

Ghada M. Mustafa B.D.S . M.Sc.*

Abstract

This Study represents an attempt to investigate histologically the effect of metallic mercury vapor on the developing rat teeth after inhalation by pregnant rats .

In this study albino – wistar rats were used and divided into control and experimental groups.

The control group consisted of 8 pregnant rats, and the experimental group consisted of 12 pregnant rats. Then 20 born rats from the control group and 20 born rats from the experimental group were selected to be sacrificed at the ages of (3&13) days.

The specimens were prepared for processing and staining with haematoxylin and eosin, and examined under light microscope.

Results showed no histological abnormalities in the dental tissue of the experimental group when compared to that of the control group .

Key words : Mercury – Erupted tooth, Rat.

Introduction

Mercury and mercury compounds are widely used in modern society, several thousand scientific reports and articles in the fields of mercury , amalgam , biology and health, have been produced .⁽¹⁾

mercury Vapor from dental amalgam alone is , a biggest source to excreted mercury⁽¹⁾

The presence of raised mercury levels, does not necessarily cause pathologic reactions .The levels will have to exceed a persons threshold level, and correlation between the amount of Hg in brain and the number of amalgam fillings^(2,3)

Exposure to mercury can occur either through direct skin contact with Hg or Hg-containing compounds or through the inhalation of mercury vapor, which is the primary route of exposure⁽⁴⁾ .

Mercury remained in vapor form for only limited periods because of its density and affinity for surfaces⁽⁴⁾

There are general sources of mercury in the body ug / day :

-Air :0040

-Fish 2.34

-Non-fish food 0.25

-Drinking – water 0.0035

-Mercury vapor from dental amalgam 3-17 ,

-Breast milk from fish – eating mothers can be quite high in mercury.⁽¹⁾

Materials and Methods

Twenty Albino Wistar female rats (200 – 250) mg aged (2-4) months were used in this study 12 of them were used as experimental group and 8 as control group .

Animals kept in cages, in the animal house of college of Medicine / Al – Nahrain University .

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Food pellets and water supply daily, bedding and environmental conditions were equal among all animals. The experimental pregnant rats were exposed to inhalation of metallic mercury (mercure, fluka, chemika, Switzerland). During the days (12-20) of gestation, approximately corresponding to dose of 0.07 mg Hg / m³ / for 8h on day, and the mercury vaporized from uncovered bottle, it was in the same room temperature., dental mask used by the researcher

The control group of pregnant rats were exposed to inhalation of rose water on the same days of gestation.

After delivery 20 pups were randomly selected from the newborn pups in the experimental group to be sacrificed, while for the control group 20 newborn pups were randomly selected to be sacrificed.

All Sacrificed were done using ether vapor, dividing each group into two equal subgroups by this way 10 new born rats were Sacrificed when they were 3 days old, and another 10 when they were 13 days old.

In the control group 10 rats were sacrificed when they were 3 days old and another 10 when they were 13 days old.

The teeth were extracted, decalcified, sectioned and stained using heamatoxylin and eosin, all sections were examined under light microscope by the researcher and data were recorded. Histological evaluation was done according to the criteria of Stanley^(5,6). This criteria was: 1-Remaining dentin 2-Cellular displacement 3-Superficial response 4-Deep pulpal response 5-Hemorrhage 6-Evidence of repair

Results

1- At the 3-days old rat, the experimental group show the 1st molar develop with three cusps

projections there will be process of the histodifferentiation of ameloblasts and, apposition of dentin and enamel matrix was appeared, in this age the molar showed delay in development than control group and there was slight decrease in size compared to control group. At the same time all the histological development occur in the control group, as that of experimental group (Figs 1,2)

- 2- At the 13- days in the experimental group the crown of the molar was completed and amelogenesis ended. also the apposition of dentin was clear, and the enamel matrix appeared over the cusps, these histological development and growth appeared in both control & experimental groups, without abnormalities were observed in the experimental group (figs 3,4)
- 3- The pulp cells were normal, absence of inflammatory cellular elements with normal presence of blood vessels.

Discussion & conclusions

Many dental researches and investigations had been done on the effects of the drugs on the dental tissues. Some of these experiments confirmed that many drugs may cause changes on the teeth and their supporting tissues^(7,8).

The present study was designed to evaluate the effect of mercury vapour exposure on the development of the rat dentition.

Mercury exposure was started to be inhaled by the pregnant rats 8 hours / day, during (12-20) of gestation, just before the beginning of the developmental process of the rat teeth^(9,10) and continue the exposure till the last day of gestation to see if there is any effect on the teeth structure during the odontogenesis process⁽⁹⁾.

The exposure of mercury vapour to pregnant rats using a dose (0.07 mg / m³ / day) considered as low dose and selected so as not to induce any maternal toxicity⁽¹⁰⁾. The occupational safety and Health Administration (OSHA) has set limits of 0.1mg / m³ and 0.05 mg / m³ of mercury vapour for 8 hours / day⁽¹⁾

From our results the development of the dentition of the rats demonstrated no differences between experimental and control groups except slight delay in development at 3-days old rats, which disappeared after that. This delay might be due to the alterations in growth process of the developing tooth, and had a complete recovery due to that this experiments were done upon developing tissues which are in continuous growth with time.

All experimental newborn rats manifested normal histological appearance in the developing molar teeth, no abnormalities or defect had been seen in the teeth structures including (form, shape, color, size) of cells or tissues, at 13-days old rats.

Differences among individuals in how easy mercury is transported into the brain over the blood – brain barrier could possibly lead to different mercury levels in brain in different individuals at a given whole – body dose of mercury, this could possibly explain some of the inter – individuals differences in susceptibility to mercury that is why some people get central nervous system symptoms at a given whole body dose, while other do not^(2,3)

A single dental amalgam filling with a surface area of only 0.4 cm² is estimated to release 15 micrograms of Hg / day through mechanical wear & evaporation, without causing any toxicity or abnormality to the pregnant women fetus.⁽¹¹⁾

Old mirrors could be coated with amalgam so mercury – mirror will liberate mercury as mercury vapor but again far from the amount enough to affect normal people.⁽¹²⁾

In contrast to the results of this study there are many factors that may affect the teeth development as x-ray⁽¹³⁾ laser therapy⁽¹⁴⁾, alcohol⁽¹⁵⁾, growth factor⁽¹⁶⁾ morphological changes as growth retardation or acceleration may be happened due to these factors.

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Fig -1- The developing upper 1st molar in 3-days old rat, in control group (H &E x33)



Fig -2-The developing upper 1st molar in 3-days old rat, in experimental group (H &E x33)

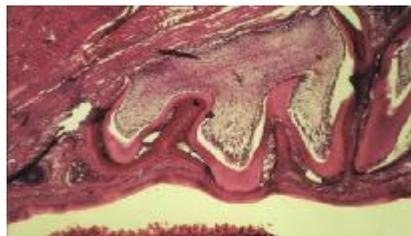


Fig -3- The developing upper first molar in 13-days old rat, in control group (H &E x33) .



Fig -4- The developing upper first molar in 13-days old rat, in experimental group (H &E x33) .

ROOT REINFORCEMENT USING CAST POST CEMENTED WITH DIFFERENT TYPES OF CEMENTS

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Abstract

The purpose of this in-vitro study is to evaluate and compare the fracture resistance of endodontically treated teeth restored using cast posts cemented with different types of cement. Thirty intact human maxillary central incisors were selected for this study. The crowns were removed and endodontic therapy were done on the roots, which were then prepared to receive cast posts, after their fabrication, the cast posts were cemented with zinc phosphate cement (group I), resin modified glass ionomer cement (group II), and resin cement (group III). The samples were subjected to compressive fracturing loads by a Zwick testing machine at a cross head speed of 5mm/min., with an angle of 45° to the long axis of the tooth. The results showed that the posts cemented with resin cement exhibited the highest mean failure load followed by posts cemented with resin modified glass ionomer cement, while posts cemented with zinc phosphate cement exhibited the lowest mean failure load.

Keywords: Casts post, Resin cement, Resin-modified glass ionomer cement.

Introduction

Contemporary endodontic therapy has allowed patients to retain severely damaged teeth. The restoration of most endodontically treated teeth involves complex and controversial procedures. These teeth commonly have lost significant coronal dentin as a result of endodontic access or previous dental caries and restoration. There is a diversity of opinion about the need for coronoradicular stabilization and numerous post systems and techniques have been described¹.

Custom cast posts and cores have been the most accepted treatment mode for many years, then commercial prefabricated posts with plastic core materials have become a common and

a popular method for post and core build up².

Parameter such as cementing medium, length, diameter, configuration, surface roughness and material used in the dowel all affect their retention and strength³.

The bond strength of the cementing agents plays an important role in the longevity and success of the cast restoration, zinc phosphate cement, although lacks adhesion to tooth structure, it has been selected for cementation of posts for many years. However, newer materials such as adhesive resin cements have been advocated for cementation of posts because they bond dentin to metal post and thereby achieve a stronger and more retentive restoration⁴.

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More recently resin modified glass ionomer cement with improved mechanical properties and chemical adhesion to tooth structure, has been used as a cementing medium⁵.

Materials and Methods

Thirty intact human maxillary central incisors recently extracted due to periodontal reasons, of comparable root length and width were selected, cleaned and stored in normal saline solution at room temperature through all the time of experimentation.

The anatomic crowns of the teeth were removed at the level of cemento-enamel junction perpendicular to the long axis of the tooth using diamond bur (Komet, Germany) rotating at a high speed under constant water spray coolant.

Endodontic therapy has been done for all teeth, and then post spaces preparation were done using peesoreamers from No.1 to No.6 successively in an increasing order of width and for a length of 8 mm measured from the coronal end of the root with the aid of a rubber stopper. After that, 1mm gingival chamfer finishing line was done with a diamond chamfer bur on a sound tooth structure.

The external surfaces of the roots were carefully notched using diamond fissure bur approximately 3mm from the apex and at 0.5mm depth to provide adequate retention for the teeth in acrylic resin blocks. After that, teeth were embedded in individual blocks of self curing resin to about 2mm below their coronal ends.

Wax pattern of posts (post crowns) were made directly on the prepared teeth using type II blue inlay wax and plastic posts, and then invested with a phosphate bonded investment material and the casting procedure was performed using nickle-chromium casting alloy.

After casting, the obtained cast posts were cleaned and smoothed and were carefully fitted into their canal spaces to assure proper seating and fitness, then for each post a groove was made along the side of the post with No.1/4 round bur rotating at a high speed to provide an escape vent for cement during cementation.

For all teeth in all groups, post spaces were cleaned with 1ml of 95% ethyl alcohol to remove any residual eugenol contaminantes from the sealer⁶, then rinsed with normal saline solution and dried with paper points. 37% phosphoric acid was applied to post spaces for 15 seconds then rinsed thoroughly with water for 30 seconds, dried with paper points and air blower⁷.

The cast posts and their respective prepared roots were randomly divided into 3 groups of ten each:

Group I: teeth with cast posts cemented using zinc phosphate cement (Multifix, Dorident, Austria)

Group II: teeth with cast posts cemented using resin modified glass ionomer cement (GC Fuji PLUS, Japan).

Group III: teeth with cast posts cemented using resin cement (Avanto, Voco product, Germany).

To reduce variables, the cementation procedure was performed by the same investigator and at a room temperature around 25°C, and a static load of 5 Kg was used to hold each posts in their canals for about few minutes according to the setting time of each cement.

The samples were placed in a fixture (mounting apparatus specially made for the purpose of this study), attached to a universal testing machine (Zwick testing machine). A continuously increasing compressive force was applied to the facial cusp in

the axio-occlusal line angle, 45 degrees to the long axis of the tooth at a crosshead speed of 5mm/min. until failure^{8,9}. The data obtained were then statistically evaluated using one way analysis of variance (ANOVA) test and Least Significant Difference (LSD) test.

Results

Results were obtained for all thirty test specimens. The means and standard deviations of the three groups are presented in table (1).

Statistical analysis of data by using analysis of variance "ANOVA" test revealed that there is a statistically very highly significant difference ($P < 0.001$)

between the mean forces among the three groups, as shown in table(2).

The source of this statistically significant difference was further investigated by using Least Significant Difference (LSD) test to show where the significant difference has occurred, as shown in table (3).

The results showed that the posts cemented with resin cement (group III) exhibited the highest mean failure loads followed by posts cemented with resin modified glass ionomer cement (group II), while posts cemented with zinc phosphate cement (group I) exhibited the lowest mean failure loads.

Table(1): Descriptive statistical failure loads (in Kg) for the three groups.

| Groups | I | II | III |
|--------|------|------|------|
| Mean | 94 | 104 | 135 |
| S.D | 6.38 | 7.32 | 6.83 |
| Min. | 82 | 94 | 128 |
| Max. | 101 | 115 | 147 |

Table (2): Analysis of variance (ANOVA) test.

| Sources of Variance | Degree of Freedom | Sum of Squares | Mean Squares | F Value | Significance |
|---------------------|-------------------|----------------|--------------|---------|-------------------------|
| Between Groups | 2 | 9140.000 | 4570.000 | 97.311 | Very Highly Significant |
| Within Groups | 27 | 1268.000 | 46.963 | | |
| Total | 29 | 10408.000 | | | |

Table (3): Least Significant Difference (LSD) test to compare the mean failure loads between groups.

| Groups | | Mean difference | Significance |
|--------|-----|-----------------|--------------|
| I | II | -10.00 | H.S |
| I | III | -41.00 | V.H.S |
| II | III | -31.00 | V.H.S |

H.S = highly significant, V.H.S = very highly significant.

Discussion

A cast post is considered the most retentive post with a high degree of biocompatibility.

The retention of cast post is further enhanced when a resin cement is used¹⁰. When these posts are just cemented and not bonded to dentin, they have been shown not to strengthen the root and may actually weaken it¹¹.

Many manufacturers today claim that their root reinforcement systems can actually strengthen the root and help prevent fracture. In this study, the effect of resin cement and resin modified glass ionomer cement was compared to determine whether bonding the post to dentin provided the root greater resistance to fracture. Zinc phosphate cement, a cement that creates no bond between the dentin in the root canal and the post was also used as it remains one of the more traditional and widely used cementing agent.

A compressive head angle of 45 degrees to the long axis of the tooth was applied to the facial cusp in the axio-occlusal line angle of the artificial crown. This angle was used to approximate the combination of forces on teeth as opposed to purely compressive or shear forces, thus simulating the angle of occlusion of the cusps of the opposing teeth⁹.

Although every effort has been made to select specimens of comparable characteristics and to standardize the experimental procedure accurately, a range failure load values with each group could not be avoided. The variability of physical properties of human teeth may be a reason for such data range, dentin is a heterogenous tissue, its structure, degree of calcification, and degree of cellularity vary from one tooth to another.

Under the conditions of this study results showed that the type of cement has a significant effect in root reinforcement, posts cemented with resin cement recorded the highest mean failure loads than those cemented with either resin modified glass ionomer cement or zinc phosphate cement. This was comparable with findings of Mendoza et al.¹² which could be attributed to the fact that resin cement has desirable physical properties, its compressive and tensile strengths exceeded that of resin modified glass ionomer cement and zinc phosphate cement with an ability to adhere to tooth structure via dentin bonding agents which are responsible for the penetration of resin tags inside the dentinal tubules and demineralized intertubular dentin with the formation of resin reinforced hybrid dentin layer, resulting in a micromechanical bond between the adhesive cement and dentin, and also resin cement has the ability to adhere to post metal surface, such features can afford the root canal system additional resistance to fracture.

Also the results of this study showed that posts cemented with resin modified glass ionomer cement recorded higher mean failure loads than posts cemented with zinc phosphate cement. A possible explanation is that the values of tensile strength of resin modified glass ionomer cement (13-24) Mpa exceed that of zinc phosphate cement (3.1-4.5) Mpa¹³, and also the adhesive nature of resin modified glass ionomer cement (chemical chelating) can afford root canal system significant additional resistance to fracture.

Conclusions

- 1- Cast posts cemented using resin cement showed significantly greater resistance to root fracture

than those cemented with either resin modified glass ionomer cement or zinc phosphate cement.

- 2- Cast posts cemented using resin modified glass ionomer cement showed significantly greater resistance to root fracture than those cemented with zinc phosphate cement.

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Microleakage evaluation of two types of pit and fissure sealants using two different methods, (in vitro study)

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Abstract

Background: Clinical preventive procedures must be done after careful assessment; one of the major risk factor is the occlusal morphology of the posterior teeth. These caries free fissures must be sealed. This in vitro study evaluated the microleakage of two types of sealant materials (unfilled resin and flowable composite) on enamel surfaces prepared using two methods (acid etching with enameloplasty and acid etching alone).

Material and methods: Thirty two extracted human third molar were selected and randomly assigned in to 4 groups of eight teeth each; group A, the occlusal surfaces of teeth were acid etched ,then sealed with concise white sealant; group B, they were acid etched then sealed with wave mv flowable composite ;group C, they were prepared with bur ,acid etched ,then sealed with concise white sealant ;group D, they were prepared by bur, acid etched, then sealed with wave mv flowable composite. The sealed surfaces were stored for seven days in distilled water, then specimens were thermocycled 500 cycles, immersed 24 hours in a 2% buffered methylene blue dye, then sectioned and analyzed for leakage under a stereo microscope. Chi-square test was performed to test the differences of leakage among the four groups.

Results: The results showed that there was no significant difference ($p>0.05$) in microleakage for the same material with and without bur preparation. Concise white sealant produced significantly ($p<0.05$) less microlaekage than wave flowable composite.

Conclusion: under the conditions of the present study, bur preparation (enameloplasty) followed by acid etching produces no less microlaekage than did acid etching alone. Concise white sealant (unfilled resin) demonstrated less amount of microlaekage when compared to wave mv flowable composite.

Key words: pit and fissure sealant, enameloplasty, unfilled resin, flowable composite.

Introduction

The major concern of modern dentistry, mainly for the last decades, has become focused on reducing patient's risk of caries, stimulating preventive measures and preserving

tooth structure, indicating as often as possible, non invasive conservative techniques. The resin sealants undoubtedly contribute to preserve the integrity of the occlusal surface acting as an effective mechanical obstacle to plaque retention, therefore reducing the

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incidence of fissure caries. However the preventive benefit of this treatment rely upon the ability of the material to promote an appropriate sealing of pits, fissures or eventual anatomic defects and remain completely intact and bonded to enamel surface, thus preventing marginal microleakage and the consequent progression of carious process underneath the sealant.^(1,2)

Mechanical preparation or enameloplasty was an earlier approach which involved widening to the fissures using rotary instrument.⁽³⁾

It enhanced sealant penetration in to the deep fissures, permitted better diagnosis of underlying demineralized tissues and increased surface area for retention of the sealant.⁽⁴⁾ For adequate retention of the sealant, it is necessary to maximize the surface area for bonding and ensure that the enamel be clean, free from salivary contamination and dry at the time of sealant placement. Micromechanical adaptation

of the sealant is achieved through porosities created by conditioning the enamel, conventionally by acid etching, before applying the sealant.⁽⁵⁾

Feigal 1998⁽⁶⁾, reported that the sealant loss was common in a regular events averaging between 5 to 10% each year and remarked that better sealant material, better use of bonding agents and alternative technique for the sealants would improve their overall effectiveness on all teeth.

Materials and Methods

Thirty two sound human third molars, extracted with in a six months period, their occlusal surfaces examined and they were stored in saline solution. They were cleaned with water-pumice slurry in dental prophylactic cup and carefully rinsed to remove the residual debris from pits and fissures. The apices were sealed with a light cured composite resin⁽⁷⁾,

and the teeth were randomly assigned in to four groups of eight teeth each:

Group A, the occlusal surfaces were etched with a 37% phosphoric acid gel (Scotch bond etchant gel, 3M ESPE, USA) for 30 seconds, rinsed with air\water spray for 20 seconds and gently air dried. A uniform layer of a pit and fissure sealant (Concise white sealant, 3M ESPE, USA) was applied over the treated surfaces from the central fissure upon the cusp height in order to prevent voids and air entrapment.

Group B, the occlusal surfaces were etched, rinsed, and air dried, then the flowable composite (Wave mv, SDI, Australia) was applied according to manufacturers.

Group C, the pit and fissures were prepared (0.5 mm depth)⁽⁸⁾, with a diamond flamed shaped bur (Komet # 8833, Gebr. Brasseler Co.Lemgo, Germany), the occlusal surfaces were acid etched, rinsed, and gently air dried, then the Concise, white sealant was applied.

Group D, the pit and fissures were prepared (0.5 mm depth) with bur, the occlusal surfaces were acid etched, rinsed, and air dried, then the Wave mv flowable composite was applied.

The sealant materials were polymerized for 20 seconds using a visible light curing unit (3H instrument CO. LTD, Germany, ISO 9002).The sealed samples were stored in distilled water for 7 days at 37°C and then thermocycled for 500 cycles between 5°C and 55°C water baths, dwell time was 30 minute, with a 3 second transfer time between baths⁽⁷⁾. In the preparation for dye penetration test, the specimens were dried superficially, entirely sealed with two layers of nail varnish excepting an area which is in the center of the occlusal surface 5 mm (width), and 1 mm window around the enamel /sealant interface. The teeth were immersed in a 2% buffered

methylene blue solution for 24 hours at room temperature to allow dye penetration in to any possible gaps between the enamel and the sealant. All samples were embedded in a self curing acrylic resin (Subiton, Polvo, Argentina), to prevent chipping of the material as shown in fig (1). The teeth were then cross sectioned in a bucco-lingual plane through the sealant and each section examined at 4X magnification using a stereomicroscope.

The scoring criteria for the amount of dye penetration were accordingly⁽⁹⁾, as follows:

Score 0 = no dye penetration.

Score 1 = dye penetration restricted to the outer half of the sealant.

Score 2 = dye penetration in to the inner half of the sealant.

Score 3 = dye penetration in to the base of the fissure.

Examples of the scoring are illustrated in fig 2,3,4,5.

The Pearson Chi-square analysis, for purposes of comparing groups overall.

RESULTS

The data of this study are demonstrated in table (1) & figure (6).

Chi-square test was performed to test the difference of leakage between Group (A) and Group (C) and between group (B) and group (D) , as shown in table (2) :

Since there is no significant difference in micro leakage for the same material with and with out bur preparation the readings were pooled together.

The results of the dye penetration for the two materials combine with and with out bur preparation presented in table (3).

To see the difference between the combine groups Chi-square test were done as shown in table (4).

Table (1): Score of dye penetration in all groups.

| Groups | A | B | C | D |
|--------------------------|--------|--------|--------|--------|
| Score of dye penetration | | | | |
| 0 | 7 | 0 | 5 | 0 |
| 1 | 1 | 6 | 3 | 4 |
| 2 | 0 | 1 | 0 | 3 |
| 3 | 0 | 1 | 0 | 1 |
| Mean | 0.125 | 1.375 | 1 | 1.625 |
| S.D | 0.3535 | 0.7440 | 0.6667 | 0.8333 |

Group A: - Concise white sealant with out preparation , Group B: - Wave mv with out preparation

Group C: - Concise white sealant with preparation , Group D: - Wave mv with preparation

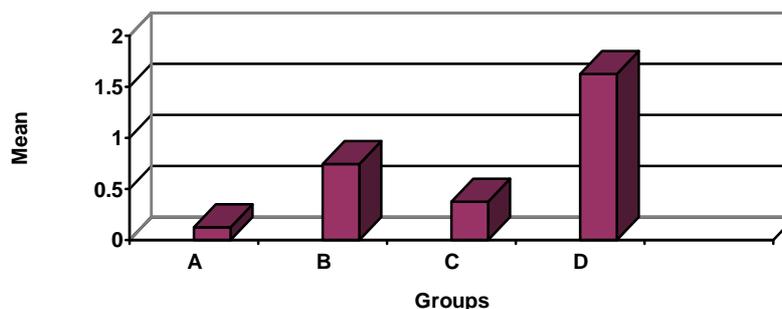


Fig. (6): Diagram showing the mean of dye penetration in all groups.

Table (2): Chi-square test between the groups

| Type of Groups | X ² | d.f | Sig. |
|-------------------|----------------|-----|------|
| Group A & Group C | 0.0160 | 3 | N.S. |
| Group B & Group D | 0.0112 | 3 | N.S. |

N.S. = Not Significant for (P > 0.05).

Table (3): Combine groups " same material with & with out bur preparation"

| Groups | A+C | B+D |
|--------------------------|--------|--------|
| Score of dye penetration | | |
| 0 | 12 | 0 |
| 1 | 4 | 10 |
| 2 | 0 | 4 |
| 3 | 0 | 2 |
| Mean | 0.25 | 1.5 |
| S.D | 0.4472 | 0.7302 |

Group A +C: - Concise white sealant with & with out preparation

Group B + D: - Wave mv with & with out preparation

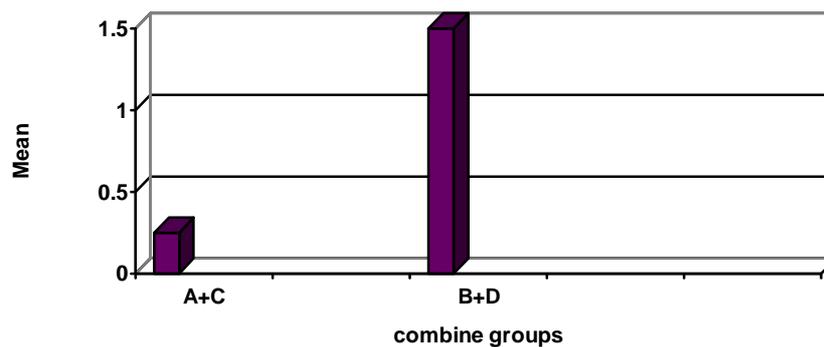


Fig (7): Diagram showing the mean of dye penetration in the combine groups.

Table (4): Chi-square test between the combine groups.

| Type of Groups | X ² | d.f | Sig. |
|--------------------|----------------|-----|------|
| (A+C) & (B+ D) | 14.2857 | 15 | S |

S.: Significant (P < 0.05).

N.S.: Not Significant (P > 0.05).

H.S.: Highly Significant (P < 0.001).

Discussion

Microleakage is considered as one of the major problems in restoring teeth with different kinds of restorative materials. The factors which affect the microleakage include: polymerization

shrinkage of the resin, coefficient of thermal expansion, the composition of the material itself, wettability of composite resin, and the presence and absence of an adhesive between tooth substances and the restorative materials^(10, 11).

The need for surface cleaning and the method of cleaning pits and fissures prior to sealant placement may seem to be controversial. Raadal et al⁽¹²⁾, suggests that careful removal of plaque and pellicle is done by the use of pumice or polishing instruments in order to obtain optimal acid etch pattern of the enamel, while another⁽¹³⁾ claimed that the effect of acid etching alone is sufficient for surface cleaning. The literature is extensive on the efficiency of different cleaning procedures on bonding, including the use of rotary burs in order to remove superficial enamel and open the fissures with bur, which has given superior retention in one study⁽³⁾, but in other studies it provides no additional benefit⁽¹⁴⁾.

In the present study, we found that the use of bur before acid etching did not lead to significantly less microleakage. purposeful removal of enamel or enameloplasty just to wide the base of the fissure in a sound tooth structure is an invasive technique which disturbs the equilibrium of fissure system and exposes the tooth to an unnecessary cutting. This agrees with Menten⁽⁷⁾, and Chan et al⁽¹⁵⁾, but disagrees with Hatibovic et al⁽¹⁶⁾, who found that the use of bur with acid etching gives superior result.

Virtually all contemporary compositions of pit and fissure sealants are unfilled and based on difunctional monomers (BIS-GMA), may be diluted with lower molecular weight species (TEGDMA) to reduce viscosity, the addition of filler particles to the sealant appears to have a little effect on clinical results⁽¹⁷⁾; filled and unfilled sealants penetrate the fissures equally well⁽¹⁸⁾.

In the present study it was found that there is a significant reduction in the microleakage when Concise white sealant (un filled resin) was applied in comparison to flowable

composite(60% by wt inorganic filler).Un filled resins are believed to undergo a volumetric shrinkage of approximately 5% during polymerization, compared to the filled resins undergoing only 1%. The addition of filler particles confers a greatly reduced coefficient of thermal expansion and a reduction in the expansion resulting form. It was believed that⁽¹⁹⁾ the un filled resin has greater up take of water and consequently undergoes greater hygroscopic expansion, minimizing the effect of the high coefficient of thermal expansion, such hygroscopic expansion compensates completely and uniformly through out the sealant, eliminating the detrimental effect of thermocycling. In addition to that the rheologic property of the unfilled resin allows the sealant to spread across the enamel surface entering the enamel micropores, this improved adaptation of the material at the interface manifests as greater resin tag penetration prior to light activated polymerization. As filler content increases, the wetting characteristic of resin decreases⁽²⁰⁾. The results of this study coincide with that of Barrie et al⁽²¹⁾, and Yildiz⁽²²⁾, but disagree with that of Perez et al⁽²³⁾, who found that the use of concise white sealant produce significantly greater marginal microleakage when used without bonding agent .

Adequate bonding by the use of an adhesive layer beneath the sealant is important to prevent marginal microleakage, the use of flowable composite as a fissure sealant without bonding agent was seen to produce significantly greater microleakage. This may be due to the fact that bonding composite to etched enamel structure reduces the potential negative effect of a difference between the coefficient of thermal expansion of tooth structure and that of the material.

The shrinkage stresses of resin composite

During polymerization creates forces that compete with the adhesive bond, and this may disturb the bond to the cavity walls, which is one of the main causes of marginal failure and subsequent microleakage. The study was in accordance with that of Kwon, and park⁽²⁴⁾, but differs from the study of Gillet et al⁽²⁶⁾, who showed that the use of flowable composite with one bottle bonding is more efficient in sealing pits and fissures of non carious teeth. Finally, we must emphasize that the behavior of dental materials in laboratory conditions can be quite different from that registered in a clinical setting. The inherent problems in teeth selection, and the biological variations in enamel micro morphology from tooth to tooth, therefore, at best, the measurement of microleakage is a screening process prior to clinical traits.

Conclusions

- 1- There is no significant difference between the use of bur before acid etching and acid etching alone.
- 2- Concise white sealant (unfilled resin) demonstrated less amount of microleakage when compared to wave mv flowable composite.

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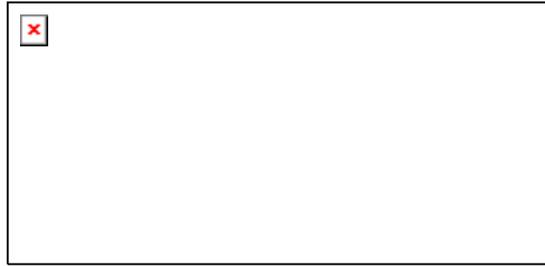


Fig (1) The tested groups were embedded in a clear acrylic blocks.



Fig (2) Section of a tooth sealed, which was scored as 0 =no dye.



Fig (3) Section of a tooth sealed, which was scored as 1=
The dye restricted to outer half of the sealant.



Fig (4) Section of a tooth sealed, which was scored as 2=
Dye Penetrated to the inner half of the sealant.

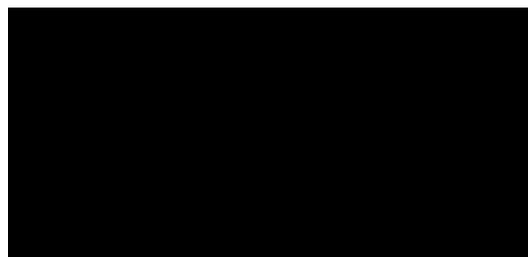


Fig (5) Section of a tooth sealed, which was scored as 3=
Dye penetrated in to the fissure.

Radiological accuracy of two different systems (Digital & Conventional) in endodontic apical fitness

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Abstract

Aim: The present study compares the accuracy of conventional and digital radiographic system in the determination of apical fitness in endodontic therapy.

Method: Thirty three root canals of first upper and lower molar teeth were used in this study; a K-file was inserted into the canal until its tip was fit snugly one millimeter shorter than the apex. Each tooth was radiographed twice with two different radiographic systems; conventional & digital systems. The right-angle paralleling technique with film holders was used in both systems. The distance between the file tip and the center of radiographical apex from both imaging systems was measured by two examiners and the mean of each two measurements was recorded, the data was collected and analyzed statistically by paired t- test.

Results: The mean value of radiographic length reveals that there is a very small difference between the measurements of conventional radiographic system (0.8727mm) and those measurements of digital radiographic system (0.8367mm) when compared with the real length measurements (1mm). Paired t-test shows that there is no significant difference ($p < 0.05$) was founded between the real measurements and the radiographic measurements are taken from both conventional and digital systems. In conclusion both the conventional and digital imaging systems can be used accurately for working length determination in an endodontic therapy.

Key Words: conventional, digital, apical fitness, endodontics.

Introduction

Electronic imaging is not a new concept. Digital image results from the conversion of analog data to digital data, and the computer processed the image to be seen on the computer screen.

Film-based image or radiograph creates by the interaction of x-ray with x-ray film to make a radiograph after processing in the darkroom. ⁽¹⁾

Major advantages of digital radiography in endodontics are that radiographic images are immediately obtained, eliminating developing time & film processing, and radiation

exposure is reduced from 50-90% compared to conventional film-based radiography. ⁽²⁾

The primary disadvantages of digital radiography are the potential reduction in the image quality when compared with the conventional radiography. ⁽³⁾

Different studies compared between the conventional & digital radiography in the working length determination, where, Akdeniz *et al* perceived image quality of the enhanced digital images was superior to the original and conventional film images for the evaluation of root fillings. ⁽⁴⁾ In contrary to that, Lozano

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et al found the conventional radiology remains the technique of choice in determining the root-canal length and the digital techniques yielded good results for size 15 file.⁽⁵⁾

The aim of this study was compared the accuracy of (Digital & Conventional) radiographic systems in the determination of endodontic apical fitness.

Materials and Methods

A fourteenth extracted multi-rooted (upper & lower first molar) teeth was used in this study. The selected teeth are placed in the normal saline after extraction, the total number of the roots were examined are 33 (figure 1) and then examined clinically to satisfy the following criteria;

1. The crown is completely formed i.e. free from the extensive carious lesion.
2. The root (s) is, without extensive curvature and abnormal anatomy.
3. The apical foramen is completely formed and free from apical resorption.
4. The canal of examined root is free from any blockage, & internal or apical resorption.

After access preparation, a K-file was inserted into the canal until the tip of the file had just seen at the main apical foramen by magnifying lens (X10), the file then was withdrawn one millimeter shorter than the apex, the working length of each root was determined, then initial instrumentation was performed two sizes larger than the first file that fit snugly at one millimeter shorter than the apex. The file was fixed in the canal by filling the access opening with composite resin to prevent its movement during tooth position adjustment and exposure.⁽⁵⁾

Each tooth was positioned as in normal anatomical location in relation to the image receptor, then the sample was radiographed twice with two

different radiographic systems; conventional & digital systems. The right-angle paralleling technique with film holders was used in both systems. The soft wax was used to facilitate the positioning of the examined tooth on the film holders. The radiographic machine of type TROPHY MINOREX (made in France) was adjusted on 65 kVp. , 10 mA. & 0.5 sec. of exposure time & size-2, E-speed film type (Kodak poly-soft, by Eastman Kodak company- USA) was used in the conventional system (figure 2). After processing, each radiograph viewed & examined under magnifying lens.⁽⁶⁾ On the other hand; 62 kVp. , 8 mA. & 0.04 sec. of exposure time & Dixi sensor size-2 from Planmeca Company was used in digital system as shown in (figure 3). The distance between the file tip and the center of radiographic apex was measured for both systems. In the conventional radiographs was directly measured by two examiners using divider & vernier of 0.05mm error, the mean of two measurements was taken. Where as in digital system; these distances was directly measured in the digital images with the software of the Dimax digital program⁽⁶⁾ (figure 4), and the mean of each two measurements was taken, the data were collected and analyzed statistically by paired t-test.

Results and Discussions

The mean value of radiographic length reveal that there is a very small difference between the measurements of conventional radiographic system (0.8727mm) and those measurements of digital radiographic system (0.8367mm) when compared with the real length measurements (1mm) (Table 1). However (0.036mm) difference has no clinical significance, because clinically, the working length

is generally measured to the nearest 0.5 mm.⁽⁷⁾

Paired t-test (Table 2) shows that there is no significant difference ($p < 0.05$) was founded between the real measurements and the radiographic measurements had taken from both conventional and digital systems. But, still the digital image is more accurate in the working length determination according the difference between the mean of real length and the mean of radiographic length of digital imaging system (0.1273), which is less than that mean difference between the real and radiographic length of conventional imaging system (0.1633). This may be due to the image quality of the enhanced digital images was superior to the conventional film images for the evaluation of root fillings.⁽⁴⁾

The results gained from the present study coincide with the previous studies performed by Goaz⁽²⁾ *et.al* and Jones *et.al*,⁽⁸⁾ they concluded that the digital imaging system is more reliable radiographic technique for working length determination in an endodontics. In contrary with the studies made Lozano *et.al*⁽⁵⁾ and Mouyen Forner,⁽³⁾ they concluded that the conventional radiography remains the technique of choice in determining the root-canal length.

Conclusions

- 1-There was no significant different between the accuracy of both radiographic systems.
- 2-Both the conventional and digital imaging systems can be used accurately for working length determination in an endodontic therapy.

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Table 1: Statistical analysis of the Real, Conventional & Digital measurements.

| | Real measurement control | Conventional measurements | Digital measurements |
|--------------------|--------------------------|---------------------------|----------------------|
| N | 33 | 33 | 33 |
| Mean | 1.0000 | 0.8727 | 0.8367 |
| Std. Error of Mean | 0.0000 | 3.995E-02 | 5.944E-02 |
| Std. Deviation | 0.0000 | 0.2295 | 0.3415 |
| Minimum | 1.00 | 0.20 | 0.34 |
| Maximum | 1.00 | 1.20 | 1.90 |

Table 2: Comparison of measurements from conventional & digital systems with normal measurements by the paired t-test.

| Variables | No | Mean | Mean difference | Standard deviation | Std. Error mean | t-value | df | p- value |
|-----------------------|----|--------|-----------------|--------------------|-----------------|---------|----|----------|
| Real length (control) | 33 | 1.0000 | - | 0.000 | 0.000 | - | - | - |
| Conventional system | 33 | 0.8727 | 0.1273 | 0.2295 | 3.995 E-02 | 3.186 | 32 | 0.05 |
| Digital system | 33 | 0.8367 | 0.1633 | 0.3415 | 5.944 E-02 | 2.748 | 32 | 0.05 |



Figure (1): The samples of 14 extracted upper and lower molar teeth.



Figure (2): Position of the tooth in the conventional radiographic system.



Figure (3): Position of the tooth in the digital radiographic system.



Figure (4): Digital radiographic measurement by the digital system.

Concentration of salivary magnesium in relation to dental caries among a group of adults

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Abstract

Magnesium is one of the major cations in plant and animal tissues and is an essential constituent of the bone and tissue, as well as the body fluids. Concentrations of most electrolytes in saliva are subjected to considerable alteration. The aim of this study was to investigate the salivary magnesium in relation to dental caries. A sample of 46 adults was involved with age range of 20-45 years. Samples of stimulated saliva were collected and prepared to be analyzed for magnesium estimation using atomic absorption spectrophotometer. Clinical examination was done for dental caries using WHO criteria. The salivary magnesium concentration was 0.38mg/dl. Neither the sex, nor the age influenced the concentration of magnesium in supernatant stimulated saliva. Negative correlations were found between salivary magnesium and age, salivary flow rate, while, a positive correlation was recorded with dental caries. All these associations were not proved to be significant ($P < 0.05$). Further investigation should be done on whole saliva to clarify the association between magnesium and dental caries. The magnesium relation with the other elements must be considered.

Keywords: Salivary magnesium, dental caries.

Introduction

Saliva is essential for oral health. The protective function of saliva is based not only on the rate of secretion but also on the composition of the secretion ⁽¹⁾. Small amounts of magnesium are present in the saliva. Magnesium ranks after potassium as the most important cations in living cells. It is an essential ion, plays an integral role in many aspects of intermediary metabolism in fundamental enzymatic reactions through its activity as a cofactor and in protein synthesis as a protein activation ⁽²⁾. Navia ⁽³⁾ has suggested a tentative classification of the elements into five groups according to their ability to promote or reduce caries in experimental animals, magnesium is one of the caries-promoting elements.

The possible mechanism of trace element action on dental caries is by altering the resistance of tooth itself or by modifying the local environment at the plaque-tooth enamel interface ⁽²⁾. The evidence relating magnesium to dental caries is equivocal. Different studies reported a relation between magnesium and dental caries ^(4, 5, 6). While, Borella et al ⁽⁷⁾ found no association between them.

Few Iraqi studies investigated the relation of salivary elements to dental diseases ^(8, 9, 10) rather than magnesium. Because of no previous Iraqi studies present regarding the salivary magnesium in relation to dental caries, this study was conducted to estimate the salivary magnesium in relation to dental caries, also, age, sex and flow rate differences.

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Materials and methods

The sample consisted of 46 adults (26 males and 20 females) with an age of 20-45 years. The salivary samples were collected at least one hour after breakfast. The subjects were asked to chew a piece of paraffin (0.5g) for two minutes then the saliva was removed by swallowing. Chewing continued for a fixed time (4 minutes) with the same bolus of paraffin and stimulated whole saliva was obtained. Salivary flow rate

was calculated per one minute. The collected specimens were centrifuged for 40 minutes at 3000 rpm. The supernatant saliva was frozen at -20°C to be ready for magnesium estimation which was done by atomic absorption spectrophotometer. Dental caries assessment was done using the criteria of WHO ⁽¹¹⁾. Student's t-test, correlation coefficient and analysis of variance (ANOVA) were used for statistical analysis, at a level of significance 5%.

Table (1): Caries experience (DMFS), salivary flow rate and salivary magnesium according to gender.

| Sex | No. | DMFS Mean±SD | | Flow Rate Mean±SD | | Mg (mg/100ml) Mean±SD | |
|---------|-----|--------------|------|-------------------|------|-----------------------|------|
| Males | 26 | 17.1 | 9.7 | 1.70 | 0.89 | 0.34 | 0.15 |
| Females | 20 | 18.2 | 10.3 | 1.71 | 0.67 | 0.41 | 0.18 |
| Both | 46 | 17.7 | 9.9 | 1.71 | 0.80 | 0.38 | 0.17 |

Table (2): Concentration of salivary magnesium according to caries experience (DMFS).

| DMFS | No. | Mg (mg/100ml) Mean ± SD | |
|-------|-----|-------------------------|------|
| 1-10 | 12 | 0.31 | 0.18 |
| 11-20 | 19 | 0.47 | 0.23 |
| >20 | 15 | 0.45 | 0.11 |

Table (3): Concentration of salivary magnesium according to salivary flow rate and age.

| Flow Rate | No. | Mg (mg/100ml) Mean±SD | | Age Group | No. | Mg (mg/100ml) Mean±SD | |
|-----------|-----|-----------------------|------|-----------|-----|-----------------------|------|
| 0.5-1 | 12 | 0.44 | 0.21 | 20-29 | 22 | 0.39 | 0.21 |
| 1.1-2 | 22 | 0.37 | 0.17 | 30-39 | 14 | 0.38 | 0.20 |
| >2 | 12 | 0.35 | 0.22 | ≥40 | 10 | 0.35 | 0.16 |

Table (4): Correlation coefficient between salivary magnesium and other variables.

| D | | | |
|----|-----------------------|----------------------|-----------------------|
| Mg | r = -0.08 P = 0.56 | r = 0.15 P = 0.29 | r = -0.18 P = 0.21 |

Results

Table 1 illustrates the caries experience (DMFS), salivary flow rate and salivary magnesium according to gender. Statistically, no significant differences were found in relation to gender ($P>0.05$). Salivary magnesium concentration according to the severity of dental caries is shown in Table 2. Although salivary magnesium increased with the severity of dental caries, statistically, no significant differences were found ($P>0.05$). Table 3 demonstrates the concentration of salivary magnesium according to salivary flow rate and age. Salivary magnesium decreased with increasing salivary flow rate and age. Statistically, no significant differences were found ($P>0.05$).

Negative weak correlation coefficients were found between the salivary magnesium concentration and (age and salivary flow rate), while a positive weak correlation coefficient was recorded with caries experience (DMFS). All the associations were statistically not significant ($P>0.05$) (Table 4).

Discussion

Concentration of salivary magnesium determined in this study was similar to that reported by Shannon and Feller⁽¹²⁾ and differed from other studies^(13, 14). The differences in the concentration of salivary magnesium may be attributed to the differences in the preparation of the salivary fractions (supernatant and sediment)⁽¹³⁾ and type of saliva (stimulated or not)^(13, 14). Although salivary magnesium was higher among females than males, the differences were not statistically significant. This result is in agreement with other studies which proved that gender did not influence the concentration of

magnesium in saliva^(13, 15) and in enamel⁽⁸⁾. Another study showed that salivary magnesium was significantly higher in males than that in females⁽⁷⁾. The slightly higher salivary magnesium among females may explain the slightly higher mean DMFS among them.

A weak negative correlation was found between age and salivary magnesium concentration. This association, statistically, was not significant. This result is in accordance with other previous studies^(15, 16), and in disagreement with Ben – Aryea⁽¹⁷⁾. A study done by Bales et al⁽¹³⁾ found that the concentrations of magnesium in all salivary fractions (whole, supernatant and sediment) were lower in elderly than in young subjects although this finding was significant only for the supernatant. The concentration of magnesium in saliva was inversely related to salivary flow rate but statistically was not proved to be significant. Other studies^(12, 18) also found a negative association between salivary magnesium and flow rate but for unstimulated saliva. The mean values of DMFS were increased with increasing salivary magnesium. This association was statistically not significant. This result is in accordance with another study⁽⁸⁾ regarding enamel magnesium. This positive correlation between salivary magnesium and dental caries is in disagreement with Borella et al⁽⁷⁾ who found no association between them. They conclude that the electrolytes levels in whole saliva might be more adequate than the levels in supernatant to evaluate the relationship with dental caries.

A number of studies have associated low caries prevalence in man and high levels of magnesium in water supplies⁽¹⁹⁾, dental enamel⁽²⁰⁾ and dental plaque⁽⁶⁾. However, a significant correlation was noted

between dental caries and levels of magnesium in hard tissue⁽⁴⁾ and in water⁽⁵⁾. In spite of the weak positive correlation between enamel magnesium and dental caries recorded, the impact of magnesium was confirmed⁽⁸⁾. On the other hand, magnesium is an essential nutrient for the *Streptococcus mutans* and has a significant effect on their growth⁽²¹⁾. Besides, the presence of other ions like Ca^{++} together with magnesium form a complex system that must be in some way related to dental caries⁽²²⁾ and the possible cariostatic properties of other elements like calcium, strontium and lithium may override magnesium stimulation⁽²¹⁾. The increased acid production in dental plaque by rinsing the mouth with magnesium⁽²³⁾ confirms the caries promoting effect of magnesium.

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