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For consultation, please contact:
Website: www.baghdentistry.com

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Instruction for the Authors

The quarterly published Journal of the College of Dentistry accepts manuscripts that address all topics related to dentistry. Manuscripts should be prepared in the following manner:

**Typescript.** Type the manuscript on A4 white paper, with margins of 25 mm. Type the manuscript with English language font (Times New Roman) and the sizes are as follows:
1) Font size 18 and Bold for the title of the manuscript.
2) Font size 14, Bold and capital letters for the headings as ABSTRACT, INTRODUCTION, etc.
3) Font size 12 and Bold for the names and addresses of the authors.
4) Font size 11 for the text of all the article, tables and legends of the figures.

Use single spacing throughout the manuscript and numbering of the pages should be in the lower right hand corner.

**Title of the paper:**
The title should be written with a capital letter for every word as (Effect of the retention and stability, etc).
The name of each author with her/his academic degrees should follow the title. The address, phone, fax, and e-mail of author responsible for correspondence about the manuscript should be typed.

**Abstract and key words.** The abstract should contain no more than 250 words. The abstract should be divided to the following categories: Background: (It contains a brief explanation about the problem for which the research was done as well as the aim of the study), Materials and methods: Results: and Conclusion: Below the abstract, write 3-5 key words that refer as close as possible to the article.

**Text.** The body of the manuscript should be divided into sections preceded by appropriate headings (INTRODUCTION, MATERIALS AND METHODS, RESULTS, DISCUSSION) which are written in bold and capital. Major headings should be typed in bold and the first letter should be capital at the left hand margin; subheadings should not be bold and appear at the left hand margin with only the first letter of each word capitalized.

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Use the style of the examples given below in listing the references:

**Book**

**Journal article**

**Tables.** All tables must have a title placed above the table. Identify tables with Arabic numbers (e.g. Table 1). Cite each table in the text in the order in which it is to appear.

**Figures and illustrations.** All figures must have a title placed below the figure. Identify figures with Arabic numbers (e.g. Figure 1). They must be placed on a separate page and numbered to correspond with the figures. If the article contains illustrations submit three clear unmounted glossy photographs and write the author’s name and the figure’s number at the back of each illustration.

The article should not exceed 10 pages. The author should submit three copies of the article (one original and two copies) and a (CD) containing the article.
**Pioneers-In Memory**

**Dr. Rasheed Noori Al-Hayali**

- Birth: 1/7/1933
- Bachelor of Dentistry: 30/6/1959
- First occupation: 18/5/1961
- Master degree from the USA (Maryland): 30/4/1967
- Assistant dean: 23/11/1969
- Lecturer: 7/7/1971
- Co-Dean: 24/8/1974
- PhD in oral pathology (University of Alabama): 1981
- Death: 3/4/1997

He died in 3/4/1997 leaving hundreds of under and postgraduate students who remember him as one of the pioneers of the college of dentistry.
Depth of cure of four different light-activated composites using different curing modes

Ali A. Al-Shekhli B.D.S., M.Sc., Ph.D.(1)  
Haitham J. Al-Azzawi B.D.S., M.Sc.(2)

ABSTRACT

Background: This study investigated the influence of different new curing modes on the depth of cure of different light-activated composites to determine to the thickness of a composite layer that could be adequately cured clinically with these new curing modes.

Materials and methods: This study investigated the depth of cure after exposure to different curing modes. Parameters included six curing modes: Control (C), Pulse Delay I (PDI), Pulse Delay II (PDII), Soft-start (SS), Pulse Cure I (PCI), and Pulse Cure II (PCII) plus three experimental curing modes of higher energy density: Prolonged low-intensity pulse cure mode (PLPC), Prolonged moderate-intensity pulse cure mode (PMPC) and Rapid high-intensity continues cure mode (RHCC) for each of the four different light-activated composite materials (Tetric Ceram, Heliomolar, Herculite XRV and Degufill Mineral).

Results: Statistical analysis of the data by using the one-way analysis of variance revealed that, there is statistically very highly significant difference for all the depth of cures between the curing modes and composite types.

Conclusion: This study indicated that, although, both curing mode and composite type significantly affect depth of cure but the effect of composite composition on the depth of cure is much more than that of curing mode.

Key words: Composite, light curing modes, depth of cure.

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), standard for polymer-based filling materials requires resin-based composites to have a minimum depth of cure of 1.5 millimeters when irradiated for the manufacturer’s recommended time. “Depth of cure” is defined in the specification 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 the depth of cure, Morrow et al., (4) and Manhart et al., (5) used the same procedure. The objective of this research was to investigate the influence of different curing modes plus three experimental curing modes of high energy density on the depth of cure of four different light-activated composites.

MATERIALS AND METHODS

A conventional Quartz tungsten halogen light-curing unit (Quayle Dental, Worthing England)(Figure 1) with an eight mm -diameter curing tip was used and modified into a variable intensity polymerizer (VIP) (Figure 2). The irradiance output of the curing light was varied by altering the input voltage using a variable AC power supply (China) (variable transformer), that can alter the input voltage from 0-260 volt.

To avoid over heating of the curing unit (damaging of the light bulb), the power supply of the fan was separated from the unit using another transformer for the fan which was supplied by electricity from the main power source without passing through the variable transformer (directly from the UPS via the automatic voltage regulator) (Figure 3).

An UPS (uninterrupted power supply)(Korea) was used and connected to a voltage regulator (Goldsource, model: SVC-...
2000W, China) to maintain a stable power supplying line voltage, thereby negating the effect of transient line voltage fluctuations on the light-intensities during photo-curing procedures. The input voltage was measured with a digital voltmeter (China) and the output voltage was measured with another one. A digital light meter (Coltolux) (Coltène/Whaledent.com, France) was used to measure the light intensity delivered from the curing tip. The curing light was operated for at least three minutes before any irradiance measurements were made, and this was done to eliminate the possibility of irradiance variations as a result of a cool bulb.

From a plot of input and output voltages versus intensity, we extrapolated the input and output voltages needed to deliver a curing-light intensity of 100, 200, 300, 400, 500 and 600 mW/cm² in 100 mW/cm² increment (Table 1) for the 400-500 nm wavelength bandwidth.

Four different light-activated resin composite materials of A2 Vita shade were selected: Tetric Ceram (Ivoclar, Vivadent AG FL-9494 Schaan/Liechtenstein.Lot: E58102), Heliomolar (Ivoclar, Vivadent AG FL-9494 Schaan/Liechtenstein.Lot: C37535), Herculite XRV (sds Kerr, 1717 West Collins Orange, CA 92867, U.S.A.Lot: 205466.Item No.: 22860) and Degufill Mineral (Degussa-Hüls AG, Degussa Dental GmbH & Co. KG, Postfach 1364. D-63403 Hanau, Germany.Lot: 0885).

For the preparation of a cylindrical specimen, a two-piece aluminum mold with a diameter of 4mm and a height of 8mm (Iraqi construction) was used as a mold for the composite specimens.

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) 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 cover slide, then a finger pressure was applied to the cover slide to extrude excess material.

Table 1: Different light intensities versus their input and output voltages.

<table>
<thead>
<tr>
<th>Light intensity</th>
<th>Output voltage</th>
<th>Input voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mW/cm²</td>
<td>8.1 volt</td>
<td>162 volt</td>
</tr>
<tr>
<td>200 mW/cm²</td>
<td>10.0 volt</td>
<td>198 volt</td>
</tr>
<tr>
<td>300 mW/cm²</td>
<td>11.2 volt</td>
<td>220 volt</td>
</tr>
<tr>
<td>400 mW/cm²</td>
<td>12.2 volt</td>
<td>239 volt</td>
</tr>
<tr>
<td>500 mW/cm²</td>
<td>12.8 volt</td>
<td>249 volt</td>
</tr>
<tr>
<td>600 mW/cm²</td>
<td>13.4 volt</td>
<td>255 volt</td>
</tr>
</tbody>
</table>
Figure 3: The electrical diagram of the modified light-curing device.

Table 2: The different light-curing modes (6).

<table>
<thead>
<tr>
<th>Light-curing mode</th>
<th>Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control (CC)</td>
<td>400 mW/cm² (40 sec)</td>
</tr>
<tr>
<td>Pulse Delay I (PDI)</td>
<td>100 mW/cm² → Delay → 500 mW/cm² (3 sec) (3 minutes) (30 sec)</td>
</tr>
<tr>
<td>Pulse Delay II (PDII)</td>
<td>200 mW/cm² → Delay → 500 mW/cm² (20 sec) (3 minutes) (30 sec)</td>
</tr>
<tr>
<td>Soft-start (SS)</td>
<td>200 mW/cm² → 600 mW/cm² (10 sec) (30 sec)</td>
</tr>
<tr>
<td>Pulse Cure I (PCI)</td>
<td>400 mW/cm² → Delay → 400 mW/cm² → Delay → 400 mW/cm² (10 sec) (10 sec) (10 sec) (20 sec)</td>
</tr>
<tr>
<td>Pulse Cure II (PCII)</td>
<td>400 mW/cm² → Delay → 400 mW/cm² (20 sec) (20 sec) (20 sec)</td>
</tr>
</tbody>
</table>

The exit window of the curing light was placed over the cover slide (the light tip in contact with the cover slide) and each composite material was irradiated, through the transparent celluloid strip and the cover slide, with the nine different curing modes (Table 2, 3).

One hour after completing irradiation, 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. This value was divided by two (in compliance with ISO CD4049: 2000), and recorded it as the depth of cure.

Mean and standard deviation were calculated for each specific depth of cure. The results were analyzed with one-way ANOVA and Least significant difference LSD-test at significance level 0.05.

RESULTS

Mean depth of cure in mm and standard deviation of the four different light-activated composites cured with the nine different curing modes are listed in Table 4. Figure 4 summarizes mean depth of cure of the four different light-activated composites cured with the nine different curing modes. Statistical analysis of the data by using the one-way analysis of variance revealed that, there is statistically very highly significant difference for all the depth of cures between the curing modes and composite types. LSD-test of the depth of cure according to the composite type is summarized in Table 5.

DISCUSSION

In this study, although both curing mode and composite type significantly affect depth of cure but Figure 4 demonstrated that, the effect of composite composition on the depth of cure is much more than that of curing mode and this is due to the fact that, the most important
factors affecting the polymerization depth are the composition and the physical properties of the composite resins and not the energy density and this finding is in agreement with DeBacker & Dermaut (7). Herculite XRV light-activated composite exhibited the highest depth of cure values for all the nine curing modes (Figure 4) followed by Tetric Ceram, Degufill Mineral, and Heliomolar, which exhibited the lowest depth of cure values.

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 indicated that, microhybrid resin-based composite had the greatest depth of cure because of their high filler loading (79% by weight) and relatively large average particle size (0.6-0.7 micron) while for the microfills (66.7% by weight) for the filler loading and (0.04 micron) for the average particle size and in this study, Herculite XRV and Tetric Ceram composites are micro-hybrids and both of them exhibited high depth of cure values in comparison with Heliomolar composite which is a microfilled composite and this finding is in agreement with the findings of Jain & Pershing (9).

The findings of this study, is not in agreement with the findings of Jain & Pershing (9) in that, greater irradiance (energy density) or longer exposure times are needed to cure small particle resin-based composites in an attempt to increase their depth of cure because in this study, the experimental curing modes of high energy density did not greatly increase the depth of cure especially with Heliomolar microfilled light-activated composite (Figure 4).

### Table 3: The three experimental light-curing modes used in this study.

<table>
<thead>
<tr>
<th>Light-curing mode</th>
<th>Regimen</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prolonged low-intensity pulse cure mode (PLPC)</td>
<td>100mW/cm² → Delay → 300 mW/cm² (20 seconds) (10 seconds) (120 seconds)</td>
</tr>
<tr>
<td>Prolonged moderate-intensity pulse cure mode (PMPC)</td>
<td>100mW/cm² → Delay → 400 mW/cm² (20 seconds) (10 seconds) (90 seconds)</td>
</tr>
<tr>
<td>Rapid high-intensity continues cure mode (RHCC)</td>
<td>600mW/cm² (60 seconds)</td>
</tr>
</tbody>
</table>

### Table 4: Mean depth of cure in mm and standard deviation of the four different light-activated composites cured with the nine-different curing modes

<table>
<thead>
<tr>
<th>Curing Mode</th>
<th>Tetric Ceram</th>
<th>Heliomolar</th>
<th>Herculite XRV</th>
<th>Degufill Mineral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>2.36 (0.01)</td>
<td>1.75 (0.02)</td>
<td>2.87 (0.05)</td>
<td>1.95 (0.03)</td>
</tr>
<tr>
<td>PDI</td>
<td>2.295 (0.04)</td>
<td>1.725 (0.04)</td>
<td>2.865 (0.02)</td>
<td>1.975 (0.03)</td>
</tr>
<tr>
<td>PDII</td>
<td>2.46 (0.02)</td>
<td>1.9 (0.04)</td>
<td>2.855 (0.04)</td>
<td>2.015 (0.04)</td>
</tr>
<tr>
<td>SS</td>
<td>2.395 (0.05)</td>
<td>1.845 (0.06)</td>
<td>2.98 (0.04)</td>
<td>2.115 (0.05)</td>
</tr>
<tr>
<td>PCI</td>
<td>2.345 (0.03)</td>
<td>1.83 (0.06)</td>
<td>2.89 (0.05)</td>
<td>1.98 (0.06)</td>
</tr>
<tr>
<td>PCII</td>
<td>2.375 (0.04)</td>
<td>1.815 (0.06)</td>
<td>2.89 (0.05)</td>
<td>2.065 (0.03)</td>
</tr>
<tr>
<td>PLPC</td>
<td>2.475 (0.05)</td>
<td>1.875 (0.04)</td>
<td>3.2 (0.05)</td>
<td>1.95 (0.04)</td>
</tr>
<tr>
<td>PMPC</td>
<td>2.52 (0.03)</td>
<td>1.9 (0.03)</td>
<td>3.25 (0.05)</td>
<td>2.08 (0.04)</td>
</tr>
<tr>
<td>RHCC</td>
<td>2.28 (0.03)</td>
<td>1.77 (0.03)</td>
<td>3.21 (0.07)</td>
<td>1.9 (0.06)</td>
</tr>
</tbody>
</table>

Standard deviation in parentheses.
Figure 4: Mean depth of cure in mm of the four different light-activated composite cured with the nine-different curing modes according to the composite type.

Table 5: LSD-test of the depth of cure according to the composite type.

<table>
<thead>
<tr>
<th>Control</th>
<th>PDI</th>
<th>PDII</th>
<th>SS</th>
<th>PCI</th>
<th>PCII</th>
<th>PLPC</th>
<th>PMPC</th>
<th>RHCC</th>
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<tr>
<td>Tetric</td>
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</tbody>
</table>

***: Highly significant difference
**: Very highly significant difference

REFERENCES
Effect of beveling with different grid size diamond fissure bur on resin bond strength

Angham G.K AL-Hashimi B.D.S., M.Sc.(1)
Anas F.M AL-Aubaydi B.D.S., M.Sc.(1)

ABSTRACT

Background: Diamond burs are recommended for grinding enamel and they are available in different grid sizes, therefore the aim of this study was to evaluate the effect of beveling with 4 different grid size diamond fissure burs on shear bond strength of light cured composite resin.

Materials and Methods: Forty extracted anterior teeth were sectioned at the level of cervical line. The crowns were embedded in cold cure acrylic resin exposing the labial surface. The specimens were divided into 4 groups according to the grid size of the diamond fissure bur which were used in flattening the labial surface (group I extra fine, group II fine, group III Medium, group IV coarse). Standardized cylinders of composite resin were bonded to the ground surface, and testing was done with Zwick testing machine.

Results: There is a non significant difference between all the four groups.

Conclusion: The grid size of diamond burs didn’t affect the resin bond strength to enamel.

Keywords: Diamond bur, bond strength, enamel beveling.

INTRODUCTION

One of the basic principles of quality operative dentistry paramount for successful esthetic resin restoration is the cavosurface margin design. Incorrect margin design decreases the survival and longevity of the restoration. Beveling the margin has advantages to the properties of acid etched resin restoration, such as, enhanced resistance to microleakage, increased retention and better abrasion resistance, in addition to beveling the margins exposing greater surface area thus improves the adhesion. (1,2)

Diamond burs are mostly efficient when used to grind brittle material and are superior to other burs for the removal of dental enamel. (3)

Diamond burs are commonly categorized according to the particle size into different grids. The clinical performance of different grid of diamond abrasive instrument is to produce surface scratches and removing more tooth structure depends on the particle size, also produce different surface roughness which may affect the bond strength (5). Therefore the purpose of this study was to evaluate the effect of beveling with four different grid size diamond fissure bur on the shear bond strength of light cure composite resin.

MATERIAL AND METHODS

Forty recently extracted anterior teeth were collected, cleaned with slurry of pumice in rubber cup used in low-speed hand piece, and sectioned at the level of cervical line then the crown of the tooth was embedded in acrylic resin exposing the labial enamel surface. (Figure1)

• Four grid size fissure burs (Mani Inc. Japan) were used in this study which were color coded: coarse; green (125-150µm), medium; blue (106-125µm), fine; red (53-63µm), extra fine; yellow (20-30µm).

• The specimens were divided into 4 groups according to the grid size of the diamond fissure bur being used in flattening the labial enamel surface:

  - Group I: Extra fine diamond fissure burs (10 specimens)
  - Group II: Fine diamond fissure burs (10 specimens)
  - Group III: Medium diamond fissure burs (10 specimens)
  - Group IV: Coarse diamond fissure burs (10 specimens)

A flat enamel surface was obtained with the diamond fissure bur in high-speed hand piece mounted in a surveyor with applied load=100 g.

• The flat labial surface was acid etched with 37% phosphoric acid gel (degufill etchant, degussa dental, GmbH & Co.KG) for 15 seconds, washed for 30 seconds and bonding agent (alpha dent bonding resin, Dental Technology, Inc.USA) applied and light cured for 20 seconds.

• The bonding procedure was done with a standardized translucent plastic straw with an internal diameter of 3mm and 6mm length filled with composite resin (alpha-dent composite, Dental Technology, Inc.USA) and was placed perpendicular on the enamel
surface and light cured in four directions for 40 seconds.

- The specimens were stored in deionized distilled water for 24 h. in humidifier.
- Testing was done with Zwick testing machine applying shear force with specially designed chisel-shaped rode with cross head speed of 5mm per minute applied at the interface between the enamel surface and the bonded composite resin. The load cell was set at 100 g. The specimens were stressed to failure and the force was recorded in Newton and divided by the surface area to obtain the shear bond strength values calculated in Mpa.

RESULTS
The resulted shear bond strength values in Mpa for the four groups are shown in Table 1 and Figure 2.
Table 1: The mean and standard deviation of shear bond strength values in Mpa for the four groups.

<table>
<thead>
<tr>
<th>Group</th>
<th>Mean</th>
<th>SD</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>19.5</td>
<td>5.02</td>
<td>18.3-23.7</td>
</tr>
<tr>
<td>II</td>
<td>20.9</td>
<td>5.42</td>
<td>18.8-25.3</td>
</tr>
<tr>
<td>III</td>
<td>19.2</td>
<td>4.75</td>
<td>18.3-25.8</td>
</tr>
<tr>
<td>IV</td>
<td>19.4</td>
<td>2.33</td>
<td>17.7-21.9</td>
</tr>
</tbody>
</table>

Group III (Medium grid diamond fissure bur) showed the lowest mean= 19.155 ± 4.75 while group II (fine grid diamond fissure bur) showed the highest mean=20.86 ± 5.42. However, the statistical analysis of the data using analysis of variance ANOVA test showed no significant difference between the four groups.

DISCUSSION
Adhesive restorative and preventive dentistry began in 1955 when acid etching of the enamel surface was proposed to increase adhesion (6). Beveling the margin has advantages to the properties of acid-etched resin restorations (1), and currently done using diamond burs (3).

The diamond fissure burs as well as the bonding agent and composite resin being used in this study were among the materials introduced to the market in our country with their manufacturers to claim high efficacy of their respective product.

The work load was standardized (100=g) on the head of the high speed handpiece. This important variable has great influence on the cutting effectiveness of the diamond fissure burs and the obtained surface roughness of the cut surface (3).

The specimens were stored in deionized distilled water for 24hrs. before being tested. This second important variable was controlled because bond strength tends to be increased gradually with prolonged storage (9).

The established reliability of the method selected for measuring the shear bond strength (using Zwick testing mash in with specially designed chisel shaped rode) (10) was the main reason for its adoption in the present work.

In this study the results of shear bond test indicated that none of the four different grid size diamond fissure burs had any significant influence on the resulted bond strength of composite resin. These findings could be explained on the fact that grinding the enamel surface with diamond burs produce gross mechanical roughness in the range of 20-150µm but leaves a smear layer of hydroxylapatite crystals and denaturated collagen that is approximately 1-3 µm thickness. Acid etch dissolves this layer and produces microscopic relief with undercuts on the surface to create a porous layer in the range of 5-50 µm with higher surface energy which can be penetrated easily by bonding resin creating a mechanical lock , thus creating opportunity for mechanical bonding (5,7). The grid size of diamond fissure bur therefore, affects the resin tag length even though it has no influence on resin bond strength to enamel because of the fact that debonding occurs on the neck of the resin tags (5).

In table 1, the means of shear bond strength values calculated in Mpa are in range of 19.155-20.86 and were higher than the 17 MPa that was reported to be sufficient to resist contraction force of polymerization shrinkage of composite resin that provides clinically successful retention and marginal seal of the restoration. Furthermore, this rang was very close the (20 MPa) reported by other studies (5,8) which appear to be clinically very acceptable.

In addition, the scatter of data was relatively of narrow range (2.33-5.42 MPa) in comparison to the scatter of the data derived from adhesion testing to enamel in other studies (11-13). This favorable result obtained may be attributed to the control of the variables, the sufficient sample size in the presented work,
and applying shear bond strength test rather than tensile bond strength test that the latest is less reliable for brittle material \(^{(14)}\). But still the scattered data derived from any adhesion testing to dental tissue is an on-going problem for researchers in the area of study due to the nature of the dental tissue itself. Controlling the problem scattered of the data is allowing a valid conclusion to be drawn \(^{(15)}\).

The non significant difference between the four groups, and the high range of mean shear bond strength values as well as the controlled range of the scattered data, seem to be of particular clinical relevance. As the four different grid size diamond fissure burs can be used in beveling the enamel margin successfully and the dentist can use any available diamond fissure bur in his/her clinic to bevel the enamel margin of the prepared cavity.

**REFERENCES**

Shape and location of torus palatinus and torus mandibularis among patients attending dental clinic

Ghayda’a H. AL-Izzi B.D.S., M.Sc.(1)

ABSTRACT

Background: The aim of this study was to determine the shape and location of torus palatinus (TP) and torus mandibularis (TM) among a group of edentulous patients.

Materials and methods: Out of 720 edentulous patients fifty three subjects were found to have tori at College of Dentistry / Baghdad University. Clinical examination was applied to assess the presence of tori, also a final cast for each patient was made for reassurance of the presence of these tori.

Results: Tori were found to be more in females compared to males, with no statistically significant differences. Also no significant difference in the percentage of occurrence of tori was recorded between different age groups. The non lobulated Tori appeared more than lobulated. Torus palatinus occurred more than Torus mandibularis.

Conclusion: There are differences in percentage of occurrence of tori with age and gender and in shape and location.

Keywords: Torus palatinus, torus mandibularis.

INTRODUCTION

The most remarkable exostoses of the human jaws are torus palatinus (TP) and torus mandibularis (TM) (1). Torus in general is a smooth rounded anatomical protuberance (2). This bony hyperostosis, is common in both the maxilla and mandible (3).

Torus palatinus (TP) is sessile nodule of bone and it is a benign osseous growth, found at the midline of hard palate at the junction of the palatine process of maxillary bones (1,3), and it is not found in all patients. Torus palatinus (TP) varies in size from that of a small pea to a huge enlargement that may even full the palate to the level of occlusal plane (4). Small tori that do not act as fulcrum point under a denture may not require removal, however even when the torus is small it may act as a fulcrum under a denture if the mucosal covering of the crest and slopes of the ridge and displaceable to a greater extent than the mucosal covering of the torus. In these instances the denture base over the area must be relieved to compensate for the difference on the torus, otherwise it should be surgically removed (3).

Generally the tori are covered with a thin layer of soft tissue and consequently they are very hard (4). The covering mucosa varies in quality and quantity and the torus may be smooth or pedunculated (3). Torus mandibularis (TM) is a boney protuberance located on the lingual cortical aspect of the mandible.

Commonly it may be seen at the canine and premolar areas (1,5), mid way between the soft tissues of the floor of the mouth and the crest of the alveolar process (6).

Although tori are not pathologically significant, they may obscure radiographic details of maxillary sinuses and mandibular premolar (1). These tori vary in size and shape, their mucosal covering is usually thin. Most mandibular tori should be removed before denture construction because relief in the denture base rarely provides comforted. As a rule the patient will not tolerate the denture well with the presence of the mandibular tori (3).

The percentage of tori varies widely in different populations ranging from 0.4%-66.5% for torus palatinus (TP) (10) and 0.5%-63.4% for torus mandibularis (TM) (10-12).

The etiology of tori has been investigated, however no consensus has been found. The postulated causes include genetic factors (1,4), environmental factors (1,11), masticatory hyper function and continuous growth (11,12,14).

Recently, the etiology of tori has been postulated to be interplay of multi factorial genetic and environmental factors (5, 11).

Racial differences appear significant with a high prevalence in Asia and Eskimo populations (10,12). The differences in percentage of tori between genders have also had been reported. Most authors reported torus palatinus (TP) was more frequent in females (1, 11, 13).

The present study was performed to determine the shape and location of the tori and to investigate the gender and age related changes of torus palatinus (TP) and torus mandibularis (TM).
MATERIALS AND METHODS

The samples consisted of 53 Iraqi patients selected from 720 dental patients attended the fourth class Prosthodontics Clinic of College of Dentistry, University of Baghdad. The subjects were divided into three age groups: 35-44, 45-54, 55-65 years.

Data collection divided into 2 days in a week; in every day 90 patients were examined. The presence of tori was assessed by clinical inspection and palpation, questionable tori was recorded as not present. In cases of positive finding, diagnosis was confirmed by examination of final cast of each patient. Recording of torus was done according to their shape (lobulated or not lobulated) and according to their location in maxillary, mandibular or in both jaws.

The statistical package for social science was used for the analysis of the data, to find the distribution of the samples according to age and gender and shape (lobulated or not lobulated). The Chi- square test was applied at significance level of 5 % to test differences between lobulated and not lobulated tori, in male and female subjects.

RESULTS

The distribution of the samples according to the occurrence of the tori by age group and gender is shown in Table 1. Although statistically not significant, tori occurred in a higher percentage in females compared to males (P=0.05). Age differences were also statistically not significant.

Figure 1 illustrates the distribution of tori in mandible and maxilla by age and gender. The percentage of occurrence was found to be greater in maxilla compare to the mandible; this was true for both males and females.

The distribution of tori, whether lobulated or not lobulated according to gender and age groups is shown in Table 2. In both genders the not lobulated tori appear to be more than lobulated, this was statistically significant in males but not significant in females as shown in Table 3.

DISCUSSION

The presence of tori and other bony exostoses must be detected and an evaluation of their presence in relation to frame work design must be made, although modification of denture design can at times accommodate for exostoses more frequently. This results in additional stressed to the supporting elements and compromised functions.

The removal of exostoses and tori is not a complex procedure, and the advantages to be realized from such removal are great in contrast to the deleterious effects their continued presence can create. Ordinarily the mucosa covering bony protuberances is extremely thin and friable partial denture components in proximity to this type of tissue may cause irritation and chronic ulceration. Also exostoses approximating gingival margens may complicate the maintenance of periodontal health and lead to the eventual loss of strategic abutment teeth.

Study results agree with the most previous studies as in Asian population and others which shows the torus palatinus (TP) is more common in females, while torus mandibularis (TM) is more common in males.

Lobular torus palatinus (TP) is lesser frequently observed than not lobulated and this is agreed with some authors who reported that the lobular torus palatinus (TP) to be rarest type.

The non-lobulated Torus mandibularis (TM) was found to be more than lobulated tori and this is in agreement with the other that reported the not lobulated tori as the most common type.

The distribution of both tori as well as the differences with age and gender support the hypothesis that torus should be considered a dynamic phenomenon, responding during life to environment and functional factors acting in a complicated enter play with the genetic factors.

<table>
<thead>
<tr>
<th>Age group</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>35-44</td>
<td>11</td>
<td>23</td>
<td>34</td>
</tr>
<tr>
<td>45-54</td>
<td>4</td>
<td>8</td>
<td>12</td>
</tr>
<tr>
<td>55-65</td>
<td>5</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>33</td>
<td>53</td>
</tr>
</tbody>
</table>

Table 1: Distribution of the sample according to age and gender
Table 2: Distribution of torus according to age, gender and shape

<table>
<thead>
<tr>
<th>Age group</th>
<th>Male</th>
<th></th>
<th>Female</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Year</td>
<td>Lobulated</td>
<td>%</td>
<td>Not Lobulated</td>
<td>%</td>
<td>Lobulated</td>
</tr>
<tr>
<td>35-44</td>
<td>11</td>
<td>84.62</td>
<td>6</td>
<td>35.29</td>
<td>12</td>
</tr>
<tr>
<td>45-54</td>
<td>1</td>
<td>7.69</td>
<td>6</td>
<td>35.29</td>
<td>4</td>
</tr>
<tr>
<td>55-65</td>
<td>1</td>
<td>7.69</td>
<td>5</td>
<td>29.41</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
<td>100</td>
<td>17</td>
<td>100</td>
<td>16</td>
</tr>
</tbody>
</table>

Table 3: Chi-square values between not lobulated and lobulated tori in (male and female)

<table>
<thead>
<tr>
<th>Types of tori</th>
<th>Gender</th>
<th>Chi-square</th>
<th>P-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not lobulated</td>
<td>Male</td>
<td>7.305</td>
<td>0.049</td>
<td>S*</td>
</tr>
<tr>
<td>lobulated</td>
<td>Female</td>
<td>1.975</td>
<td>0.578</td>
<td>NS**</td>
</tr>
</tbody>
</table>

*S*P<0.05 Significant, **P>0.05 Non significant

Figure 1: Distribution of toris according to shapes and location in males and females (maxillary and mandibular)

REFERENCES
Effectiveness of four different light-activated composites
cure with different light energy densities

Ali A. Al- Shekhli B.D.S., M.Sc., Ph.D.(1)
Haitham J. Al-Azzawi B.D.S., M.Sc.(2)
Isra’a A. Al- Aubi B.D.S., M.Sc.(3)

ABSTRACT

Background: This study investigated the influence of light energy density (intensity x time) on the effectiveness of composite cure in view of the curing profiles of light-polymerization units with different light-activated composites to determine the energy density that satisfies adequate polymerization of all light-activated composite types used in this study.

Materials and methods: This study investigated the hardness of the top/bottom surfaces and hardness ratio of two mm thick composite specimens after exposure to different light energy densities. Parameters included five light intensities (200, 300, 400, 500 and 600 mW/cm²) and seven irradiation times (20, 40, 60, 90, 120, 150 and 180 seconds) for each of the four different light-activated composite materials (Tetric Ceram, Heliomolar, Herculite XRV and Degufill Mineral).

Results: Statistical analysis of the data by using the one-way analysis of variance revealed that, most of the hardness ratios exhibited a very highly significant difference according to intensity, composite type and curing time. The results indicated that, Heliomolar and Degufill Mineral light-activated composites required approximately (36 J/cm²) energy density for adequate polymerization for a two-mm thick specimen while, Herculite XRV and Tetric Ceram light-activated composites required approximately (12 J/cm²) energy density for adequate polymerization for a 2-mm thick specimen.

Conclusion: This study indicated that, final curing should not be done with energy density less than (300 mW/cm² for 120 seconds, 400 mW/cm² for 90 seconds and 600 mW/cm² for 60 seconds) for Heliomolar and Degufill Mineral light-activated composites.

Key words: Resin composite, light curing, microhardness, photo-activation.

INTRODUCTION

Light-activated resin composites, introduced in the 1970s, revolutionized clinical dentistry by maximizing working time and minimizing setting time. Over the last few years, composite restoratives and adhesive techniques have become the foundation of modern dentistry. The hardening of dental composite results from a chemical reaction between dimethacrylate resin monomers that produces a rigid and heavily cross-linked polymer network surrounding the inert filler particles (1). The extent of this reaction often is referred to as the degree or effectiveness of cure, is very important in that it dictates many physical and mechanical properties of the composite restoration (2). Inadequate polymerization has been associated with inferior physical properties, higher solubility, retention failures and adverse pulpal responses due to unpolymerized monomers (3).

The effectiveness of composite cure may be assessed directly or indirectly.

Direct methods that assess degree of conversion, such as infrared spectroscopy and laser Raman spectroscopy, have not been accepted for routine use because these methods are complex, expensive, and time-consuming (4).

Indirect methods have included visual, scrapping and hardness testing. Surface-hardness has been shown to be an indicator of the degree of conversion (5). High intensity lights may provide higher values for degree of conversion, but they also produce higher contraction strains during composite polymerization (6). A slower curing process that permits composite flow may allow for stress relaxation to take place during photo-polymerization (7), as the polymerization process is dependent on total light energy rather than light intensity alone (8).

A slower curing process with an equivalent degree of conversion can be obtained by applying a lower intensity light for a longer time or using variable intensities over a given time period. The objective of this research was to investigate the influence of different light energy densities on the effectiveness of cure of four different light-activated composites and to determine the minimum energy density required by each type of composite used to be adequately polymerized.

(1) Lecturer, Department of Conservative Dentistry, College of Dentistry, University of Baghdad
(2) Professor, Head of the Department of Conservative Dentistry, College of Dentistry, University of Baghdad
(3) Assistant lecturer, Department of Conservative Dentistry, College of Dentistry, University of Baghdad

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MATERIALS AND METHODS

A conventional Quartz tungsten halogen light-curing unit (Quayle Dental, Worthing England) with an 8-mm diameter curing-tip was used and modified into a variable intensity polymerizer (VIP) to be used as the light source for all curing procedures later on. A digital light meter (Coltolux) (Coltène/Whaledent.com, France) was used to measure the light intensity delivered from the curing tip. Four different light-activated resin composites of A2 shade were selected: Tetric Ceram (Ivoclar, Vivadent AG FL-9494 Schaan/Liechtenstein.Lot: E58102), Heliomolar (Ivoclar, Vivadent AG FL-9494 Schaan/Liechtenstein.Lot: C37535), Herculite XRV (sds Kerr, 1717 West Collins Orange, CA 92867, U.S.A.Lot: 205466.Item No.: 22860) and Degufill Mineral (Degussa-Hüls AG, Degussa Dental GmbH & Co. KG, Postfach 1364. D-63403 Hanau, Germany.Lot: 0885).

A stainless steel cylindrical mold of 2-mm high and 4-mm in diameter (Iraqi construction) was used as a mold for the composite material. To prepare each specimen, the mold was placed on a clear glass slide (Blue star glass industries, Delhi, India) with a transparent celluloid strip (Hawe-Neos Dental, CH-6925 Gentilino, Switzerland) in between, and the resin composite material was carried and placed in the mold. Then, another transparent celluloid strip was placed on the top surface of the mold over which, a cover slide (0.3 mm in thickness) was then placed and excess material was extruded by finger pressure application. The composite was then irradiated from the top through the cover slide and the celluloid strip using different light energy densities. Parameters investigated included five light intensities (200, 300, 400, 500 and 600 mW/cm²) and seven irradiation times (20, 40, 60, 90, 120, 150 and 180 seconds) for each type of the four different light-activated composite materials. One hour after light polymerization the specimens in their molds, were positioned centrally beneath the Micromet Vickers micro-hardness tester (Adolph I. Buehler Inc. Optical and Metallurgical instruments 2120 Greenwood st/Evanston ILL USA 60204) (Figure 1) to calculate Vickers hardness number (VHN) of the top and bottom surfaces.

![Figure 1: Micromet Vickers micro-hardness tester.](image)

Ten specimens were assigned for each of the different light intensities and each type of composite materials. Hardness ratio was calculated using the following formula:

\[
\text{Hardness ratio} = \frac{\text{VHN of bottom surface}}{\text{VHN of top surface}}
\]

That means if the value exceeded 0.8, the specimen was considered adequately polymerized (9).

Mean and standard deviation were calculated for each specific hardness ratio. The results were analyzed with one-way ANOVA at significance level 0.05.

RESULTS

Mean hardness ratios of the four light-activated composites at different light intensities and different time intervals are listed in Table 1.
Table 1: Mean hardness ratio of the four different light-activated composites at different time intervals at light intensity of 200-600 mW/cm² respectively.

<table>
<thead>
<tr>
<th>Energy density</th>
<th>Tetric Ceram</th>
<th>Helio molar</th>
<th>Herculite XRV</th>
<th>Degufill Mineral</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intensity (mW/cm²)</td>
<td>Curing time (seconds)</td>
<td>HR</td>
<td>HR</td>
<td>HR</td>
</tr>
<tr>
<td>200</td>
<td>20</td>
<td>0.58 (0.06)</td>
<td>?</td>
<td>0.57 (0.05)</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>0.75 (0.06)</td>
<td>?</td>
<td>0.77 (0.08)</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>0.79 (0.10)</td>
<td>0.57 (0.04)</td>
<td>0.88 (0.05)</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>0.93 (0.07)</td>
<td>0.58 (0.02)</td>
<td>0.85 (0.05)</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>0.93 (0.05)</td>
<td>0.71 (0.07)</td>
<td>0.86 (0.04)</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>0.94 (0.05)</td>
<td>0.75 (0.06)</td>
<td>0.84 (0.04)</td>
</tr>
<tr>
<td></td>
<td>180</td>
<td>0.93 (0.05)</td>
<td>0.75 (0.08)</td>
<td>0.85 (0.04)</td>
</tr>
<tr>
<td>300</td>
<td>20</td>
<td>0.67 (0.06)</td>
<td>?</td>
<td>0.78 (0.04)</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>0.68 (0.06)</td>
<td>?</td>
<td>0.75 (0.03)</td>
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<tr>
<td></td>
<td>60</td>
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<td>0.76 (0.09)</td>
<td>0.88 (0.06)</td>
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<tr>
<td></td>
<td>120</td>
<td>0.86 (0.03)</td>
<td>0.78 (0.09)</td>
<td>0.88 (0.06)</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>0.87 (0.11)</td>
<td>0.80 (0.09)</td>
<td>0.9 (0.04)</td>
</tr>
<tr>
<td></td>
<td>180</td>
<td>0.87 (0.02)</td>
<td>0.80 (0.07)</td>
<td>0.9 (0.05)</td>
</tr>
<tr>
<td>400</td>
<td>20</td>
<td>0.62 (0.03)</td>
<td>?</td>
<td>0.82 (0.08)</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>0.7 (0.05)</td>
<td>?</td>
<td>0.8 (0.09)</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>0.83 (0.07)</td>
<td>0.73 (0.07)</td>
<td>0.88 (0.05)</td>
</tr>
<tr>
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<td>90</td>
<td>0.88 (0.06)</td>
<td>0.8 (0.05)</td>
<td>0.87 (0.05)</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>0.88 (0.04)</td>
<td>0.8 (0.06)</td>
<td>0.89 (0.03)</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>0.89 (0.04)</td>
<td>0.81 (0.09)</td>
<td>0.9 (0.03)</td>
</tr>
<tr>
<td></td>
<td>180</td>
<td>0.89 (0.06)</td>
<td>0.81 (0.08)</td>
<td>0.91 (0.03)</td>
</tr>
<tr>
<td>500</td>
<td>20</td>
<td>0.7 (0.09)</td>
<td>?</td>
<td>0.82 (0.03)</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>0.76 (0.06)</td>
<td>0.64 (0.05)</td>
<td>0.89 (0.04)</td>
</tr>
<tr>
<td></td>
<td>60</td>
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<td>0.74 (0.05)</td>
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</tr>
<tr>
<td></td>
<td>90</td>
<td>0.87 (0.06)</td>
<td>0.8 (0.04)</td>
<td>0.88 (0.04)</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>0.85 (0.04)</td>
<td>0.81 (0.07)</td>
<td>0.9 (0.05)</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>0.85 (0.06)</td>
<td>0.86 (0.14)</td>
<td>0.9 (0.04)</td>
</tr>
<tr>
<td></td>
<td>180</td>
<td>0.87 (0.03)</td>
<td>0.86 (0.10)</td>
<td>0.91 (0.04)</td>
</tr>
<tr>
<td>600</td>
<td>20</td>
<td>0.83 (0.08)</td>
<td>0.73 (0.05)</td>
<td>0.97 (0.04)</td>
</tr>
<tr>
<td></td>
<td>40</td>
<td>0.84 (0.09)</td>
<td>0.77 (0.07)</td>
<td>0.98 (0.06)</td>
</tr>
<tr>
<td></td>
<td>60</td>
<td>0.93 (0.08)</td>
<td>0.84 (0.15)</td>
<td>0.99 (0.03)</td>
</tr>
<tr>
<td></td>
<td>90</td>
<td>0.92 (0.04)</td>
<td>0.86 (0.04)</td>
<td>0.96 (0.03)</td>
</tr>
<tr>
<td></td>
<td>120</td>
<td>0.92 (0.04)</td>
<td>0.9 (0.06)</td>
<td>0.95 (0.03)</td>
</tr>
<tr>
<td></td>
<td>150</td>
<td>0.97 (0.05)</td>
<td>0.92 (0.12)</td>
<td>0.96 (0.04)</td>
</tr>
<tr>
<td></td>
<td>180</td>
<td>0.97 (0.07)</td>
<td>0.93 (0.10)</td>
<td>0.97 (0.04)</td>
</tr>
</tbody>
</table>

Standard deviation in parentheses. ? : The hardness ratio is not calculated, because of the poor polymerization of the bottom surface.

1. The effect of intensity on the hardness ratio:

Statistical analysis of the data by using the one-way analysis of variance revealed that, there was statistically very highly significant difference (****) (p < 0.001) for all the hardness ratios with the light intensity except the hardness ratio of Tetric Ceram composite cured for 90 seconds where, there was insignificant difference (NS) (p > 0.05) and the hardness ratios of Tetric Ceram composite cured for 60 seconds, Tetric Ceram composite cured for 120 seconds, Herculite XRV composite cured for 120 seconds where, there was a highly significant difference (**) (p < 0.01) and the hardness ratio of Helio molar composite cured for 150 seconds where there was only a significant difference (*) (p < 0.05).
2. The effect of composite type on the hardness ratio:

Statistical analysis of the data by using the one-way analysis of variance revealed that, there was statistically very highly significant difference (***)(p<0.001) for all the hardness ratios with the composite type except the hardness ratio of 200 mW/cm² light intensity and curing time for 20 seconds where, there was an insignificant difference (NS) (p>0.05) because, the comparison occurs between only two types of composites (Tetric Ceram and Herculite XRV) and their mean hardness ratios were (0.58,0.57 respectively).

The mean hardness ratios of Heliomolar and Degufill composites were not calculated because their bottom surfaces were poorly polymerized. Also, there was an insignificant difference (NS) (p>0.05) carried out in the hardness ratio of 500 mW/cm² light intensity and curing time for 150 seconds. There was a highly significant difference (**)(p<0.01) in the hardness ratios of 300 mW/cm² light intensity and curing time for 120 seconds, 400 mW/cm² light intensity and curing time for 90 seconds, 500 mW/cm² light intensity and curing time for 180 seconds and 600 mW/cm² light intensity and curing time for 60 seconds. There was only a significant difference (*) (p<0.05) in the hardness ratios of 600 mW/cm² light intensity and curing time for 120 seconds, 600 mW/cm² light intensity and curing time for 150 seconds and 600 mW/cm² light intensity and curing time for 180 seconds.

3. The effect of curing time on the hardness ratio:

Statistical analysis of the data by using the one-way analysis of variance revealed that, there was statistically very highly significant difference (***)(p<0.001) for all the hardness ratios with the curing time except the hardness ratio of Heliomolar composite cured at 300 mW/cm² light intensity, Heliomolar composite cured at 400 mW/cm² light intensity and Herculite composite cured at 600 mW/cm² light intensity where, there was an insignificant difference (NS) (p>0.05).

DISCUSSION

The relative importance of microhardness test lies in the fact that it sheds a light on the mechanical properties of a material (10). The higher the degree of conversion, the better the mechanical properties, hardness, biocompatibility, water sorption, color stability and wear resistance of the resin composites (11).

In this study, the top surface was not as susceptible to the effects of light intensities as the bottom surface. This finding agrees with Soh et al. (12), who stated that, duration of exposure (curing time) is the most important factor in polymerization of surface resin composites. In this study, all the specimens of the four different light-activated composites in microhardness tests, exhibited high VHN of the top surfaces in relation to that of the bottom surfaces for all the energy densities being tested and this finding is in an agreement with the findings of Tate et al. (13) who found that, the polymerization of resin composites generally decreases from the surface of the restoration inwardly.

The composite type, light intensity and curing time significantly affected the effectiveness of composite cure (hardness ratio). 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 (14). Composites that contained prepolymerized filler particles (Heliomolar) exhibited significantly lower physical properties than composites that contained round, irregular-shaped filler particles (Herculite XRV), or a mixture of prepolymerized and irregular-shaped particles. The results of this study were, in agreement with the findings of Kim et al. (15), who found that the filler loading also affected the physical properties including microhardness of the composites evaluated.

The results of this study showed a direct relationship with the filler load level (weight percent). This is due to the fact that, Herculite XRV composite contains 79% by weight filler loading and in other reference (16) 87.1% by weight filler loading and this increased filler loading or the type of its filler loading could be the main cause for its highest VHN followed by Degufill Mineral (80% filler loading by weight), Tetric Ceram (79% filler loading by weight) and finally Heliomolar (66.7% filler loading by weight). The bottom surfaces of Herculite XRV light-activated composite exhibited the highest VHN for all the energy densities followed by Degufill Mineral, Tetric Ceram and Heliomolar, which exhibited the lowest VHN and this is true for the high energy densities.

The bottom surfaces of Herculite XRV light-activated composite exhibited the highest VHN for all the energy densities followed by Tetric Ceram, Degufill Mineral and Heliomolar, which
exhibited the lowest VHN and this is true for the low energy densities. This means that, in spite of its high filler loading by weight, Degufill Mineral required high energy density for adequate polymerization and this could be due to the fact that, Degufill Mineral is one of the fluoride releasing composites and the incorporation of borosilicate and calcium phosphate-fluoride-apatite filler particles might interfere with light transmission through the composite material.

In this study, whatever the light energy density was, Heliomolar light-activated composite (microfill) exhibited the lowest hardness ratio than all the composites being tested followed by Degufill Mineral, Tetric Ceram and Herculite XRV, which exhibited the highest hardness ratio (starting from the lowest to the highest values). The hardness ratio of Heliomolar was not calculated for 20, 40 seconds at 200, 300, 400 mW/cm² light intensities and 20 seconds at 500 mW/cm² light intensity, because its bottom surfaces were poorly polymerized in spite of the manufacturer recommendation of 40 seconds curing time for each 2-mm thickness increment (manufacturers’ data) without prescribing the light intensity that should accompanied this curing time.

REFERENCES
Assessment of diametral tensile strength and microhardness of Glass ionomer reinforced by different amounts of Hydroxyapatite

Mohammed Rasheed. B.D.S, M.Sc., Ph.D.
Raghad A. Mohammed B.D.S, M.Sc.

ABSTRACT

Background: Glass ionomer materials lack resistance to wear and pressure and are susceptible to moisture during the initial stages of setting and dehydration. So this study was done to assess diametral tensile strength and microhardness of glass ionomer reinforced by different amounts of hydroxyapatite.

Materials and methods: In this study a hydroxyapatite material was added to glass monomer cement at different ratios: 10%, 15%, 20%, 25% and 30% (by weight). The diametral tensile strength test described by the British standard specification for zinc polycarboxylate cement was used in this study and the microhardness test was performed using Vickers microhardness testing machine and the microhardness values were calculated and statistical comparison was performed on the tested groups.

Results: The group of glass ionomer cement that contains 20% hydroxyapatite has higher diametral tensile strength and microhardness values than other groups of this study. Also the results showed that the group of glass ionomer cement without hydroxyapatite has the lowest values of diametral tensile strength and microhardness than other groups. The groups of glass ionomer cement with 10%, 15%, 25% and 30% hydroxyapatites also showed increasing in diametral tensile strength and microhardness values in comparison with group of glass ionomer cement without hydroxyapatite.

Conclusion: The addition of hydroxyapatite to conventional glass ionomer cement will increase its diametral tensile strength and microhardness.

Key words: Diametral tensile, microhardness, glass ionomer, hydroxyapatite.

INTRODUCTION

Glass ionomer cements were developed by Wilson and Kent 1972 (1), since then applications in operative dentistry have steadily increased, however, there are some limitations in their applications due to low early mechanical strength and short working time (2). Mechanical strength is an important factor that has to be analyzed for clinical success of dental restorations. The diametral tensile test provides a simple method for measurement of the tensile strength of brittle materials like glass monomer cement (3). The microhardness of the material is defined as the resistance of the material to plastic deformation. In this study microhardness measurements were made with Vickers hardness Tester (VHT). There have been recent modifications that replace part or most of the original formulations with alternative filler particles and/or matrix setting reaction (4). Therefore, hydroxyapatite materials were added to improve the microhardness of Glass ionomer cement. It is well known that Hydroxyapatite shows high stability, strength and low irritation to tissue but it does not set itself by any chemical reaction, Hydroxyapatite is similar to the host bone crystallinity (5, 6). Glass ionomer reinforced by hydroxyapatite have been newly introduced to undergo some laboratory testing. This study was conducted to investigate the diametral tensile and microhardness of a new glass ionomer reinforced by hydroxyapatite cement material.

MATERIALS AND METHODS

Preparation of hydroxyapatite

In this study a synthetic hydroxyapatite was prepared by using 250 ml of 0.02 moles of Ca(AC)2 added drop by drop to 150 ml of boiling solution of 0.1 moles of Na2HPO4, the PH should be 9 throughout the procedure (7, 8).

The prepared hydroxyapatite was added to the powder of glass monomer cement at different weight percentage (10%, 15%, 20%, 25% and 30%) and the mixed powders were shaken for half to one hour to get homogenous powders.

Sample grouping

Six groups were used in this study (15 samples for each group in each test) as shown in Table 1:
Table 1: The experimental and control groups of the base materials.

<table>
<thead>
<tr>
<th>Group I (Experimental)</th>
<th>Glass ionomer without hydroxyapatite</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group II (Experimental)</td>
<td>Glass ionomer with 10% hydroxyapatite</td>
</tr>
<tr>
<td>Group III (Experimental)</td>
<td>Glass ionomer with 15% hydroxyapatite</td>
</tr>
<tr>
<td>Group IV (Experimental)</td>
<td>Glass ionomer with 20% hydroxyapatite</td>
</tr>
<tr>
<td>Group V (Experimental)</td>
<td>Glass ionomer with 25% hydroxyapatite</td>
</tr>
<tr>
<td>Group VI (Experimental)</td>
<td>Glass ionomer with 30% hydroxyapatite</td>
</tr>
</tbody>
</table>

Diametral tensile strength test
Specimens of glass ionomer cement and glass monomer cement reinforced by hydroxyapatite were prepared as cylinders of 4mm in diameter and 6mm in length which were prepared by using a stainless steel mold and kept in water bath at 37±1 °C and 90-100% relative humidity for one day. The diametral tensile strength was determined by using compressive strength testing machine at speed of 1mm/minutes. The load was applied in the short axis of the specimens. The diametral tensile strength was measured for each specimen by detecting the force that caused early signs of fracture of the specimens (9).

Microhardness test
Six acrylic blocks were prepared with 2.5cm width, 5cm in length and 0.5cm in high, with 15 holes of 4mm in diameter and 2mm in depth (one block for each group), then the glass monomer cement and glass monomer cement reinforced by hydroxyapatite were loaded in holes of acrylic block after mixing and kept in the ambient at 37 °C for 24 hours. The Vickers microhardness testing machine was used to measure the microhardness values of the experimental and control groups (8).

RESULTS
Diametral tensile test
The results of the diametral tensile test are presented in Figure (1) showing that group IV has the highest values of the diametral tensile test while group I have the lowest values. The results of other groups II, III, V and VI also showed increasing in the diametral tensile strength with different levels.

One way ANOVA test for the all tested groups showed that there was statistically significant difference among the groups (Table 2), while LSD statistical test to compare between each paired tested groups (Table 3) showed that there was statistical significant difference between most compared paired groups except when we compare the group I with group II showed there was no statistical significant difference at P value less than 0.05.

![Figure 1: Diametral tensile strength of all tested groups.](image)

Table 2: ANOVA test of the diametral tensile strengths of the tested groups.

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of square</th>
<th>df</th>
<th>Mean square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>420.297</td>
<td>5</td>
<td>84.059</td>
<td>153.174</td>
<td>P&lt; 0.01</td>
</tr>
<tr>
<td>Within groups</td>
<td>46.098</td>
<td>84</td>
<td>0.549</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>466.395</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

DF = degree of freedom , P-value = probability
### Microhardness test

The results are presented in Figure 2 showing that the group IV and group V have the highest values of the microhardness test while the group I has the lowest mean values for microhardness test.

One-way ANOVA test (Table 4) showed that there was statistically significant difference among all tested groups while LSD statistical test to compare between each paired groups (Table 5) showed that there was statistical significant difference between most compared paired groups except when we compare the group II with group VI and group IV with group V showed that there was no statistical significant difference at the level $P$ less than 0.05.

### DISCUSSION

Glass ionomer cements have some limitations in their applications due to low early mechanical strength and short working time, glass ionomer cements have also shown moisture sensitivity especially during the initial stages of the setting reaction. To overcome these problem, hydroxyapatite in different amounts were added to the powder of the conventional glass ionomer to improve these properties.

![Figure 2: The difference between the mean values of microhardness (HV Kg/ mm²) of the base materials.](image)

#### Table 3: LSD statistical test to compare between the tested groups.

<table>
<thead>
<tr>
<th>Comparison groups (I) group X (J) group</th>
<th>Mean difference (I-J)</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I X II</td>
<td>-0.515</td>
<td>0.06</td>
</tr>
<tr>
<td>I X III</td>
<td>-1.558 *</td>
<td>0.00</td>
</tr>
<tr>
<td>I X IV</td>
<td>- 6.067 *</td>
<td>0.00</td>
</tr>
<tr>
<td>I X V</td>
<td>-4.477 *</td>
<td>0.00</td>
</tr>
<tr>
<td>I X VI</td>
<td>- 3.131 *</td>
<td>0.00</td>
</tr>
<tr>
<td>II X III</td>
<td>-1.043 *</td>
<td>0.00</td>
</tr>
<tr>
<td>II X IV</td>
<td>-5.553 *</td>
<td>0.00</td>
</tr>
<tr>
<td>II X V</td>
<td>-3.963 *</td>
<td>0.00</td>
</tr>
<tr>
<td>II X VI</td>
<td>- 2.617 *</td>
<td>0.00</td>
</tr>
<tr>
<td>III X IV</td>
<td>-4.509 *</td>
<td>0.00</td>
</tr>
<tr>
<td>III X V</td>
<td>-2.919 *</td>
<td>0.00</td>
</tr>
<tr>
<td>III X VI</td>
<td>-1.573 *</td>
<td>0.00</td>
</tr>
<tr>
<td>IV X V</td>
<td>1.590 *</td>
<td>0.00</td>
</tr>
<tr>
<td>IV X VI</td>
<td>2.936 *</td>
<td>0.00</td>
</tr>
<tr>
<td>V X VI</td>
<td>-1.346 *</td>
<td>0.00</td>
</tr>
</tbody>
</table>

* The mean difference is significant at the 0.05 level

#### Table 4: ANOVA test of the microhardness (HV) of the all tested groups.

<table>
<thead>
<tr>
<th>Source</th>
<th>Sum of square</th>
<th>Df</th>
<th>Mean square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between groups</td>
<td>5493.898</td>
<td>5</td>
<td>1098.780</td>
<td>45.066</td>
<td>P&lt; 0.01</td>
</tr>
<tr>
<td>Within groups</td>
<td>2048.029</td>
<td>84</td>
<td>24.381</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>7541.927</td>
<td>89</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$^*$DF = degree of freedom, $^*$P-value = probability
Table 5: LSD statistical test to compare between the groups.

<table>
<thead>
<tr>
<th>Comparison groups</th>
<th>Mean difference (I-J)</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I X II</td>
<td>-10.11 *</td>
<td>0.000</td>
</tr>
<tr>
<td>I X III</td>
<td>-14.98 *</td>
<td>0.000</td>
</tr>
<tr>
<td>I X IV</td>
<td>-22.37 *</td>
<td>0.000</td>
</tr>
<tr>
<td>I X V</td>
<td>-22.37 *</td>
<td>0.000</td>
</tr>
<tr>
<td>I X VI</td>
<td>-22.37 *</td>
<td>0.000</td>
</tr>
<tr>
<td>II X III</td>
<td>-4.87 *</td>
<td>0.008</td>
</tr>
<tr>
<td>II X IV</td>
<td>-12.26 *</td>
<td>0.000</td>
</tr>
<tr>
<td>II X V</td>
<td>-12.26 *</td>
<td>0.000</td>
</tr>
<tr>
<td>II X VI</td>
<td>-0.237 *</td>
<td>0.896</td>
</tr>
<tr>
<td>III X IV</td>
<td>-7.40 *</td>
<td>0.000</td>
</tr>
<tr>
<td>III X V</td>
<td>-7.40 *</td>
<td>0.000</td>
</tr>
<tr>
<td>III X VI</td>
<td>-5.10 *</td>
<td>0.006</td>
</tr>
<tr>
<td>IV X V</td>
<td>0.000 *</td>
<td>1.000</td>
</tr>
<tr>
<td>IV X VI</td>
<td>12.50 *</td>
<td>0.000</td>
</tr>
<tr>
<td>V X VI</td>
<td>12.50 *</td>
<td>0.000</td>
</tr>
</tbody>
</table>

* The mean difference is significant at the 0.05 level.

**According to diametral tensile strength**

The diametral tensile test provides a simple method for measurement of the tensile strength of brittle material like glass monomer \(^{(11)}\). All the tested groups presented an increase in diametral tensile strength except the group I (glass ionomer without hydroxyapatite); this increase can be explained by setting reaction of glass ionomer. Calcium polyacryl2GaTe may be formed in the first 5-7 minutes after mixing. The diametral tensile strength in the group IV has the highest values but in the group I the results showed the lowest values. These results might be due to admix of hydroxyapatite to the glass monomer leading to formation of chemical reaction between polycarboxylic acid and hydroxyapatite forming strong chemical bonds.

**According to microhardness**

Within the limits of this investigation, the data showed that the highest values of microhardness in group IV while the lowest value in group I without hydroxyapatite. The other groups II, III, V and VI also showed increase in microhardness but with different levels in comparison to group IV. This might be due to powder/liquid ratio differences and also particle size of the powder. According to Kent and Wilson \(^{(1)}\), fine grained glasses produce stronger cement. It is claimed that finer the powder particle, shorter the working time and faster setting time. This may be responsible for better surface finish and hardness.

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Shear bond strength measurement of different root canal sealers to gutta percha

Ali Mamdooh A.K  B.D.S, Ph.D.(1)

ABSTRACT

Background: Bond strength of root canal sealers to gutta-percha is an important property for the integrity of sealing of root canals. The purpose of this study was to measure the shear bond strength of contemporary commercially available endodontic sealers to gutta-percha.

Materials and Methods: Forty disks of gutta-percha with a diameter of 10 mm and thickness of 4 mm were made by softening gutta-percha cones and then fixed with plaster in 1-inch phenolic rings. Five-millimetre long sections of polyethylene tubing, filled with freshly mixed sealer, were placed on the gutta-percha and tested for shearing bond strength after setting. A custom made holder was attached to the rings and placed in a testing machine, which was activated at a cross-arm speed of 0.5 mm per minute.

Results: The bond strength of different sealers to gutta-percha ranged from 0.92 MPa to 8.17 MPa.

Conclusion: The Epoxy resin sealer exhibited the highest bonding with gutta-percha under the shearing force.

Keywords: Adhesion, Sealer, Gutta-percha, and Shear. (J Bagh Coll Dentistry 2006; 18(3)21-25)

INTRODUCTION

A desirable property of a root canal sealer is to have good sealing ability. In addition an endodontic sealer should adhere firmly both to dentin and gutta-percha, which is highly important both in static and dynamic situations since it eliminates any space allowing penetration of fluids between the filling and the wall and resist any tendency towards dislodgement of the filling during the subsequent manipulation (post space preparation)(1).

It seems, therefore, that the bond of the root canal filling to the walls should be a major factor of interest. The adhesion or more correctly, the bond of endodontic sealers to dentin (2,3) has been the subject of several studies in the last decades (4–6). The stability of the filling, however, also depends upon the bond of the sealer to gutta-percha (or whichever other core material is used). This applies not only to single cone obturation techniques, but also to all root canal filling methods combining a solid or semisolid material with a sealer (7).

The adhesion depends on a multitude of interacting factors including the surface energy of the adherent (dentine or gutta-percha); the surface tension of the adhesive (sealer), its ability to wet the surfaces and the cleanliness of the adherent surface. The sealer must also have cohesive strength to hold the obturation together (8).

Bonding of the sealer to gutta-percha has rarely been explored in detail. Jeffrey and Saunders (9) seem to have been the first investigators to build an appropriate model for this purpose.

Presuming that leakage of the root canal filling may be related to the strength of adhesion of the sealer, the bond of eight different endodontic sealers to both dentin and gutta-percha was assessed and compared with the extent of apical penetration of the marker (6). The magnitude of the bond showed no correlation with the extent of leakage. Furthermore, ranking of the sealers according to the strength of their bond to gutta-percha differed from that obtained with dentin alone, indicating an interaction between the sealer and the substrate. Wennberg and Orstavik (10) attempted to duplicate clinical conditions by using a thin layer of sealer between disks of gutta-percha and bovine dentin. Although the model permitted calculation of the combined strength of the bond of the sealer to dentin and to gutta-percha, it could not disclose the exact value of the bond to each substrate. Furthermore, separation did not always occur at an interface, indicating the possibility of cohesive failure of the sealer. The purpose of this investigation was to measure the bond of different endodontic sealers to gutta-percha as shearing strength in a model devised for measuring the bond to dentin.

MATERIALS AND METHODS

The bond strength of the sealers to gutta-percha was determined in shear mode using Zwick testing machine. Four commercially available contemporary sealers were tested in this study. They were purchased from independent sources.
According to their composition, they could be subdivided into four groups:

1. Group I: Zinc oxide-eugenol based sealer: Dorifil (Dorident, Austria; batch # 266904).
2. Group II: Calcium hydroxide sealer: Apexit (Vivadent Ivoclar, Liechtenstein; Lot: E21008).
3. Group III: Glass ionomer sealer: Ketac-Endo (Fuji, Japan; batch # 24535).

Disks of gutta-percha were prepared by compacting a number of standardized cones of Gutta-Percha (Maillefer; Dentsply, Swiss; size 140, batch #129448). The cones were softened by short immersion in a thermostat controlled water bath (45±3°C) and compacted with a large plugger into a split-ring mold 10 mm in diameter and 4-mm high.

Proper control of the heating of gutta-percha is necessary to avoid physico-chemical and structural-molecular changes. After cooling, the gutta-percha disks were embedded in plaster of Paris at the surface of a 1-inch phenolic ring. (Figure 1).

After the plaster had set, the surface of the pellet was lightly polished on wet waterproof polishing paper to standardize the surface preparation of each pellet to get intimate contact between the sealer material and the gutta-percha substrate. The sealers were mixed according to the manufacturers’ instructions. Five-millimetres long sections of polyethylene tubing with (6mm) internal diameter (8mm external diameter) were filled with freshly mixed sealer and carefully placed with one open side contacting the gutta-percha, perpendicular to its surface. The more fluid sealers were poured into the tubes that were held in contact with the gutta-percha disks, taking care to let the material flow to the substrate and avoid entrapping air bubbles.

Due to the great variety of types of sealers, different methods and times were used to ensure complete setting. All sealer cylinders were allowed to bench set for 2 hours to ensure that initial setting reaction had taken place. Specimens were then stored at 100% humidity at 37°C for a period of 1 week. The shearing bond strength of the sealers was tested after they had set completely.

Ten specimens were prepared from each sealer. The surface of contact was equal for all specimens. The phenolic rings were inserted into a special holder, and locked with a screw in such a way that the flat surface of the substrate was on a perpendicular plane on which a blunt chisel, fixed to the moving (upper) jaw of the device, could slide.

The samples were subjected to shear loading until failure using shear punch test with Zwick testing machine (Model 1454, Germany) Figure 2. A stainless steel chisel-shaped rod was directed toward the interface between the two substrates, allowing the sealer to be sheared from the gutta-percha substrate in a displacement speed of 0.5mm/min. The shear bond strength for each sample was calculated by dividing the force by the surface area, and was expressed in Mega-Pascal (MPa).

RESULTS

After calculating the shear bond strength, the mean and standard deviation for each group were recorded. The result data showed that the specimens showed different resistance to failure under loading as shown in figure 3.

Dorifil gave very low bond strength to gutta-percha (0.92 MPa). Examination of the bonding surface did not reveal defects, such as air bubbles, that could account for the lower grade of bonding.

The mean shear bond strength of the other three sealers ranged from 2.56 MPa (Apexit), 3.12 MPa (Ketac-Endo) to 8.17 MPa (AH 26). The results are summarized in Table 1.

ANOVA indicated a highly significant difference (p < 0.000) between the mean bond strength of the sealers; table 2. AH (26), exhibited a significantly stronger bond to gutta-percha than the remaining sealers (p < 0.000). The Dorifil sealer did not differ significantly (p>0.05) from Apexit sealer in the strength of its bond to gutta-percha, despite the apparently wide difference in their performance. On the other hand, the Ketac-Endo (Glass Ionomer sealer) bond strength to gutta-percha, was significantly higher than those of Dorifil and Apexit sealers and lower than that of AH 26 sealer (p < 0.000).

DISCUSSION

The sealers tested in this study exhibited different adhesion abilities to gutta-percha when subjected to shear mode of stress. Sealer of the zinc oxide-eugenol type (Dorifil) simply exhibited very low bonding to gutta-percha. Eugenol affects or softens the surface of many plastic materials. Eugenol can react with ZnO...
which ranges from 50-70% of the constituent of gutta-percha according to the manufacturer to create a chelate bond, because the two materials share common ingredients and because eugenol, in excess, may soften gutta-percha, thus increasing the sealer-gutta-percha interface. If eucalyptol is added to the liquid component of the sealers, the bond to dentin may be dramatically improved.\(^{(12)}\)

<table>
<thead>
<tr>
<th>Source of variation</th>
<th>Sum of squares</th>
<th>Degree of freedom</th>
<th>Means of square</th>
<th>F value</th>
<th>P value</th>
</tr>
</thead>
<tbody>
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<td>Between groups</td>
<td>789.32</td>
<td>4</td>
<td>199.58</td>
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<tr>
<td>Within groups</td>
<td>29.37</td>
<td>15</td>
<td>1.96</td>
<td>117.979</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>827.7</td>
<td>19</td>
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</tbody>
</table>

In the other sealers, such as Apexit, the setting reaction occurs via a reaction between calcium hydroxide and glycol salicylate to form an amorphous calcium disalicylate, which does not bond to gutta-percha\(^{(13)}\). Also, this sealer contains rosin, an additive that was suggested to impart “tackiness” to the mixed sealer\(^{(2)}\). It is possible that this component has improved the bond to gutta-percha (2.56 MPa) to the third highest rank in bonding to gutta-percha\(^{(5)}\). According to the manufacturer, this material is not intended to obtain a long-lasting hermetic apical seal but is supposed to be degraded and to induce apical hard tissue formation owing to hydroxyl ion release. Therefore, high adhesive properties might not be required for this material.

The ketac-Endo sealer bonded more strongly to gutta-percha (3.12 MPa) than Apexit and Dorifil sealers. The polyacrylic acid matrix of GIC contains multiple ionized carboxylate groups than can react with the mineral phase of gutta-percha, as the GIC could chelate with zinc in guttapercha. A recent scanning electron microscopy study, showed a characteristic etch pattern on gutta-percha points sealed with a GIC, as well as there was associated evidence of chemical or physical bonding. The adhesion of the GIC to gutta-percha may be limited to surface phenomena of gutta-percha\(^{(3)}\).

In the AH 26 sealer group, highest bond strength to gutta-percha (8.17 MPa) was recorded. This may be due the presence of Biphenol A Epoxy resin (looks like glue) in the formulation of this sealer.

The high result of AH 26 to gutta-percha suggests that the resin can react with the components of gutta-percha that may induce chemical bonding, especially with smoother surface gutta-percha\(^{(14)}\). In a recent study, Lee et al\(^{(3)}\) showed that the mean bond strength of AH 26 to gutta-percha was 2.9 MPa and that 60% of the failures were mixed and 40% were cohesive indicates that AH 26 bonded more strongly to gutta-percha than to dentin. This was unexpected, because the gutta-percha surface was smooth and without any evidence of surface roughness. The slightly acidic pH of AH 26 associated with potential chemical bonding, due to ring opening, may explain, in part, the high values obtained. The matter, however, is more complex. Gutta-percha is not a uniform product. It is known that gutta-percha compounds used for the fabrication of filling cones differ in their composition, varying from manufacturer to manufacturer\(^{(15)}\). Consequently, commercial gutta-percha cone brands differ in their properties, such as radiopacity\(^{(16)}\), solubility\(^{(12)}\), and flow when heated\(^{(17)}\).

It is quite possible; therefore, that the results of bond strength tests may differ if another gutta-percha brand is selected as substrate. The optimal magnitude of the bond of endodontic sealers to gutta-percha has not yet been determined, but it is obvious that when two sealers are being considered, the more adhesive one should be selected, provided that the other properties are similar. In the laboratory, application of this method may help improve the physical properties of new sealers before their release for clinical use.
Figure 1: Schematic, illustrating how sealer was attached to

PE tube filled with sealer
Compacted Gutta-percha
Plaster filling the ring

Figure 2: The Zwick testing machine.

Figure 3: Bar chart summarizing the shear bond strength of endodontic sealers to gutta-percha.

REFERENCES
11. Goodman A, Schilder H, Aldrich W. The


Fluoride ions release study of different GIF materials

Raid F. Salman  M.Sc., B.D.S. (1)

ABSTRACT
Background: The purpose of this in vitro study was to compare & measure the release of fluoride ions from set tested materials, CGI (Pro-med), MGI (Ketac molar), and LCGI (Vitremer).

Materials & Methods: The tested materials were made as molds with certain dimensions and each mold was placed in vial containing 100 ml. of DDW. Every 24 hrs, 5 ml. of the solution was transferred into smaller tubes to measure the fluoride release using spectrophotometer. This procedure was repeated every 24 hrs. for 14 days.

Results: The results revealed that the CGI (conventional glass ionomer) had higher release over other materials, then the MGI (modified glass ionomer) material, and finally the LCGI (light cure glass ionomer) material, with significant differences between them at P < 0.05.

Conclusions: The MGI material had higher fluoride ions release concentrations over the LCGI. However, the CGI had higher fluoride ions release concentrations over other materials.

Keywords: Glass ionomer, fluoride release, filling materials. (J Bagh Coll Dentistry 2006; 18(3)26-29)

INTRODUCTION
Dentistry is undergoing enormous changes at the present time, and the field of operative dentistry is the very forefront of that transformation. The need for conservative, aesthetic, and durable restorative material is a challenge. One of the respected restorative filling materials was the glass ionomer. Glass ionomer was developed in the late 1960 at the Laboratory of the Government Chemist and was first described in 1972 by Wilson and Kent (1). It was developed in an attempt to combine the successful properties of both the silicate and polycarboxylate cements (2). Originally, the material was designed for the esthetic restoration of anterior teeth and it was recommended for use in restoring teeth with class III and V cavity preparations. The use of glass ionomer has broadened to encompass formulations as luting agents, liners, restorative materials for conservative class I and II restorations and core build – ups, and pit and fissure sealant (3). One of the advantages of the glass ionomer is the fluoride ions release. The poly-acid attacks the glass to release cations and fluoride ions (4,5). Fluoride ions release is proportional to the concentration available to diffuse from the matrix and/or residual silicate particles through to the restoration surface. Generally, fluoride ion release is relatively high during the first few days but that rate of release falls as fluoride concentration is depleted in the matrix. A critical level of the fluoride release over time never has been defined clinically. The absence of significant secondary caries is not evidence of fluoride ion effect.

For posterior composites, the incidence of secondary caries can be less than 3% at 10 years even in the absence of fluoride release. No clinical evidence indicates that glass ionomer restorative materials can produce comparable or better result. Nonetheless, fluoride release from restorative materials such as glass ionomer may have therapeutic effects that have yet to be demonstrated. Glass ionomer restoration seems very well suited for situations that involve high caries risks. These include patients who are known to be more susceptible to caries, patients with reduced or no saliva flow, or patients with oral disease that accelerate the pathogenic activities associated with caries. In some cases, when bonding composite to gingival areas with little or no enamel, a glass ionomer liner extended just short of the margins has been suggested as away to reduce caries risks if microleakage occurs. Fluoride release from glass ionomer material can provide resistance to marginal carious breakdown via two distinct mechanisms: the first, it has shown that glass ionomer restorations are more resistance to marginal carious break down, the second, it has been shown that GIs exert inhibitory growth effect on streptococcus micro-organisms due to their ability to release fluoride (4,6). The initially high burst of fluoride release is due to the high concentration of fluoride that exists in the matrix immediately after the setting reaction is complete. During the initial acid dissolution of powder particle edges, a large amount of fluoride becomes part of the reaction product matrix. This fluoride diffuses quickly from the matrix exposed on the surface of the material and is only slowly replaced by fluoride diffusing from greater distances in the matrix.

(1) Assistant Lecturer, Department of Conservative Dentistry, College of Dentistry, University of Baghdad.

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below the surface or by fluoride diffusing from the particles into the matrix. Therefore, the long term release of fluoride is at much lower rates. Due to the porous nature of the cement matrix, fluoride ions pass through without affecting it’s physical make up \(^{(4)}\).

**MATERIALS AND METHODS**

**Specimens preparation**

The tested materials were mixed according to the manufacturer instructions. The specimens were made into pieces using composite testing mold (Helio-Test, Vivadent). The pieces have dimensions of 3, 3, and 3 mm. in width, height, and depth. The LCGI (light cure glass ionomer) was cured by light-curing device. Each material piece after setting was finished for any excess material at the line angles of the cubic piece.

**Samples grouping**

Each piece was placed in polyethylene vial containing 100 ml. of deionized distilled water of pH value (5.0) using acetic acid. Every 24 hrs, a pipette with a disposable tip was used to transfer 5 ml. of the solution from the vials into smaller coded tubes for measuring fluoride release from the tested materials using spectrophotometer. This procedure was repeated every 24 hrs. for 14 days. The specimens were divided into three equal groups, with ten samples for each group, as shown in table 1.

<table>
<thead>
<tr>
<th>Table 1: Sample grouping in fluoride ions release study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>I</td>
</tr>
<tr>
<td>II</td>
</tr>
<tr>
<td>III</td>
</tr>
</tbody>
</table>

**Fluoride concentration measurement**

The measurement of fluoride ions released was done with atomic absorption spectrophotometer. The measurement is based on the absorption of radiant energy of characteristic wave length by free atoms of the element. The diluted solution was aspirated into an air acetylene flame, in which the ground state fluoride atoms absorbed incident light from fluoride electrode\(^{(7,8)}\). Fluoride concentration in PPM was determined by comparison of sample absorbance reading with that of standard utilizing the calibration curve which was constructed, utilizing the concentration of different standards and their corresponding absorbance readings. Each sample was tested twice, and the mean was calculated for each sample.

**RESULTS**

The descriptive statistics for the fluoride ions release study results with the mean values and the standard deviations of the fluoride ions release of all the tested materials in PPM, are presented in table 2. From table 2, the results revealed that the CGI had the highest fluoride ions release mean value with (17.78 PPM) for all the 14 days as compared with other materials.

<table>
<thead>
<tr>
<th>Part Two: Between groups for all times</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>CGI</td>
</tr>
<tr>
<td>LCGI</td>
</tr>
<tr>
<td>MGI</td>
</tr>
</tbody>
</table>
The LCGI had the lowest mean value with 13.56 PPM for all the 14 days, however, for all the tested materials, the first day had the highest mean value with 24.46 PPM and the day 14 had the lowest mean value with 8.16 PPM. By using LSD test for multiple comparisons, the results indicate significant difference at $P< 0.05$ between the tested materials for all the 14 days (from day 1 to day 14) (table 3). Table 4 shows the testing of the homogeneity of variances, and it is clear that significant difference at $P< 0.05$ was obtained between all variables, using Levene test. By using one-way ANOVA with LSD of multiple comparison test, the results
have shown that there was a significant difference at $P < 0.05$ between all the variables (time and materials). (table 5 and figure 1)

**DISCUSSION**

One of the main advantages of the GI materials was the fluoride ions release. The fluoride is released from the glass particles on mixing. The presence of fluoride also has benefits in increasing translucency and strength & improving handling properties (9). The fluoride release is maximum in the first few days and decreases rapidly to a lower level over weeks, and attains low level for months. Most of fluoride is released as sodium fluoride which is not critical to the matrix , and thus does not result in weakening or disintegration of the set material. RMGI shows similar dynamics of fluoride release, although, for both types, the dynamics of release and the amounts released depend on the particular material and the experimental design (10). The results of this study revealed that the CGI had the highest release among other materials. This result agree with the finding of Craig in 1997 (4), Anusavice in 1996 (6), Erickson and Glasspoole in 1995 (11), Raggio et al in 2002 (12), and Hrsted-Bindslev in 1994 (13). This may be explained by the action of the polyacrylic acid on the aluminosilicate glasses of the material with continuous release of anions and cations (one of them, the fluoride). However, the MGI material had higher release over the LCGI and comparable release with the CGI. This may explained by the action of PAA on the glasses resulting in continuous release of fluoride ions. This explanation is supported by Schricker et al in 2004 (14). Many previous studies conducted the repeated measurements of the fluoride ions release over 14 days. This is due to observations found in many studies that much more of fluoride ions release would be at the first fourteen days. (7,8,15). Almost always, the release had higher concentration at the first days and decrease steadily with the time. This finding agrees with that of Yip et al in 2002 (16) and Wandera et al in 1996 (17). This may be explained by that the initial high burst of fluoride release is due to the high concentration of fluoride that exists in matrix immediately after setting reaction is complete. This explanation is supported by research of Forsten in 1990 (18).

**REFERENCES**

Causes of tooth extraction in AL Mushahda village

Ban F. AL- Droubie  B.D.S., M.Sc.

ABSTRACT

Background: In spite of the current emphasis on preventive dental health, many people are still affected by dental caries. In fact, dental caries is the most common chronic infectious disease and it remains a severe problem in some cultural and ethnic groups. The purpose of this study was to analyze the causes of tooth need extraction among adult population in AL Mushahda village in Baghdad City, which was not included in the previous Iraqi studies.

Materials and methods: A random sample of 210 subjects was examined 160 adult subjects having 370 teeth needing extraction.

Results: The result showed that caries was found to be the principle reason for loss of all tooth types for all age group. The first molar was the most common teeth needing extraction and the main cause for its extraction was caries, as it is the first tooth to erupt and probably neglected during the mixed dentition.

Conclusion: The highest percentage of tooth needing extraction indicated low awareness of oral disease by the population and little or no involvement of communities in promoting oral health

Key words: Tooth loss, tooth extraction (J Bagh Coll Dentistry 2006; 18(3)30-33)

INTRODUCTION

Loss of teeth is associated with increasing age as a result of overgrowth of specific organisms, which are part of dental plaque, that affect the tooth by causing caries or periodontitis (1). Detectable decline in caries experience and improvement of gingival health have been recorded in well developed countries due to improvement of the community dental health, knowledge, application of preventive measures and wide use of fluoride (2) while in developing countries, an increase in the prevalence of dental caries and deterioration of gingival health have been observed among them, they lack of dental knowledge, services and preventive measures (3).

Many studies have been carried in many countries demonstrated that caries and periodontal disease were the most common causes of dental extraction (4,5). The tooth that is the most commonly extracted due to caries was first molar (maxillary and mandibular), while the mandibular anterior and maxillary third molar were the most common teeth that extracted due to periodontal disease (6). The principle reasons for extraction among patient aged over 30 years was extensive damage by caries while the periodontal disease was the main reason among patient over 40 years old (7).

Surveys of the reasons for extraction in Iraq have been carried; caries was sited as the main cause of tooth extraction (8-10).

The present study was conducted in an attempt to investigate the causes of tooth extraction among adult population in AL Mushahda village in Baghdad City in order to provide a sound basis for estimation of the present oral health status of a population and its further need for oral health care. This study is intended to help to produce a reliable base line data for development of national or regional oral health programmers and will permit comparison with data of other countries

MATERIALS AND METHODS

The present study was conducted in AL Mushahda district Baghdad city. Randomly selected 210 adult subjects were examined and 160 adult subjects had teeth needing extraction. Every patient was identified by special case sheet containing background information of the patients name, age, gender. They were examined under sunlight using plane mouth mirror and dental probe; teeth need extraction and their causes were recorded.

The reasons for extraction was recorded for every single tooth according to the following criteria (8,9)
1-Caries-crowns of teeth affected by caries that are beyond treatment or only roots remained (11)
2-Periodontal disease beyond treatment
3-Impacted (partially erupted)
4-Orthodontic indication
5-Prosthetic–to facilitate better prosthetic restoration
6-Mal posed tooth

(1) Lecturer, Department of Oral Diagnosis, College of Dentistry, University of Baghdad.
RESULTS

The sample included in this study were 160 subjects, 102 females, and the remaining 58 were males with female to male ratio 2:1. The age of the patient ranged between 15-75 years with a mean age 36 years for female and 34 years for male. The highest percentage of subjects belongs to 15-25 years age group (Table 1).

The percentage of teeth needing extraction related to age and gender are seen in Table 2. It can be clearly seen that the age group 15-25 year contained the highest percentage of tooth needing extraction. Concerning gender difference for the total sample, female experienced significantly more teeth need extraction than male (x=2.439 P<0.05).

Table 3 illustrates the percentage of tooth needing extraction related to tooth type; the first molar shows the highest percentage followed by third molar. Caries is the main cause of extraction of teeth followed by periodontal disease as shown in Table 4. The percentage of teeth needing extraction due to caries is higher among females than males, while the opposite figure found for the second cause.

Distribution of indication for tooth extraction in relation to age group is shown in Table 5. The highest number of teeth needing extraction due to caries are among age group 36-45 years, while concerning periodontal disease the highest number are among 46-55 years age group. Table 6 shows that the highest percentage of teeth needing extraction due to caries are seen among mandibular first molars, followed by second premolars, while the highest percentage of teeth needing extraction due to periodontal disease are the canines. The impacted teeth (partially erupted teeth) were mainly seen related to mandibular third molars

DISCUSSION

The result of the present study showed that the percentage of teeth needing extraction were higher among female than that of males. This finding was in agreement with similar studies (8,12). The highest percentage of tooth needing extraction were belong to 15-25 years age group, and this in agreement with AL Azzawi. (9) This is due to the high number of teeth need extraction for orthodontic treatment, malposed teeth and partially erupted teeth in this age group. The highest percentage of tooth needing extraction was found in this study to be the first molar. This may due to the fact that it is the first tooth to erupt in the oral cavity and probably neglected during the mixed dentition period. The present study showed that caries was the main cause of tooth extraction in all age groups and for all tooth type. This finding is demonstrated in previous Iraqi study carried Kalil in Baghdad city in 1991 (8) and may be due to low fluoride content of the water supply. Of the 370 teeth extracted during this study 61.3% were extracted because of caries and this is similar to the result of the previous Iraqi study carried by AL Azzawi in Oral-Maxillofacial surgery department, college of dentistry, Baghdad University that demonstrated the percentage of tooth extraction because of caries 60%. This result indicated no difference between urban and rural areas in Baghdad city. The highest percentage of tooth needing extraction due to caries was in age group 36-45 years. This is in agreement with Holm who showed that loss of teeth associated with increasing age as a result of action of microorganism. The second cause of tooth extraction in present study was periodontal disease, and this was similar to the findings by others (4,5,6,13) who demonstrated that periodontal disease was the most common cause of extraction, as it was one of the most wide spread diseases. Its clear that the higher number of teeth need extraction due to periodontitis were among old age group. This is because the progression and accumulative effects of periodontal disease are more severe in older adults, such as changes in blood vessels of the periodontium (atherosclerosis) or certain chronic conditions (diabetes, osteopenia), health behaviors (smoking, stress) and poor oral hygiene. Our results confirm high caries prevalence and the need for preventive and educational programmers for caries and also the need for more treatment carried by programmed medical staff visit to this village.

REFERENCES
3-WHO1987: prevention of oral disease-Geneva

Table 1: Distribution of patients by age and gender

<table>
<thead>
<tr>
<th>Age group</th>
<th>Male No.</th>
<th>%</th>
<th>Female No.</th>
<th>%</th>
<th>Total No.</th>
<th>%</th>
</tr>
</thead>
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<tr>
<td>15-25</td>
<td>24</td>
<td>41.38</td>
<td>25</td>
<td>24.51</td>
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<tr>
<td>26-35</td>
<td>11</td>
<td>18.97</td>
<td>23</td>
<td>22.55</td>
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<td>21.25</td>
</tr>
<tr>
<td>36-45</td>
<td>5</td>
<td>8.621</td>
<td>28</td>
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<tr>
<td>46-55</td>
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<td>18.97</td>
<td>12</td>
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<td>14.375</td>
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<tr>
<td>56-65</td>
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<td>10.78</td>
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<td>Total</td>
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<td>102</td>
<td>100</td>
<td>160</td>
<td>100</td>
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</table>

*Chi-square=2.825 P<0.05 Significant

Table 2: Distribution of teeth needs extraction by age and gender

<table>
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<tr>
<th>Age group</th>
<th>Male No.</th>
<th>%</th>
<th>Female No.</th>
<th>%</th>
<th>Total No.</th>
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<tbody>
<tr>
<td>15-25</td>
<td>41</td>
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<td>26-35</td>
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<td>47</td>
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<td>36-45</td>
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<td>71</td>
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<td>Total</td>
<td>137</td>
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<td>233</td>
<td>100</td>
<td>370</td>
<td>100</td>
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</table>

*Chi-square=2.439 P<0.05 Significant

Table 3: Distribution of patients by age and gender

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<tr>
<th>Tooth type</th>
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<th>Male Mandibular</th>
<th>Female Maxillary</th>
<th>Female Mandibular</th>
<th>Total Maxillary</th>
<th>Total Mandibular</th>
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<td>Central incisor</td>
<td>4</td>
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<td>4</td>
<td>11</td>
<td>15</td>
<td>6</td>
</tr>
<tr>
<td>Lat incisor</td>
<td>9</td>
<td>0</td>
<td>9</td>
<td>23</td>
<td>32</td>
<td>4</td>
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<tr>
<td>Canine</td>
<td>10</td>
<td>3</td>
<td>13</td>
<td>11</td>
<td>21</td>
<td>11</td>
</tr>
<tr>
<td>First premolar</td>
<td>12</td>
<td>6</td>
<td>18</td>
<td>10</td>
<td>22</td>
<td>12</td>
</tr>
<tr>
<td>2nd premolar</td>
<td>14</td>
<td>14</td>
<td>28</td>
<td>15</td>
<td>29</td>
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<td>1st molar</td>
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<td>14</td>
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<td>28</td>
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<td>42</td>
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<tr>
<td>2nd molar</td>
<td>4</td>
<td>12</td>
<td>16</td>
<td>15</td>
<td>29</td>
<td>29</td>
</tr>
<tr>
<td>3rd molar</td>
<td>7</td>
<td>12</td>
<td>21</td>
<td>13</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Total</td>
<td>74</td>
<td>63</td>
<td>137</td>
<td>107</td>
<td>233</td>
<td>200</td>
</tr>
</tbody>
</table>

*Chi-square=3.321 P<0.05 Significant

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Table 4: Distribution of teeth needs extraction according to reason extraction by gender

<table>
<thead>
<tr>
<th>Causes</th>
<th>Male No.</th>
<th>Male %</th>
<th>Female No.</th>
<th>Female %</th>
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<th>Total %</th>
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</thead>
<tbody>
<tr>
<td>Caries</td>
<td>84</td>
<td>61.3</td>
<td>118</td>
<td>77.6</td>
<td>256</td>
<td>71.62%</td>
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<tr>
<td>Periodontics</td>
<td>29</td>
<td>21.2</td>
<td>14</td>
<td>6.09</td>
<td>43</td>
<td>11.12%</td>
</tr>
<tr>
<td>Partially erupted</td>
<td>12</td>
<td>8.76</td>
<td>11</td>
<td>4.721</td>
<td>23</td>
<td>6.216%</td>
</tr>
<tr>
<td>Ortho</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>3.863</td>
<td>9</td>
<td>2.432%</td>
</tr>
<tr>
<td>Prosth</td>
<td>0</td>
<td>0</td>
<td>9</td>
<td>3.863</td>
<td>9</td>
<td>2.432%</td>
</tr>
<tr>
<td>Malposed</td>
<td>12</td>
<td>8.76</td>
<td>9</td>
<td>3.863</td>
<td>21</td>
<td>5.675%</td>
</tr>
<tr>
<td>Total</td>
<td>137</td>
<td>100</td>
<td>233</td>
<td>100</td>
<td>370</td>
<td>100</td>
</tr>
</tbody>
</table>

*Chi-square=2.439 P<0.05 Significant

Table 5: Distribution of teeth needs extraction according to reason for extraction by age group

<table>
<thead>
<tr>
<th>Age group</th>
<th>Caries No.</th>
<th>Caries %</th>
<th>Periodontitis No.</th>
<th>Periodontitis %</th>
<th>Partially erupted No.</th>
<th>Partially erupted %</th>
<th>Ortho No.</th>
<th>Ortho %</th>
<th>Prosth No.</th>
<th>Prosth %</th>
<th>Malposed No.</th>
<th>Malposed %</th>
<th>Total No.</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-25</td>
<td>52</td>
<td>19.6</td>
<td>0</td>
<td>0</td>
<td>14</td>
<td>60.9</td>
<td>6</td>
<td>15</td>
<td>0</td>
<td>15</td>
<td>0</td>
<td>0</td>
<td>84</td>
<td>22.7</td>
</tr>
<tr>
<td>26-35</td>
<td>57</td>
<td>21.5</td>
<td>6</td>
<td>14</td>
<td>4</td>
<td>17.4</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>14.3</td>
<td>73</td>
<td>19.73</td>
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<tr>
<td>36-45</td>
<td>66</td>
<td>24.9</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>21.7</td>
<td>3</td>
<td>6</td>
<td>3</td>
<td>66.7</td>
<td>3</td>
<td>14.3</td>
<td>83</td>
<td>22.43</td>
</tr>
<tr>
<td>46-55</td>
<td>53</td>
<td>20</td>
<td>19</td>
<td>44.2</td>
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<td>0</td>
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<td>0</td>
<td>72</td>
<td>19.46</td>
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<tr>
<td>56-65</td>
<td>20</td>
<td>7.55</td>
<td>11</td>
<td>25.6</td>
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<td>0</td>
<td>0</td>
<td>6</td>
<td>0</td>
<td>66.7</td>
<td>0</td>
<td>0</td>
<td>37</td>
<td>10</td>
</tr>
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<td>66-75</td>
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<td>6.42</td>
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<td>24</td>
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<tr>
<td>Total</td>
<td>265</td>
<td>100</td>
<td>43</td>
<td>100</td>
<td>23</td>
<td>100</td>
<td>9</td>
<td>9</td>
<td>100</td>
<td>21</td>
<td>100</td>
<td>370</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Table 6: Distribution of teeth needs extraction according to reason extraction by tooth type

<table>
<thead>
<tr>
<th>Tooth type</th>
<th>Caries No.</th>
<th>Caries %</th>
<th>Periodontitis No.</th>
<th>Periodontitis %</th>
<th>Partially erupted No.</th>
<th>Partially erupted %</th>
<th>Ortho No.</th>
<th>Ortho %</th>
<th>Prosth No.</th>
<th>Prosth %</th>
<th>Malposed No.</th>
<th>Malposed %</th>
<th>Total No.</th>
<th>Total %</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>12</td>
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<td>0</td>
<td>6</td>
<td>28.36</td>
</tr>
<tr>
<td>2</td>
<td>27</td>
<td>10</td>
<td>14</td>
<td>9.3</td>
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<td>0</td>
<td>3</td>
<td>33</td>
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<td>34</td>
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<td>0</td>
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<td>0</td>
<td>0</td>
<td>6</td>
<td>66.7</td>
<td>0</td>
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<td>67</td>
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<td>50</td>
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<td>0</td>
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<td>21</td>
<td>100</td>
<td>370</td>
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</tr>
</tbody>
</table>
The use of anterior mid stop point splint in comparison with full coverage splint therapy in the management of temporomandibular joint dysfunctions

Ihsan A. Kamel B.D.S., M.Sc. (1)  
Jamal N. Ahmed B.D.S., M.Sc. (2)  
Kadhum Al Sudani B.D.S., M.Sc. (2)

ABSTRACT
Background: The effectiveness of occlusal splint in decreasing the symptoms of temporomandibular joint dysfunctions has been demonstrated in many studies. There are many designs of acrylic splint fabricated as a therapeutic device in the management of various TMJ problems. The purpose of this study was to evaluate the use of anterior mid stop point splint (AMSP) in comparison with the full coverage (conventional flat splint) in the management of temporomandibular joint dysfunctions.

Subject and methods: Thirty patients were chosen for this study. They were of both genders with age ranged between (21-60) years. They were divided into two groups. The first group (15 patients) was treated with anterior mid stop point splint, while the second group (15 patients) was treated with full coverage flat surface splint. Clinical and electromyographic evaluation were performed for each patient before and after treatment.

Results: It has shown that 93.3% improvement of the symptoms of pain in the first treatment group (AMSP splint), and 53.3% improvement in the second treatment group (full coverage splint) during the course of treatment (45 days). The opening capacity was increased in an average of 9.9mm and 7.3mm for the same groups respectively in the same period. Electromyographic investigation showed 40.54% resting potential of temporalis in patients treated with anterior mid stop point, while 18.21% resting potential of temporalis muscle in patient treated with full coverage splint in 45 days of therapy. In other word, the ability to re-establish a smooth coordinated musculo-skeletal relation, balanced occlusion, and effective function through treatment was evaluated in this project.

Conclusion: The findings demonstrated that anterior mid stop point splint is more useful in comparison with smooth surface full coverage splint in the management of temporomandibular dysfunctions.

Keywords: Anterior mid stop point splint, full coverage splint, TMJ dysfunctions.

INTRODUCTION

Splint therapy is a reversible non invasive method of treatment. The principles of good occlusion could be built on through its action in modification of occlusal forces which are responsible for dysfunctional symptoms of patient and orientation of condyle to its muscolo-skeletal seat to glenoid fossa. (1, 2)

There are many designs of acrylic splints used to reduce the time of hyperactive muscles and relieve the symptoms of pain. These splints cover partly or completely the occlusal surfaces of the teeth they are fabricated for the upper or lower jaws. (3, 5) Anterior mid stop point (AMSP) is a type of splint covers only the central incisors and the concepts of this splint design are to:

A) Interrupt the propioception of masticatory muscle by initiation of nociceptine trigeminal inhibitory reflex which is provoked by the hardness acrylic stopper when contact the lower centrals whose periodontal ligament (via receptor) will signal the trigeminal spinal nucleus which send the quick reflex to suppress the contraction of temporalis and masseter muscles. This occurs only during day time when the subject is awake. (6)

B) In this type of splint, the canines do not come in contact; this means that the propioceptions of masseter and temporalis contraction will be avoided. (7, 8)

C) This splint will aid in passive retraction of the mandible, which means the posterior and superior displacement of condyle resulting in relaxation of lateral pterygoid muscle and correction of musculoskeletal seat of condyle in glenoid fossa. (9, 10)

D) Normally the inferior belly of lateral pterygoid muscle come into contact so that to re-open the mouth in AMSP the posterior teeth will stay apart, so the propioception of contraction of LPM will be inhibited also.

(1) Retired.  
(2) Assistant Professor, Department of Oral Diagnosis, College of Dentistry, University of Baghdad.
the superior fibers of this muscle which are responsible mainly for lateral movement will relax because the jaw is free to move laterally without any imposition or resistance.\(^{(11)}\)

The purpose of this investigation was to find out the use of AMSP as a design of hard acrylic splint therapy and compared with full coverage (conventional) splint.

SUBJECTS AND METHODS

A total of thirty adult patients (of both genders) were selected for this investigation. They were complaining of pain in temporalis and/or masseter muscles at the first time of presentation. The information representing the history, clinical examination, investigation, and diagnosis were collected and registered in a case sheet designed for this purpose.

The patients were examined basically at three time intervals during the period of treatment which extend for 45 days. The presented symptoms and changes in severities of these symptoms during treatment period were recorded carefully in the designated case sheet. The information included the interincisal distance, clicking sounds, Para functional movement as well as the pain in the muscle of mastication or the joint itself. The 1st group was treated with AMSP splint, the other group was treated with full coverage splint.

The AMSP is a splint of 2mm thickness was constricted of hot cured acrylic resin. This splint could be designed for upper or lower central incisors (Figure1). The patients were instructed to use them at bed time for 45 days. EMG records were carried on for temporalis muscle pretreatment and 45 days after treatment. The average values were calculated for final results.

RESULTS

The results were recorded in respect to the changes in symptoms of pain, average of maximum mouth opening, and mathematically calculated changes of EMG before and after treatment. Painful symptoms included headache, pain of the joints, intra and extra oral muscles, but all of them share in their symptoms, pain and/or tenderness of temporalis muscles (table1).

Table 1: Change of temporalis symptoms in response to different splint therapy.

<table>
<thead>
<tr>
<th>Type of splint</th>
<th>Number of patients</th>
<th>Pre therapeutic</th>
<th>Post therapeutic</th>
<th>Change%</th>
<th>Period of treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Positive</td>
<td>Negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AMSP</td>
<td>15</td>
<td>14</td>
<td>1</td>
<td>93.3</td>
<td>45 days</td>
</tr>
<tr>
<td>Full coverage</td>
<td>15</td>
<td>8</td>
<td>7</td>
<td>53.3</td>
<td>45 days</td>
</tr>
</tbody>
</table>

The positive post therapeutic column in table 1 represents a number of patients who responded well to the treatment method based on the clinical evaluation by the specialists, while the negative one represent the number of patients who didn’t respond to treatment and their symptoms remained unchanged or their response was too week to be recorded.

All other symptoms in patients treated AMSP splint were significantly reduced like headache, peri-auricular pain, joint and muscular pain. Eight patients of fifteen treated with full coverage splint showed some improvement in temporalis pain to a less extent than those treated with AMSP splint. Seven patients who were treated with full coverage splint didn’t expressed any recordable changes along the term of treatment, or may be worse.

The maximum opening capacity of patients in different groups were shown in table 2 which concluded the measurement of pre-therapeutic and post-therapeutic and the average changes in mm during the course of treatment (45 days). EMG records of resting temporalis before and after treatment was concluded in table 3.

Table 2: The changes in opening capacity in response to the type of splint therapy.

<table>
<thead>
<tr>
<th>Type of splint</th>
<th>Average max. opening capacity mm</th>
<th>Average change mm</th>
<th>Period of treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMSP</td>
<td>Pre therapeuitic 30.3 Post therapeuitic 40.2</td>
<td>9.9</td>
<td>45 days</td>
</tr>
<tr>
<td>Full coverage</td>
<td>Pre therapeuitic 31.4 Post therapeuitic 38.7</td>
<td>7.3</td>
<td>45 days</td>
</tr>
</tbody>
</table>
Table 3: The efficacy of splints in reducing the resting potential of the temporalis muscles before and after treatment using electromyography.

<table>
<thead>
<tr>
<th>Type of splint</th>
<th>Average value of EMG</th>
<th>Change %</th>
<th>Period of treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pre therapeutic</td>
<td>Post therapeutic</td>
<td></td>
</tr>
<tr>
<td>AMSP</td>
<td>2.22 mv</td>
<td>1.32 mv</td>
<td>40.54</td>
</tr>
<tr>
<td>Full coverage</td>
<td>2.91 mv</td>
<td>2.38 mv</td>
<td>18.21</td>
</tr>
</tbody>
</table>

The results showed marked changes of AMSP splint in comparison with full coverage. It has revealed an average reduction of 40.54% in resting potential of hyperactive muscles while, the average reduction in the same muscle of patients treated with full coverage splint was 18, 21 during the course of treatment (45 days).

**DISCUSSION**

Myogenic pain dysfunction syndrome is a common disorder among populations which includes spasm of on or more of the muscles of mastication. Tenderness of the muscles of mastication as well as related muscles in head and neck is often a common sign although not usually diagnosed by the patient, it could be detected by the examiner. LPM is mostly involved followed by masseter and temporalis. (12-14)

All patients who were chosen for this study were complaining of pain and tenderness of temporalis muscle. This was in regard to the use of surface electrode of the EMG in the measurement of the activity of the muscles of mastication. However, the other muscles were also considered in evaluating the clinical findings. (15, 16)

In patients treated with full coverage splint, all the complains of lateral pterygoid muscle were reduced or eliminated, while temporalis showed weaker response in eight patients (53.3%), four patients showed no change and the rest three patients became worse. This was attributed that the full coverage splint prevented any resistance to lateral pterygoid action in side to side movement which resulted in relaxation of the muscle, but at the same time, it provides a new flat surface for temporalis to clench on which did not aid much in positive changes in its symptoms or it may cause temporalis complain worse. (3) This might explains what happened to the three patients of the group who were treated with full coverage splint.

In patients treated with AMSP splint, all complains of lateral pterygoid muscles were eliminated and 93.3% of temporalis pain was significantly reduced or eliminated because the splint acted either by stopping the proprioceptions which lead to contraction of both muscles, or by initiating the nociceptive trigeminal inhibitory reflex.

These results agreed with Clark who found the improvement of temporalis symptoms 70-90% by using splint therapy (17, 18). For lateral pterygoid muscle, the splint provided a free way space for un-resisted lateral movement and prevented the contact of posterior teeth, so that no signals will be transferred to this muscle to contract (to re-open the mouth) because the mouth is not closed(19,20)

Anterior mid stop point splint was highly efficient in reducing all TMD symptoms whether it was constructed for day or bed time, but the mechanism of action differs between these two applications, in the bed time splint, the mechanism of action is by avoiding the contraction proprioceptions to masseter, temporalis and lateral pterygoid muscles as mentioned above, (7,8) while the mechanism of action of the day time splint is by initiating the nociceptive trigeminal inhibitory reflex which is summarized by that, once the patient bites on the midline bulk of the splint, signals from the periodontal ligament of lower centrals will travel to trigeminal spinal nucleus which in turn sends quick reflex to the closing muscles to cease their contraction, this reflex occurs only when the patient is awake, (6) which was applied to two patients suffering from clenching at day time, while the alteration in muscles proprioceptions occurs during sleep period.

In AMSP, there is no way for over eruption of posterior teeth even if the splint was constructed to be inserted at day time, since the patient is clenching during meals normally at day time without wearing the splint.

Three patients who were treated with AMSP experienced a slight tenderness in the lower centrals because they were bruxers, but they showed an excellent improvement of the other complains.

Headaches in patients treated with AMSP were significantly reduced or eliminated.
especially temporal type because of the high efficiency of this splint in relaxing muscles, while temporal pain and headache were slightly reduced or remained unchanged or became worse in patients treated with full coverage splint as mentioned above.

Opening capacity is influenced mainly by two factors, the first is the action of opening muscles especially the lateral pterygoid muscle and the second is the degree of accuracy of musculo-skeletal seat of condyle in glenoid fossa. AMSP and full coverage splints relax lateral pterygoid by providing enough free way space and avoiding resistance to side to side movement, but AMSP was superior to full coverage type by aiding in passive retrusion of the mandible due to the presence of anterior stopper and this will push the condyle postero-superiorly to more accurate musculo-skeletal seat, as a result of that, the opening capacity was much improved in patients treated with AMSP splint.

Electromyographic records reflected the domination of AMSP splint on full coverage type in lowering the resting potential of hyper active temporals and this is due to the superior ability of AMSP in relaxing temporals by avoiding the excitatory signals through preventing canines and posterior teeth contact, or by initiating the inhibitory signals through provoking the nociceptive trigeminal inhibitory reflex. While full coverage splint provided a wide flat surface for teeth to clench on, so temporals will continue to contract but to a less extent because the splint avoids teeth intercuspation.

![Figure 1: Upper and lower acrylic anterior mid stop point splint. a. designs of acrylic splint. b. Splint inserted on upper central incisors. c. splint inserted on lower central incisors.](image)

REFERENCES


The incidence of oral lesions induced by chronic irritations among patients attending Oral Diagnosis Clinic

Jamal N. Ahmed, B.D.S., M.Sc.(1)  
Riyadh O. Alkaisi, B.D.S., M.Sc., PhD(1)

ABSTRACT

Background: Chronic irritations can produce a variety of clinical lesions in the oral cavity, such as; reactive hyperplasia, red and white lesions, traumatic ulcers and swellings. The purpose of this study was to find out the incidence and the main causes of these lesions in Iraqi patients during the last two years.

Materials and methods: A total of 340 patients attending the diagnosis clinic within 2 years (2003 and 2004) were examined clinically and diagnosed thorough a search for the etiological factors of the lesions mentioned in this study.

Results: Out of 340 patients complaining of various oral lesions, only 146 patients were diagnosed as having oral lesions due to chronic irritation. Highest frequency was reactive hyperplasia (35.6%), followed by traumatic ulcers (24.7%), red lesions (19.9 %), white lesions (15 %) and swellings (4.8 %) respectively. Mechanical irritation represents the major causative factor in creating the traumatic lesions.

Conclusions: The incidence of oral lesions due to chronic irritation was increased (mainly traumatic ulcers) due to health negligence of mouth hygiene, besides the increasing incidence of smoking and other bad habits.

Key words: Oral lesions, chronic irritations. (J Bagh Coll Dentistry 2006; 18(3)39-42)

INTRODUCTION

A variety of clinical lesions can be produced by chronic irritations and trauma induced on the oral mucosa depending upon the circumstances and nature of the insult, such lesions include: exophytic lesions (reactive inflammatory hyperplasia), red lesions (erythematous and purpuric macules), white lesions (keratotic), traumatic ulcers and swellings. (1)

Oral soft tissue masses are mainly hyperplastic inflammatory responses due to local, chronic trauma or infection and formed as a result of proliferation of one or more component of normal connective tissue stroma and sometimes unique to the mouth because of their origin from periodontal or odontogenic tissues. Reactive lesions are found in the oral cavity of 3% of adults, such lesions collectively represent more than 80% of biopsized oral masses .(2)  These lesions are divided into separate entities according to the specific traumatic agent involved such as: traumatic fibroma, pyogenic granuloma (fibrotic pyogenic granuloma epulis fissuratum, and gingival polyps. (3) Some traumatic agents usually cause traumatic ulcer of the oral mucous membrane, which could be mechanical, chemical or thermal. (1).

Healing in most instances is rapid and uneventful, while occasional ulcers persist for a long time without healing, particularly those having a considerable resemblance to carcinoma or those associated with underlying systemic diseases.

Red lesion such as erythematous macule got its name from the increased vascularity of the underlining tissue and / or loss of part or all the covering epithelium. (2, 4) A white keratotic lesion (trauma associated leukoplakia) is a white plaque covering oral mucosa located at the traumatic site of irritation; it varies according to the nature and intensity of the traumatic agent. (5) Also chronic traumatic irritation on oral mucosa may cause swelling eruption at the involved region, it can occur anywhere in the mouth in which salivary glands are available. (7)

The purpose of this study was to find out the incidence of oral lesions caused by chronic irritation of Iraqi patients after the last war (years 2003, 2004) and compare the results with that of the last decade, (8) to estimate the effects of the longest blockade and the terrible war on the frequency of oral traumatic lesions of the Iraqi people and this will ultimately facilitate not only the prevention but also the treatment of these conditions successfully.

SUBJECTS AND METHODS

A total of 340 patients attending the oral diagnosis clinic at the college of dentistry, Baghdad University within 2 years (2003 and 2004) complaining from various oral lesions,
after history taking the patients were examined clinically using a sterilized mirror, probe, tweezers and gauze. After the examination, diagnosis was done and the patients received the proper treatment. The obtained information was recorded in a special format for later evaluations. Exophytic lesions (reactive inflammatory hyperplasia) like denture granuloma, traumatic fibroma, pulp polyp and parulis were easily diagnosed based on the chief complain, history and clinical features.

Red lesions were diagnosed as any red macules or erosions resulted from chronic irritation and they were somehow symptomatic, while white lesions were commonly asymptomatic, so most of the patients were unaware of these lesions especially if they were not their chief complain.

Suspicious lesions were biopsied then examined using a light microscope, patients with traumatic ulcers were mainly complaining from illness or pain in the ulcer area; and it was easy to identify the main causes. Ulcers located on critical areas were biopsized. (1)

RESULTS

Out of 340 patients attended the oral diagnosis clinic in 2 years complaining of various oral lesions, only 146 patients were diagnosed as having oral lesions due to chronic irritation with a frequency of 42.9 % . Those lesions were grouped into 1, 2, 3, 4, and 5, as reactive hyperplasia, ulcerative, red white, and swelling lesions respectively. Since reactive hyperplasia got many subtypes, so it was sub grouped into: A, B, C, D, and E, for further detailed information, then arranged in separate tables as: polyp, parulis, pyogenic granuloma, fibroma, and epulis fissuratum.

Table 1, showed the details of the oral lesions caused by chronic irritation in general, the highest frequency was reactive hyperplasia (35.6%), traumatic ulcers (24.7 %), red lesions (19.9 %), white lesions (15 %) and swellings (4.8 %) respectively.

Table 2 shows the details of reactive hyperplasia subgroups. Gingival polyps had the highest frequency among this group (27.9%), followed by parulis and pyogenic granulomas (25% each), then fibroma (15.4 %) and finally epulis fissuratum (7.7 %).

DISCUSSION

The great majority of soft tissue masses of the mouth are hyperplastic inflammatory responses to local, usually chronic trauma or infection. Reactive lesions are much more common in the mouth than in other parts of the body, because oral mucosa is exposed to various irritating and stimulating factors mainly from hard, rough, sore food, sharp teeth, prosthetic appliances and other foreign materials. The oral tissues respond differently according to the nature, intensity and duration of the stimulants. (1) This study showed that the frequency of oral traumatic lesions was 42.9 %, this is higher than that of Ahmeds study in 1993 (24.57%), (9). Also this study showed that reactive hyperplastic tissue lesions were the commonest among traumatic lesions in the oral cavity (35.6 %), this finding is similar to that of Rossian and Hirsch, and Ahmeds finding however, their percentages were higher (66% and 48.28% respectively). (8, 9)
Traumatic ulcers are the most common oral mucosal ulcers. In the present study, they represent 24.7% among oral traumatic lesions, and they were higher than red and white lesions (19.9% and 15% respectively). These results disagree with Ahmed’s findings in 1993, which showed that the percentage of traumatic ulcers was 11.49% and that it was less than red and white lesions in the sequence (22.60% and 14.55% respectively) (9).

The reasons behind such an increase in the percentage of traumatic ulcerations could be the bad effects of the unprecedented blockade, the last fierce war, and the terrible occupation of Iraq which had bad effects not only on the economical but also on the social life, the public health of the Iraqi people, and even on the quality of dental treatment and prevention of dental diseases.

For this reason, health negligence including that of mouth hygiene, in addition to the increasing incidence of smoking and other bad habits could be considered as important factors in increasing oral lesions like erosions and ulcers formation for instance.

Traumatic erythematous mauls are produced by a low grade and chronic physical insult (2). In this study, red lesions percentage was 19.9%, white lesion was 15% and finally swelling was 4.8%. So in this study swelling was considered the least among all oral lesions caused by chronic irritation, and that mucocele is the only type of swelling representing this group which was confirmed by biopsies. These results were more or less similar to Ahmed’s finding (9). Gingival polyp was common among chronic irritative lesions (27.9%), this is again because of high caries index that will lead to destruction of tooth structure so creating many sharp edges that irritate the gum continuously leading to polyp formation. Parulis, which is a draining granulation tissue mass surrounding and often hiding the end of fistulous tract from the underlying intraosseous dental infection (20) came after the polyps in the sequence (25%), so it is again a common finding, and large number of patients complain of bacterial chronic irritation because of the high caries index among them which was the source of pulpal and periapical lesions that lead to pus discharge from a sinus that often located on the gingiva. This study showed that pyogeic granuloma and parulis got the same percentage (25%), while traumatic fibroma (irritation fibroma) got (15.4%), this lesion is a common submucosal response to trauma from teeth or dental prostheses and was first reported in 1846 as fibrous polyp and polypus (2).

It is universally understood that the use of the term (fibroma) is not intended in this case to convey neoplastic origin, as is the usual intent of its use for fibrous tumors in other anatomic sites, found in 1.2% of adults, this inflammatory hyperplasia is the most common oral mucosa mass submitted for biopsy and is usually composed of types I and III collagen (2). Finally epulis fissuratum was the least (7.7%) as shown in table 2. This lesion is an exophytic inflammatory reactive hyperplasia which got a distinguishable clinical features, but its microscopical picture is similar to routine traumatic fibroma except that the chronic inflammatory cells are more numerous and the surface epithelium is much more likely to be ulcerated. (2) The results of this study were in agreement with that of Ahmed (9), Wood and Goaz (1) and Gnepp. (2) In this study it was obvious that the patients had no complain unless the lesion was ulcerated. This remark agrees with Cutright findings in 1974 who studied a large series of these lesions which were asymptomatic. (10) So these lesions will be unnoticed unless the patients seek correction or

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**Table 2: Classification and distribution percentage of reactive inflammatory hyperplastic lesions.**

<table>
<thead>
<tr>
<th>Group</th>
<th>Category</th>
<th>No. of cases</th>
<th>% of sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Polyps</td>
<td>14</td>
<td>27.9</td>
</tr>
<tr>
<td>B</td>
<td>Parulis</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>C</td>
<td>Pyogenic granuloma</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>D</td>
<td>Fibroma</td>
<td>8</td>
<td>15.4</td>
</tr>
<tr>
<td>E</td>
<td>Epulis Fissuratum</td>
<td>4</td>
<td>7.7</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>52</td>
<td>100</td>
</tr>
</tbody>
</table>

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construction of new denture or when they are associated with surface ulceration, which reflect a true number of cases attending our diagnosis clinic. Further studies about this issue are necessary for other oral diseases.

REFERENCES
The relation of candida growth in the development of “leukoplakia”

Anwar A. Al-Hussain Al-Saeed, B.D.S., M.Sc. (1)

ABSTRACT
Background: Many predisposing factors affect the onset of leukoplakia. This study evaluates the relation of the candidal infections for the development of leukoplakia in relation to gender, age, and smoking habit.

Patients and Methods: Fifty three patients of average age from (40-70) years of old, were complaining from leukoplakia in their oral mucosa, in the period of (January 1999-Nov 2000), and the same number of healthy individuals were used as control group. Swabs were taken immediately from the leukoplakia lesion and from the same site of the normal mucosa of the healthy individuals, and send for microbiological study.

Results: The majority cases of leukoplakia 37 (70%) have (+Ve) growth of candida growth of pathogenic type in compare to 8 (15%) of normal individuals from the same region of the oral mucosa which have (+Ve) growth of candida but of non-pathogenic type, and the most common were Candida albicans 28 (75%) from the whole sample. The candida growth were significantly higher in the leukoplakia lesion in those of heavily smokers 35(66%), particularly in the retromolar area, as well as hard palate, tongue, mandibular lip, and cheek. The study also reported that the smoking habit act as a main factor for alteration of oral epithelium for proliferation by enhancement of candida growth to produce their mycelium and toxins that lead to development of leukoplakia.

Conclusions: The study shows that the majority cases of leukoplakia are caused by candidal growth of pathogenic type, mainly Candida albicans which are more obviously detected in the smokers, old age, but there is no relation to their gender.

Key words: Leukoplakia, candida, smoking.

INTRODUCTION
Leukoplakia may be define as a raised white patch of oral mucosa of 5mm and/ or more in measurement, which can not scrapped off and cannot be attributed to any other diagnostic disease (1). The term Leukoplakia is derived from Greek word “Leukos” meaning white, and “Plakos” meaning tablet or block (2). Jepsen and Winter in (1965), reported that there was a relationship between the candidal infections and the development of Leukoplakia (3). Cawson and Lehner in (1968), found that the candidal infections were the cause leukoplakias. Candida may have ability of provoking epithelial proliferation, which appeared to be irreversible, even after the causes or the infections was treated (4,5). Renstrup in (1970), also suggested that Candida was superimposed as secondary infections with Leukoplakia, but not the causes of the disease (6), while Daftary in (1972) stated that there is a correlation between the presence of Candida and the incidence of epithelial atypia, but still made no comment on its role in Leukoplakia (7).

PATIENTS AND METHODS
Patients
Fifty three samples were selected from patients attending Department of Oral and Maxillofacial Surgery/ College of Dentistry/ University of Baghdad in the period between (Jan 1999-November 2000), having leukoplakia in their oral mucosa, and the same number of healthy individuals were used as a control group. The average age of both groups ranged between 40-70 years of old, as shown in Table 1, and Figure 1-3. All the patients in both groups were free from any systemic diseases, but most of the patients having leukoplakia were heavy smokers for a long time. The site of the development of leukoplakia in their oral mucosa was recorded, as well as the age, gender, and the duration of the lesions for comparison with the control group.

Method
The samples were collected by the use of swabs from the leukoplakia according to its development site, and the same procedure was done from the same site of normal individuals. Before the swab insertion of the lesion, the patients were instructed to rinse their mouth with normal saline 1-2 times in order to prevent contamination of the region by food debris and accidentally presence of other microorganisms which may give false results. The swabs were immediately cultured on Sabouraud’s dextrose agar media. The plates were incubated for 24-27

(1) Assistant professor, Department of Oral and Maxillo-Facial Surgery, College of Dentistry, University of Baghdad.
hrs at 37 °C. The colonies of budding yeast like organisms were identified by using Gram Stained Smears. A single colony of the isolated yeast was transferred into a slant of Sabourauds’ dextrose agar (screw cap bottles) to which Gentamycin and Chloromphenicol were added to prevent growth of other microorganisms.

These slants were incubated at 37 °C for 24 hours, then stored at 4 °C for further tests needed for the identifications of yeasts. The isolated candida species were differentiated by conventional methods according to Emmons and Binford (1974) (8) by:

1. Production of chlamydospores.
2. Production Germ tubes.
3. Surface growth.
4. Sugar fermentation tests.

RESULTS

Table 2 shows that 37 (70%) of patients who they are complaining of leukoplakia have a (+ve) growth of pathogenic candida in culture media in comparison to 8 (15%) of the control group from the same area of the oral mucosa, while the majority of the control group who were 45 (85%) showed a (-ve) growth of candida. The most common candida species isolated from leukoplakia was Candida albicans 28 (75.7%), while the remaining types of candidal species isolated were: 4 (10.8%) Candida krusei, 1 (2.7%) Candida stelloteodia, 3(8.1%) Candida tropicalis, 1 (2.7%) Candida parapsilosis. In comparison to the majority of candida species in the control group which are 8 (100%) Candida albicans, and 0 (0%) of the remaining candida species, as recorded in Table 3.

The results show that the majority of candidal infections were significantly higher in the leukoplakia that were located in the mandibular jaw more than in the maxillary jaw,
particularly in retromolar area and in the region that were exposed to the cigarette smoking (Table 4).

Table 5 shows a significance of candidal growth in the leukoplakia which enhanced with the aging process, in comparison to the control group of similar average age, while, there is no significant relationship of candidal growth in leukoplakia with the gender of the patients in comparison to normal individuals. The results show that, the smoking habit will increase and enhance the development of candidal growth that provoke the epithelial proliferation for the development of leukoplakia which appear significantly higher than in those of normal individuals as shown in Table 6.

Table 1: The number of patients having leukoplakia in their oral cavity according to the age, gender, and duration of the lesion.

<table>
<thead>
<tr>
<th>No. of patients</th>
<th>Average age (years)</th>
<th>Gender</th>
<th>Duration</th>
<th>Site</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Female</td>
<td></td>
<td>Tongue</td>
</tr>
<tr>
<td>53 (100%)</td>
<td>40-70</td>
<td>51</td>
<td>2</td>
<td>6 Months-11/2 years</td>
</tr>
</tbody>
</table>

Table 2: The results of candida growth in leukoplakia and in normal individuals from the same site of swab collection.

<table>
<thead>
<tr>
<th>No. of patients</th>
<th>Types</th>
<th>Candidal growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(+ve) growth</td>
</tr>
<tr>
<td>53 (100%)</td>
<td>Leukoplakia</td>
<td>37 (70%)</td>
</tr>
<tr>
<td>53 (100%)</td>
<td>Control group</td>
<td>8 (15%)</td>
</tr>
</tbody>
</table>

Table 3: The incidence of candidal species in both the leukoplakia patients and the control group.

<table>
<thead>
<tr>
<th>No. of patients</th>
<th>Candida species(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>C.Albicans</td>
</tr>
<tr>
<td>Leukoplakia 37 (100%)</td>
<td>28(75.7%)</td>
</tr>
<tr>
<td>Control 8(100%)</td>
<td>8(100%)</td>
</tr>
</tbody>
</table>

Table 4: The incidence of Candidal growth according to the site of leukoplakia development.

<table>
<thead>
<tr>
<th>No. of patients</th>
<th>Incidence of Candidal growth according to sites</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Retromolar area</td>
</tr>
<tr>
<td>Leukoplakia 37(100%)</td>
<td>24(64.9%)</td>
</tr>
</tbody>
</table>

Table 5: The incidence of Candidal growth in the leukoplakia and the control group in relation to the age.

<table>
<thead>
<tr>
<th>No. of patients</th>
<th>Average age</th>
<th>Incidence of Candidal growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(+Ve)</td>
</tr>
<tr>
<td>Leuk.</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Control</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>Total</td>
<td>53</td>
<td>100%</td>
</tr>
</tbody>
</table>
**Table 6: The incidence of candidal growth in relation to smoking habit in both groups.**

<table>
<thead>
<tr>
<th>Type of patients</th>
<th>Incidence of candidal growth</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(+Ve)</td>
<td>(-Ve)</td>
</tr>
<tr>
<td></td>
<td>Heavy</td>
<td>Little</td>
</tr>
<tr>
<td>Leukoplakia</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>35 (66%)</td>
<td>2 (3.8%)</td>
</tr>
<tr>
<td>Total</td>
<td>37 (70%)</td>
<td>16 (30%)</td>
</tr>
<tr>
<td>Control</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0(0%)</td>
<td>8(15%)</td>
</tr>
<tr>
<td>Total</td>
<td>8 (15%)</td>
<td>45 (85%)</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Candida and its related species are common components of the human oral flora. The total number of candida present is for the development of infection. It has been suggested that in order to change from commensal to pathogenic mode of life, candida need to aggregate in large numbers to accumulate sufficient enzymes for penetration of the membrane (9,10).

Candidosis is the most opportunistic infection in the world mainly caused by Candida albicans, although other species may be also involved such as Candida tropicalis, Candida parapsilosis, Candida stellatoidea, and Candida krusei. Candida albicans is the most important pathogenic species and the usual etiological agent of oral infections (11,12).

The pathogenicity of candida was linked with the transformation from the yeast-phase of the organism to the mycelial phase. The endotoxins of yeast produced during yeast-phase which affects the body to permit invasion and the development of the mycelium in the tissues. Other endotoxins are then produced and lead to the characteristic clinical lesion which is one of these lesions is leukoplakia (13,14).

From this microbiological study, the result shows that all the (+ve) growth of candida from leukoplakia lesions are pathogenic type according to Emmons and Binford procedure (8), while the (+ve) growth in the normal individuals are normal microflora (i.e. not pathogenic).

Therefore, the study proved that there is a significant correlation between the pathogenicity of candidal growth and the development of leukoplakia and this is due to the presence of candidal hyphae which acts as an important role in the production of clinical leukoplakia. All patients having leukoplakia were free from any systemic diseases, or under long duration of medications, which means exclusion from any other possible systemic causes of the lesion, and this is in agreement with Jepsen and Winter suggestions (5).

All the patients of both groups did not wear any dental prosthesis (partial, complete denture, bridge, and implant) in their oral cavity, and this mean exclusion of chronic traumatic irritation that may be caused by these prostheses as well as from their remaining teeth, and these findings were in disagreement with Renstrup findings (6).

On the other hand, most of the patients who had leukoplakia were heavy smokers for long time, in compare to very few numbers of normal individuals who had this habit. In the comparison between the results of both groups the current study presented that all the smokers with leukoplakia have (+ve) candidal growth of pathogenic type, while in normal individuals have (+ve) candida growth of non-pathogenic type, and this means the smoking or the effect of nicotine lead to alteration the mucous membrane of oral epithelium and enhancement of candida growth to change from normal oral flora to pathogenic type that produce these lesions (15,16). Therefore, for the above reasons the study reported that the main causes of leukoplakia are candidal growth of pathogenic type, particularly Candida albicans, and the smoking or nicotinic effects will act as predisposing factors for creating a good field or media for change the normal oral flora to pathogenic type, particularly candida organisms. Therefore, not every smoker has leukoplakia in his oral cavity but, leukoplakia may associate with smokers, and these findings
were in agreement with Jepsen (3), and Cawson (3,4).

The study shows that there is a significant relationship between candidal growth and the aging process in the development of leukoplakia, but this correlation does not detect in the control group, because the majority of normal individuals are shown (-ve) candidal growth. So aging process does not act as a main cause in the development of leukoplakia, but act indirectly as predisposing factor. The explanation of this relationship is suggested to the little amount of the oxygenated blood supply to the tissues due to reduction in the blood vessels lumen which may results from atherosclerosis, and this may reduce the local resistance of oral tissues that increase and enhancement of candidal growth particularly in those patients who have acidic pH of their saliva which acts as a good media for its growth (9,10).

In comparison between the pH of the saliva in both groups, the study found that the pH of saliva in patients who have leukoplakia are acidic (pH: 7-7.5), and this pH acts as good media for candida growth, while the majority saliva pH in normal individuals are alkaline (pH: 5.0), which does not shows a significant evidence of candida growth.

Fodick and Hansen (17) suggested the relationship between candida growth and acid production in the mouth. Normally the acidity of the saliva ranged from (pH: 5.0-7.5), but the percentage of candida positive growth were considerably higher in those with more acidic saliva, (in the most acidic group at pH: 5.0, as reported in this clinical study). It seems that this hyperacidity encouraged candida growth due to the presence of Ketone bodies in the circulation, and extra-cellular fluid together with the fermentation of carbohydrates found both of that contained in the saliva are at acid medium (17).

REFERENCES
The effect of frequency of tooth brushing on the gingival status among 10-13 years old school children in Dohuk

Barzan A. Mirza B.D.S  M.Sc (1)  
Vian M. Hussain B.D.S  M.Sc (1)  

ABSTRACT 
Background: The aim of the study was to estimate the prevalence and severity of gingivitis and the effect of tooth brushing on the gingival health among school children in the city of Dohuk. 
Materials and Methods: Four hundred school children, 190 males and 210 females were examined. Plaque and gingival indices, and the frequency of tooth brushing for each child were recorded. 
Results and Conclusions: The results of this study showed that 98.7 % of the school children examined had gingivitis, with different severities. 45 % of them did not brush at all and 55 % of them brushed their teeth with different frequencies. Those school children who brushed more had less mean of plaque and gingival scores. 
Key words: Plaque, gingivitis, tooth brushing. (J Bagh Coll Dentistry 2006; 18(3)48-50)  

INTRODUCTION 
Periodontal disease usually begins at childhood as gingivitis and increases in prevalence and severity, which may lead to the development of periodontitis. (1,2) The presence of plaque has been established as being a pre condition for gingivitis. (3) 
Tooth brushing is considered to be the most reliable mean of plaque control, providing thorough and regular cleaning. Nowadays, a wide variation exists in the tooth brush design, brushing technique, and in the frequency and time of tooth brushing. It is generally accepted that good oral hygiene is the most important factor for the health of periodontal tissue, and the most appropriate oral hygiene habit is by the regular and proper technique of tooth brushing and the proper use of interdental aids. (4,5) 
The aims of the present study are:
1- To estimate the prevalence and severity of gingivitis among school children in Dohuk.
2- The effect of tooth brushing on gingival health. 

MATERIALS AND METHODS 
The sample of the present study consisted in 400 school children, 190 males and 210 females in the fifth and sixth stages in five elementary schools in Dohuk city. 
The ages ranged between 10-13 years divided into two age groups:

The 1st age group 10-11 years old children. 
The 2nd age group 12-13 years old children. 
A clinical examination were carried out in the class room using ordinary chair, mouth mirror and (O) Michigan probe, under natural day light, the two indices that were used for assessing plaque, and gingival condition were:
• Plaque Index by Silness and Loe 1964(6) 
• Gingival Index by Loe and Silness 1963. (7) 
All the examined children were asked whether they brush their teeth or not, and those answered yes were asked about the frequency of brushing: either infrequent or once a day, or twice or more.
The statistical analyses include measuring of the mean of plaque and gingival index scores. Chi-square was used to determine the differences in the severity of gingivitis, and differences in the frequency of tooth brushing between age groups and gender. 

RESULTS 
The distribution of sample according to age and gender is shown in table 1. The total sample consisted of 400 school children; 190 males and 210 females. Table 2 shows that only 1.2% of school children had healthy gingiva, whereas 98.7% of them were with gingival inflammation. The highest percentage (72.5%) of the affected children was found to have moderate gingivitis. 
Table 3 represents the number and the percentage of students according to tooth brushing frequency by gender and age groups. About 17.8 % of the males, and about 27.1 % of the females were found to brush their teeth once a day, while about 50 % of males and about
40.5% of the females did not brush their teeth at all.

Table 4 represents the relation between tooth brushing frequency and the mean of plaque and gingival scores. The highest mean of plaque and gingival scores were 3.02, 2.25 respectively among those children with no brushing at all. The lowest mean of plaque and gingival scores were 0.99, 0.5 respectively among those children who brushed twice or more.

### Table 1: The number and percentage of students according to gender and age groups

<table>
<thead>
<tr>
<th>Age In Years</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>%</td>
<td>No.</td>
</tr>
<tr>
<td>10-11</td>
<td>70</td>
<td>36.8%</td>
<td>100</td>
</tr>
<tr>
<td>12-13</td>
<td>120</td>
<td>63.1%</td>
<td>110</td>
</tr>
<tr>
<td>Total</td>
<td>190</td>
<td>47.5%</td>
<td>210</td>
</tr>
</tbody>
</table>

### Table 2: The number and percentage of students according to tooth brushing frequency by gender and age groups

<table>
<thead>
<tr>
<th>Age</th>
<th>Gender</th>
<th>No.</th>
<th>No. brushing</th>
<th>Infrequent</th>
<th>Once</th>
<th>Twice or More</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-11</td>
<td>Male</td>
<td>70</td>
<td>30 42.8%</td>
<td>21 30%</td>
<td>18</td>
<td>25.7%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>100</td>
<td>40 40%</td>
<td>30 30%</td>
<td>17</td>
<td>17%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>170</td>
<td>70 41.1%</td>
<td>50 30%</td>
<td>25</td>
<td>14.7%</td>
</tr>
<tr>
<td>12-13</td>
<td>Male</td>
<td>120</td>
<td>65 54.1%</td>
<td>10 8.3%</td>
<td>16</td>
<td>13.3%</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>110</td>
<td>45 40.9%</td>
<td>20 18%</td>
<td>40</td>
<td>36.4%</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>230</td>
<td>110 47.8%</td>
<td>30 13%</td>
<td>54</td>
<td>23.4%</td>
</tr>
</tbody>
</table>

### Table 3: The number and percentage of students according to the severity of gingival inflammation

<table>
<thead>
<tr>
<th>Severity of Gingival Inflammation</th>
<th>Males</th>
<th>Females</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Mild</td>
<td>30</td>
<td>40</td>
<td>70</td>
</tr>
<tr>
<td>Moderate</td>
<td>143</td>
<td>155</td>
<td>298</td>
</tr>
<tr>
<td>Severe</td>
<td>14</td>
<td>13</td>
<td>35</td>
</tr>
</tbody>
</table>

X^2=204.53  d.f=3    p<0.01

### Table 4: The relation between brushing frequency and mean plaque and gingival scores

<table>
<thead>
<tr>
<th>Frequency of Brushing</th>
<th>Mean PI</th>
<th>Mean GI</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Brushing</td>
<td>3.02</td>
<td>2.25</td>
</tr>
<tr>
<td>Infrequent</td>
<td>2.00</td>
<td>1.99</td>
</tr>
<tr>
<td>Once a day</td>
<td>1.80</td>
<td>0.90</td>
</tr>
<tr>
<td>Twice or More</td>
<td>0.99</td>
<td>0.50</td>
</tr>
</tbody>
</table>
DISCUSSION
The present study showed that only about 1.2% of the total sample had healthy gingiva and about 98.7% of them had gingivitis with different severities. This high percentage comes in agreement with other study carried out in Al-Fingan Village in Baghdad among 180 children and teenagers aged 6-13 years using gingival index and plaque index scores. The results showed that a very high percentage of them suffer from gingivitis. Such results also agreed with other studies done among rural population in Ninevah Governorate and at Sharkhan village in Mosul, that showed high percentage of gingivitis among the examined population. The results of our study comes in agreement with results of a study which was carried out to determine plaque, gingival condition and brushing behavior in 15 years school children in the center region of Baghdad.

The present study revealed that the females tend to brush their teeth more than males, and this agreed with a grooming behavior in girls, and a better oral hygiene in females, but a higher gingivitis prevalence in males than in females.

This study also revealed that the highest means of plaque and gingival score was for those with no brushing and tends to decrease with increasing frequency of tooth brushing, and this agreed with the fact that the single most important hygiene measure is tooth brushing and it is the most effective mean of promoting oral health. The poor oral hygiene in children could be transient associated with tooth eruption, or due to short brushing time, or the use of an ineffective technique, also it is possible that some of the school children did not brush as they claimed.

REFERENCES
Prevalence and severity of periodontal disease in mandibular molar teeth of adult smokers

Maha Abdul Aziz B.D.S., M.Sc. (1)

ABSTRACT

Background: Smoking has been associated with periodontal disease severity and is considered a risk factor for its development. The objective of this study was to evaluate the prevalence and severity of periodontal destruction in mandibular molar teeth of adult smokers and non-smokers.

Materials and Methods: The study group consisted of 100 subjects (50 smokers & 50 non-smokers) age range (30-60) years of both sexes. Plaque index (PLI), gingival index (GI), bleeding on probing (BOP), calculus index (CLI), gingival recession (GR), tooth mobility (MO), furcation involvement (FI), probing pocket depth (PPD) and teeth loss were assessed at mandibular molar teeth excluding the third molar.

Results: Revealed that the prevalence and severity of GR, PPD, FI and MO were significantly increased in smokers compared to non-smokers.

Conclusion: The results of this study suggest that smoking appears to be a major environmental factor associated with accelerated periodontal destruction in adult smokers.

Key words: Smoking, periodontitis.

INTRODUCTION

Smoking has been suggested to be the most important risk factor associated with periodontal diseases (1). The prevalence of tobacco smoking among Iraqi adults aged 16 years and older in 1990 was 40% male and 5% female (2). Several studies conducted have shown that smokers exhibit increased PPD (3-6), GR (3,7), loss of attachment (4,7,9), loss of alveolar bone (9-11) and an increased number of missing teeth (4,8,12) compared to non-smokers. Periodontal conditions appear more advanced in smokers than in non-smokers in subjects with generally high oral hygiene standards and regular dental care habits (3), as well as in subjects with poor oral hygiene and in the absence of professional dental care (12).

MATERIALS AND METHODS

The sample consisted of 100 subjects (50 smokers & 50 non-smokers), age range (30-60) years of both sexes. For smoking history, subjects were defined as non-smokers if they had never used tobacco products and smokers group who smoke 10 cigarettes per day or more for ten years or more.

The participant attended the College of Dentistry for routine dental treatment and patients presenting with a history of concurrent systemic diseases and if they used antibiotics 4 weeks prior to the study were excluded.

The clinical examinations were conducted using graduated Williams periodontal probes, dental explorers and plane mouth mirrors. All examinations were carried on mandibular molars (excluding third molar) without cervical restorations or serving as an abutment for prosthesis.

Clinical Assessments:

1. PLI: Plaque index system in scale from (0-3). (13)
2. GI: Gingival index system in scale from (0-3). (14)
3. BOP: Absence or presence of bleeding on probing. (15)
4. CLI: Absence or presence of supra and sub gingival dental calculus. (16)
5. GR: The recession was scored if the free gingival margin located apical to CEJ without retraction of the gingival margin in the facial surface. (17)
6. FI: Furcation involvement was classified according to the index system presented by Hamp et al. (18)
7. MO: Tooth mobility recordings followed OLeary Classification. (19)
8. PPD: The probing pocket depth was measured at four sites the distance from gingival margin to the most apical extent of the probe was recorded.
9. Teeth loss: Number of extracted teeth was also recorded.
RESULTS
The sample consisted of 100 subjects (50 smokers and 50 non-smokers) each group divided into two groups according to gender, 25 in each (Table 1). In this study the total number of teeth examined in males and females group was 151 and 164 respectively (Table 2).

It is obvious from the results that the smokers and non-smokers at each sex group exhibited nearly similar oral hygiene conditions and gingival health thus in Table 3, non significant differences were observed in respect to means of PLI and GI but male and female smokers revealed higher means of PLI in comparison with non-smokers, on the contrary, smokers at each sex group showed lower means of GI than non-smokers and generally females recorded lower means of PLI and GI than males.

It is clear that the percentage of BOP in female smokers was lower than that in non-smokers, the results were 55.13%, 55.82% respectively with a significant difference between them but male smokers registered higher percentage of BOP than non-smokers with a non significant difference was recorded between them. In addition, results from Table 4 showed that smokers at both genders demonstrated higher percentages of CLI in comparison with non-smokers and significant differences were recorded between the two groups. However, females showed lower percentages of BOP and CLI than males.

Male and female smokers showed higher percentages of GR (91.31%), (70.52%) respectively when compared with male and female non-smokers (48.78%), (31.56%) and significant differences were recorded between smokers and non-smokers at each gender group. Also females showed lower percentages of GR than males (Table 5).

Tooth mobility showed much higher percentages of score 1 at male and females smokers, the results were (47.82%), (37.17%) respectively in comparison with non-smokers (4.87%), (4.65%) while score 2 was only recorded in smokers group and the differences were significant between smokers and non-smokers at each gender group (Table 6).

Results from (Table 6) also revealed much higher percentages of score 1 & 2 of FI at male smokers in comparison with non smokers, the same results were observed in females group in respect to score 1, while score 2 was only recorded in female smokers. On the other hand score 3 was only registered in male and female smokers the results were (1.44%), (1.28%) respectively and significant differences were shown between smokers and non-smokers at each gender group. Generally percentages of MO and FI were lower in females than males in smoker and non-smoker groups.

Percentages of PPD of 4-5mm and 6-7mm were higher at male and female smokers when compared with non-smokers, while PPD of (8mm) was only recorded at male and female smokers the results were 2.89%, 1.28% respectively. Also a significant difference was observed between smokers and non-smokers at each sex group. As it was expected percentages of PPD were lower in females than males (Table 7).

Finally, results showed that the percentage of teeth loss in male smokers was higher than that in non-smokers and significant differences between them was registered. Similar results were detected by comparing female smokers and non-smokers (Table 8).

DISCUSSION
Data collected in this study showed that smokers expressed higher mean values of PLI in comparison with non smokers but the differences were non-significant. This finding agree with (3,7,9,17) in which they reported that plaque was abundant in smokers. This result may be attributed to personality traits, leading to decreased oral hygiene habits, increased rate of plaque formation or combination of both (20).

In the present study the highest percentages of patients with calculus were found in smoker groups especially in males and the differences were significant this is in agreement with (4). The reasons for such result could be attributed to tooth brushing frequency; dental flossing and dental attendance were reported to be less among smokers (7).

Not surprisingly, there is a positive association between dental calculus and BOP due to the non mineralized plaque on the calculus surface is the principal irritant to the gingiva, but the underlying calcified portion may be a significant retentive factor (21). For this reason male smokers revealed higher percentage of BOP than non-smokers with a non significant difference between them and this result is not in accordance with (3,6). On the contrary, smokers demonstrated lower means of GI, also female smokers showed lower
percentage of BOP in comparison with non-smokers, these results are consistent with \(^{(3,4,17,22)}\). The reduction in clinical signs of inflammation in smokers may be due to decreased gingival crevicular flow and gingival blood vessels, in addition to the pharmacologic effects of nicotine that had patent and persistent vasoconstrictive action that carries the potential for reduced host defense and malnutrition because of impaired circulation. \(^{(23,24)}\)

Smokers exhibited higher percentages of GR than non-smokers which is in agreement with \(^{(3,5,7,8)}\) and disagree with \(^{(25)}\). These results may be explained by the causative relationship between GR and long standing calculus \(^{(26)}\) or since smokers experience more stain on teeth surfaces so they either use harder brush or much harder brushing technique. From this study we observed that the severity of periodontal destruction manifested by PPD, FI and MO were significantly increased in smokers compared to non-smokers.

### Table 1: Distribution of study population according to smoking habit by age group and gender

<table>
<thead>
<tr>
<th>Age group</th>
<th>Smoker</th>
<th>Non smoker</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>30-39</td>
<td>8 32%</td>
<td>8 32%</td>
</tr>
<tr>
<td>40-49</td>
<td>8 32%</td>
<td>9 36%</td>
</tr>
<tr>
<td>50-59</td>
<td>9 36%</td>
<td>8 32%</td>
</tr>
<tr>
<td>Total</td>
<td>25 100%</td>
<td>25 100%</td>
</tr>
</tbody>
</table>

### Table 2: Distribution of teeth examined according to smoking habit by gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Smoker</th>
<th>Non smoker</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td></td>
<td>No. %</td>
<td>No. %</td>
</tr>
<tr>
<td>Male</td>
<td>69 45.69</td>
<td>82 54.31</td>
</tr>
<tr>
<td>Female</td>
<td>78 47.56</td>
<td>86 52.44</td>
</tr>
</tbody>
</table>

### Table 3: Distribution of PLI & GI according to smoking habit by gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Smoker</th>
<th>Non smoker</th>
<th>P-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
</tr>
<tr>
<td>PLI</td>
<td>Male</td>
<td>1.795 0.211</td>
<td>1.599 0.270</td>
<td>0.123</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>1.537 0.142</td>
<td>1.487 0.152</td>
<td>0.114</td>
</tr>
<tr>
<td>GI</td>
<td>Male</td>
<td>1.600 0.240</td>
<td>1.650 0.183</td>
<td>0.143</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>1.470 0.120</td>
<td>1.520 0.180</td>
<td>0.125</td>
</tr>
</tbody>
</table>

\(^*P>0.05\) Non significant

### Table 4: Distribution of BOP & CLI according to smoking habit by gender

<table>
<thead>
<tr>
<th>BOP</th>
<th>Gender</th>
<th>Smoker</th>
<th>Non smoker</th>
<th>P-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. %</td>
<td>No. %</td>
<td>P-value</td>
<td>Sig</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>33.33</td>
<td>28 34.15</td>
<td>0.168</td>
<td>NS</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>66.67</td>
<td>54 65.85</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>44.87</td>
<td>38 44.18</td>
<td>0.047</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>55.13</td>
<td>48 55.82</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### CLI

<table>
<thead>
<tr>
<th>CLI</th>
<th>Gender</th>
<th>No. %</th>
<th>No. %</th>
<th>P-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>43.47</td>
<td>42 51.21</td>
<td>0.039</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>56.53</td>
<td>40 48.78</td>
<td>0.041</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>56.41</td>
<td>54 62.79</td>
<td>0.039</td>
<td>S</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>43.59</td>
<td>32 37.21</td>
<td>0.041</td>
<td>S</td>
<td></td>
</tr>
</tbody>
</table>

\(^*P>0.05\) Non significant, \(^**P<0.05\) Significant
Table 5: Distribution of GR according to smoking habit by gender

<table>
<thead>
<tr>
<th>GR</th>
<th>Gender</th>
<th>Smoker</th>
<th>No.</th>
<th>%</th>
<th>Non smoker</th>
<th>No.</th>
<th>%</th>
<th>P-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>6</td>
<td>8.69</td>
<td>42</td>
<td>51.22</td>
<td></td>
<td></td>
<td>0.049</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>23</td>
<td>29.48</td>
<td>58</td>
<td>67.44</td>
<td></td>
<td></td>
<td>0.044</td>
<td>S</td>
</tr>
</tbody>
</table>

*P<0.05 Significant

Table 6: Distribution of MO & FI according to smoking habit by gender

<table>
<thead>
<tr>
<th>MO</th>
<th>Gender</th>
<th>Smoker</th>
<th>No.</th>
<th>%</th>
<th>Non smoker</th>
<th>No.</th>
<th>%</th>
<th>P-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>31</td>
<td>44.92</td>
<td>78</td>
<td>95.12</td>
<td></td>
<td></td>
<td>0.039</td>
<td>S</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>43</td>
<td>55.12</td>
<td>82</td>
<td>95.34</td>
<td></td>
<td></td>
<td>0.044</td>
<td>S</td>
</tr>
</tbody>
</table>

Table 7: Distribution of PPD according to smoking habit by gender

<table>
<thead>
<tr>
<th>PPD</th>
<th>Gender</th>
<th>Smoker</th>
<th>No.</th>
<th>%</th>
<th>Non smoker</th>
<th>No.</th>
<th>%</th>
<th>P-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>2-3</td>
<td>Male</td>
<td>22</td>
<td>31.88</td>
<td>72</td>
<td>87.80</td>
<td></td>
<td></td>
<td>0.022</td>
<td>S</td>
</tr>
<tr>
<td>4-5</td>
<td>Female</td>
<td>44</td>
<td>56.41</td>
<td>79</td>
<td>91.86</td>
<td></td>
<td></td>
<td>0.027</td>
<td>S</td>
</tr>
</tbody>
</table>

*P<0.05 Significant

Table 8: Distribution of Teeth loss according to smoking habit by gender

<table>
<thead>
<tr>
<th></th>
<th>Smoker</th>
<th>Non smoker</th>
<th>P-value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>31</td>
<td>63.26</td>
<td>18</td>
<td>36.73</td>
</tr>
<tr>
<td>Female</td>
<td>22</td>
<td>61.1</td>
<td>14</td>
<td>38.9</td>
</tr>
</tbody>
</table>

*P<0.05 Significant

These data are in consistence with the findings of other studies (1,3-6,20,27) but disagree with several previous studies that reported a non significant differences between smokers and non-smokers in respect to PPD(7,9). One can explain the significant increase of PPD in smokers, by the effect of nicotine which may impair the attachment of fibroblast to root surfaces (28).
Smoking exerts a major effect on the bacterial composition of subgingival plaque and on the protective elements of the immune response. First of all, a qualitative rather than quantitative alteration exists in the microbial challenge of plaque in smokers, thus they have greater extent of colonization by periodontal pathogens than non-smokers which may lead to an increased periodontal destruction.\(^{(29)}\)

Second, smoking has been shown to impair the chemotaxis, phagocytosis, cell movement and the oxidative burst of neutrophils\(^{(30)}\) as well as an increased numbers of T-cells and elevated T-cell responsiveness in smokers may explain why smoking is a risk factor for periodontitis.\(^{(31)}\) In addition, the production of antibody essential for phagocytosis and killing of bacteria, specifically IgG2 levels has been reported to be reduced in smokers versus non-smokers with periodontitis\(^{(22)}\), suggesting that smokers may have reduced protection against periodontal infection. In contrast, increase the release of tissue destructive enzymes in smokers have been demonstrated.\(^{(30,33)}\)

The observations of localized bone loss in the furcation area corroborate several previous investigations showing a relationship between smoking and periodontal disease progression including alveolar bone loss.\(^{(9-11)}\)

In the present study the exact cause for teeth extraction is unknown. However, smokers revealed higher percentages of teeth loss than non-smokers which is in agreement with\(^{(3,4,8,12)}\).

Generally, it is found that females demonstrated better clinical signs of oral hygiene conditions, gingival health and periodontitis than males; this may be due to the fact that females are more concerned about their appearance and their oral hygiene especially from esthetic point of view.

Smoking appears to be a major environmental factor associated with accelerated periodontal destruction in adult smokers.

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The effect of atenolol (B- blocker) on salivary composition in patients with essential hypertension

*Tahrir N.N. Aldelaimi BDS, MSc *(1)*

**ABSTRACT**

Background: saliva play an important role in maintaining oral health, it is important to dentist as well as physician. The aim of the study was to examine the salivary flow rate and composition in patients with essential hypertension before and after treatment with Atenolol.

Materials and methods: 48 patients with hypertension were examined in Ramadi General Hospital, from October 2001 till October 2003.

Results: The hypertensive patients were characterized by lower salivary flow rate and significantly elevated levels of proteins, potassium and phosphate.

Conclusions: This might relate to chronic adrenergic over stimulation of the salivary glands in hypertensive patients. Salivary sodium, calcium and magnesium concentrations were similar in both groups. Atenolol increased the salivary flow rate and lower the phosphate but had no effect on protein and on potassium concentrations.

Key word: Salivary composition, salivary gland, hypertension.

**INTRODUCTION**

Saliva plays a critical role in maintaining the oral health, It is to dentist what blood is to a physician and its contents are analyzed and used to diagnose specific diseases or to assay the presence of certain substances *(1)*.

Saliva is secreted by glands through a duct system in the mouth, which composed of a large number of secretory units. Secretion is under the control of autonomic nervous system, it has high flow during feeding, low flow between meals and minimal during sleep *(2)*. Salivary glands are controlled by parasympathetic and sympathetic nuclei in medulla and spinal cord. The interconnection of nuclei are with sensory nuclei probably account for salivary reflexes in which flow and composition are altered by chewing and taste stimuli *[^3]*. The parasympathetic control the secretion of water and electrolytes while reflex stimulation of the sympathetic nerves evokes a secretory response through the release of catecholamine and both α and β adrenergic receptors are present in the secretory cell membrane.*[^4]*

Most studies on the effect of adrenergic agents on salivary glands were conducted on animals.

A limited number of studies were published on the effect of adrenergic agents on saliva in healthy human volunteers and on the salivary composition of hypertensive patients, mainly on the Na/K ratio as a screening test for hyperaldosteronism*[^5,6]*.

**MATERIALS AND METHODS**

Forty eight patients suffering from essential hypertension were treated by Atenolol and 48 were controlled persons "normotensives", (age and gender matched controls). All patients were informed about the nature of this study and agreed to participate. All the patients were aged 35-72 years, and had normal renal function.

Saliva was collected 2 to 3 times before the treatment with Atenolol and 24 hrs., 1 week and 4 weeks after treatment with Atenolol. Samples were collected by a standard method using simple ‘spitting’ technique, between 8–9 a.m. in the morning using large plastic test tube for 10 min. without stimulation since it alters salivary composition. PH value was estimated by pH meter (CG–701). Saliva was kept in centrifuge for 60 seconds at speed of 2000 r.p.m and the supernatant was isolated and transformed to another test tube which was frozen at –4 C *[^1]*.

Both Na and K were estimated by emission flame photometry "Corning 410" while phosphorus was estimated by calorimetric method *[^7]*. Ca and Mg was estimated by atomic-absorption spectrophotometry (Perkin-Elmer 107). The total protein was measured by using Lowry method *[^4]*. The salivary flow rate was estimated by measuring the volume of

[^1]: Lecturer, Oral & Maxillofacial Surgery Department College of Dentistry, Anbar University
saliva collected during 10 minutes. Student's "t" test was used for statistical analysis.

RESULTS

Forty eight hypertensive patients were examined in this study aged 34-72 years, average age 49 years, 20 were males and 28 females (table 1). The blood pressure of the patients decreased from 215±18 / 115±7 mm Hg to 145±18 / 90±13 and 130±10 / 85±7 mm Hg, 24 hrs, and 4 weeks after the beginning of treatment. Table 2 showed that the salivary secretion rate of the controls was 0.38±0.14 and decreased to 0.33±0.15 ml/min. after treatment. The salivary concentration of calcium, magnesium and sodium were similar in the healthy controls and in the hypertensive patients.

The phosphate concentration was significantly higher in the hypertensives than in the normotensives, 31.9±5.6 & 15.5±13 mg/100 ml (p<0.005), and decreased after 4 weeks of treatment to 20.1±9.5 mg/100 ml. The concentration of potassium was high in the hypertensives, 29.7±6.1 and 20.4±4.5 mg/100 ml in the controls (p<0.005), treatment with Pindolol had no effect. The total protein concentration was 292.4±89.1 in the hypertensives and 121.5±41 mg/100 ml in the controls (p<0.005). The changes in protein concentration after treatment were minor.

DISCUSSION

The systolic and diastolic blood pressure of the patients decreased significantly within 24 hrs. after treatment with Atenolol. The salivary composition of the hypertensive patients differed from healthy controls. The flow rate was lower and the concentrations of potassium, protein and phosphate were significantly higher. A lower salivary secretion rate in hypertensive patients was also detected by Baum [8].

The salivary protein and potassium concentrations were significantly elevated in hypertensive patients. Increase in potassium secretion after adrenergic stimulations of the rat parotids was also reported [2,6]. The high potassium and protein concentrations found in our patients support the hypothesis that patients with essential hypertension have prolonged adrenergic overstimulation of the salivary glands. No effect of Atenolol on potassium concentration was found.

REFERENCES

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Table 1: The mean values of difference in B.P of hypertensive patients in relation to age group and gender.

<table>
<thead>
<tr>
<th>Age group</th>
<th>Male (n=20)</th>
<th>Female (n=28)</th>
<th>Blood pressure [mmHg](Mean ± S.D )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Before treatment</td>
<td>Before treatment</td>
</tr>
<tr>
<td>35-44</td>
<td>4</td>
<td>6</td>
<td>210±18 / 115±7</td>
</tr>
<tr>
<td>45-54</td>
<td>6</td>
<td>7</td>
<td>205±10 / 114±5</td>
</tr>
<tr>
<td>55-64</td>
<td>8</td>
<td>11</td>
<td>195±15 / 110±8</td>
</tr>
<tr>
<td>65-75</td>
<td>2</td>
<td>4</td>
<td>210±15 / 115±5</td>
</tr>
</tbody>
</table>

Table 2: The difference in salivary composition of hypertensive patients before and after treatment with atenolol. (*) P < 0.005

<table>
<thead>
<tr>
<th></th>
<th>Controls</th>
<th>Hypertensive Patients Before Treatment</th>
<th>After Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>24hrs</td>
<td>1 week</td>
</tr>
<tr>
<td>Flow rate (ml/min)</td>
<td>0.38±0.18</td>
<td>0.24±0.14</td>
<td>0.26±0.11</td>
</tr>
<tr>
<td>Ca (mg/100 ml)</td>
<td>5.53±2.3</td>
<td>5.6±3.6</td>
<td>6.8±4</td>
</tr>
<tr>
<td>Mg ( m Eq/L)</td>
<td>0.57±0.4</td>
<td>0.83±0.5</td>
<td>0.78±0.3</td>
</tr>
<tr>
<td>Na ( m Eq/L)</td>
<td>5.53±1.8</td>
<td>7.8±2.6</td>
<td>6.6±2.1</td>
</tr>
<tr>
<td>K ( m Eq/L)</td>
<td>19.4±4.6</td>
<td>29.7±6.1(*)</td>
<td>27.1±6</td>
</tr>
<tr>
<td>Protein (mg/100 ml)</td>
<td>122.5±51</td>
<td>292.4±89(*)</td>
<td>295.7±118.7</td>
</tr>
<tr>
<td>Phosphate (mg/100 ml)</td>
<td>16.5±13</td>
<td>31.9±5.6(*)</td>
<td>32.5±17.1</td>
</tr>
</tbody>
</table>
Oral health status among a group of dental students in Yemen

Hala A. Al-Juboury, B.D.S, M.Sc.

ABSTRACT

Background: Both caries experience and gingival health are precise indicators for oral health status. The purpose of the present study was to determine dental and periodontal conditions among third year dental students in Dahmar University-Yemen.

Methods: Dental and gingival conditions of third year dental students were recorded, they were (57) with age range from (20-21) years, (46) boys and (11) girls. The statistical significance was calculated using T-significance comparison test.

Results: The results showed a high caries prevalence (96.7) which is higher among females than males with non significant difference, while for periodontal condition; gingivitis scores were found to be equal for both genders which is low grade or very mild gingivitis, both plaque and calculus values were less among females than males also these results were non-significant.

Conclusion: Oral health status was impaired among dental students of third class which may be attributed to the low level of dental education at this period.

Keywords: Caries, gingivitis, dental students. (J Bagh Coll Dentistry 2006; 18(3)60-62)

INTRODUCTION

Periodontal disease is one of the most widespread diseases of mankind in the world but it can be adequately prevented by adopting a specific health behavior, and tooth brushing which influenced by social factors as age, socioeconomic status, family attitudes, occupation, level of education attained and place of residence. (1)

On the other hand, dental caries is one of the most common oral diseases, It's a major problem in dentistry and should receive significant attention from restorative and preventive stand point. (2) Several statistical studies suggest a positive correlation between caries and gingival disease, (3,4) but this has not been substantiated. (5) although both have dental plaque as their chief etiologic factor, caries and periodontal disease appear to be two independent processes. (5,6) The different regions of plaque are significant, marginal plaque is of prime importance in the development of gingivitis. Supragingival plaque and tooth-associated subgingival plaque are critical in calculus formation and root caries. (7)

The pathologic changes of dental caries involve hard, calcified tissues, whereas gingival disease involves soft tissues. Unlike dental caries, gingival disease does not lend itself easily to objective measurement, because the signs of gingival pathologic alteration involve color changes in the soft tissues, swelling and bleeding.

Therefore, examining the teeth for the signs of dental caries is far easier than evaluating the pathologic variables used to define gingival disease. (7)

The aim of the present study was to determine oral health status (caries and gingivitis) among the 3rd year dental students. In Dahmar University, College of Dentistry, there was no available study demonstrating oral health status among dental students, therefore this study was conducted to be a baseline data for future studies.

MATERIALS AND METHODS

This study was conducted in Dahmar University in Republic of Yemen to investigate oral health status of 3rd year dental students which included estimation of caries prevalence and severity. Furthermore, parameters which evaluated the gingival health were estimated. All the students of the 3rd class in this College were examined in this study. They were 46 boys and 11 girls totaling 57. The dental record of each student contained dental and gingival condition. Diagnosis of dental caries was recorded according to criteria described by Jackson (8). The detection of caries was made by the use of a mouth mirror and a sharp explorer under dental light. The gingival health was estimated using three indices as follows:

1- Plaque index (PII): This parameter was estimated on a scale of (0-3) according to Silness and Loe (1964) (9).
2- Gingival index (GI): This parameter was estimated on a scale of (0-3) according to Loe and Silness (1963) (10).
3- Calculus index (CALI): This parameter was estimated on a scale of (0-3) according to Bjorby and Loe (1967) (11).

Both plaque and gingival indices were measured by the use of a periodontal probe (Williams no.14) and a mouth mirror while calculus index was estimated by the use of a sharp dental explorer with a mouth mirror. Mean and Standard deviations were estimated and the collected data were tested for the significant differences using t-test.

RESULTS
The study sample was composed of 57 students aged 20-21 years divided into 46 males with caries prevalence of 95.7% only two males had no caries, and 11 females with a 100% caries prevalence, this was shown in Table 1.

Caries experience by gender was shown in Table 2, the mean DMFT and DMFS showed higher values among females than among males, although the difference was not significant (p>0.05). Table 3 revealed the DS and FS components of DMFS. The decay component for males group was higher than that for females group and vise versa for the filled component, however the difference was not significant (p>0.05). For both groups the mean (DS) was greatly higher than mean (FS).

Plaque, gingival and calculus indices in relation to gender were shown in Table (4); the mean plaque and calculus indices were higher among boys than girls but with no significant difference, on the other hand gingival indices were equal for both groups.

DISCUSSION
Result of this study showed a high caries prevalence (96.5%) for the total sample; this result was approximately the same to that found by Mohammed among 3rd class dental students in Baghdad (12).

Caries prevalence among females was higher than that among males; this could be attributed to the earlier eruption of teeth in females than males which enhance longer exposure to the environmental factors. (13)

The DMFT among females was higher than among males, this comes in agreement with a control group which had been taken by a study conducted in Baghdad by Shareef, the total DMFT was also nearly the same for this study (14).

Total means DMFS were lower than that reported by other studies in Baghdad (12, 15), this difference in the results may be attributed to the area of residence. In Dahmar the area was fluoridated with a fluoride level range (0.1 – 1.9 ppm) (16). The rate of acid dissolution of teeth containing pre-eruptively acquired fluoride is lower than in other teeth, this decreases tooth susceptibility to caries (17).

The DS component was found to be higher than FS component of the DMFS; this result was opposite to the result of Mohammed study (12) in Iraq, which showed FS component higher than DS component, and this result reflected low care about dental health among dental students in Dahmar. This was less among boys than girls as represented by higher DS component among boys than girls with lower FS component among boys than girls.

One might expect that dental students should have good oral hygiene than other subjects in the community, results of this investigation showed that most of the dental students did not demonstrate an effective oral hygiene. This comes in agreement with other study made in Iraq in the year 2002 which showed nearly similar mean PLI of (0.79) (18) but our results regarding oral hygiene and gingival condition were better than those reported by other studies in Iraq (12, 19) and other countries in the world (20) which was demonstrated by lower PLI and GI values than these studies but the CALI showed higher values than Mohammed study (12). This could be due to differences in dietary habits and oral hygiene practice among different communities, in addition, the habit of chewing QATT has a negative effect on oral hygiene and periodontal condition in form of gingival recession due to chronic irritation. Moreover, the roughness of exposed cementum enhanced calculus retention (21). From our personal observations in Yemen, the negative effect of the habit of chewing QATT was mostly on one side of the mouth that reduced the total mean effect on the mouth.

Further investigations are needed to follow up the attitude and knowledge of dental students with different aspects of dental health and to examine if there is any hope to get rid of bad habits especially chewing QATT, and improve oral health.
Table 1: Prevalence of dental caries by gender

<table>
<thead>
<tr>
<th>Caries free</th>
<th>With caries</th>
<th>No.</th>
<th>%</th>
<th>No.</th>
<th>%</th>
<th>Gender</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>4.3</td>
<td>44</td>
<td>95.7</td>
<td>46</td>
<td></td>
<td>Male</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>11</td>
<td>100</td>
<td>11</td>
<td></td>
<td>Female</td>
</tr>
<tr>
<td>2</td>
<td>3.5</td>
<td>55</td>
<td>96.5</td>
<td>57</td>
<td></td>
<td>Both</td>
</tr>
</tbody>
</table>

Table 2: Mean of caries experience by gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>No.</th>
<th>DS mean ± SD</th>
<th>Sig.</th>
<th>FS mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>46</td>
<td>8.2 ± 4.8</td>
<td>N.S.</td>
<td>11.5 ± 9.4</td>
</tr>
<tr>
<td>Female</td>
<td>11</td>
<td>9.8 ± 4.8</td>
<td>N.S.</td>
<td>13.1 ± 8.2</td>
</tr>
<tr>
<td>Both</td>
<td>57</td>
<td>8.5 ± 4.8</td>
<td></td>
<td>11.8 ± 9.1</td>
</tr>
</tbody>
</table>

Table 3: The (DS) and (FS) components by gender.

<table>
<thead>
<tr>
<th>Gender</th>
<th>No.</th>
<th>DS mean ± SD</th>
<th>Sig.</th>
<th>FS mean ± SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>46</td>
<td>9.3 ± 5.4</td>
<td>N.S.</td>
<td>1.5 ± 5.0</td>
</tr>
<tr>
<td>Female</td>
<td>11</td>
<td>7.5 ± 4.5</td>
<td>N.S.</td>
<td>2.9 ± 4.4</td>
</tr>
<tr>
<td>Both</td>
<td>57</td>
<td>9.0 ± 5.3</td>
<td></td>
<td>1.8 ± 4.9</td>
</tr>
</tbody>
</table>

Table 4: Plaque, gingival and calculus indices by gender.

<table>
<thead>
<tr>
<th>Gender</th>
<th>No.</th>
<th>PlI mean ± SD</th>
<th>Sig.</th>
<th>GI mean ± SD</th>
<th>Sig.</th>
<th>CALI mean ± SD</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>46</td>
<td>0.8 ± 0.3</td>
<td>N.S.</td>
<td>0.7 ± 0.3</td>
<td></td>
<td>0.3 ± 0.3</td>
<td>N.S.</td>
</tr>
<tr>
<td>Female</td>
<td>11</td>
<td>0.7 ± 0.2</td>
<td>N.S.</td>
<td>0.7 ± 0.3</td>
<td></td>
<td>0.2 ± 0.2</td>
<td>N.S.</td>
</tr>
<tr>
<td>Both</td>
<td>57</td>
<td>0.8 ± 0.3</td>
<td></td>
<td>0.7 ± 0.3</td>
<td></td>
<td>0.3 ± 0.3</td>
<td></td>
</tr>
</tbody>
</table>

REFERENCES

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Autogenous maxillary canine transplantation: A therapeutic alternative to Dental Implant.

Lukman F. Omar (1)

ABSTRACT

Background: Since there is no previous study in Kurdistan region of Iraq concerning the autotransplantation, therefore, the study is designed to evaluate (14) case of impacted maxillary canines autotransplanted in young patients.

Materials and Method: Fourteen healthy young patients with partially erupted or impacted maxillary canines were taken. The tooth was extracted and placed in the recipient prepared socket and stabilized with wire splint. The patients followed up clinically and radiographically for two years.

Results: At the end of this period, (12) cases showed that the clinical tooth mobility was similar to that of the adjacent teeth, radiographically showed normal lamina dura and periodontal ligament space, and two cases showed inflammatory resorption with widening of the periodontal space and tooth mobility.

Conclusion: Autotransplantation is a useful alternative treatment which should be considered as a viable option for treatment of impacted and partially erupted canines.

Key words: Autogenous, Canine, transplantation.

INTRODUCTION

Autogenous tooth transplantation, or autotransplantation, is the surgical movement of a tooth from one location in the mouth to another in the same individual. Careful patient selection coupled with an appropriate technique can lead to exceptional esthetic and functional results (1,2).

It is thought that Ambrase Pam in (1562) was the first author to describe the "replantation of teeth". He detailed the replacement of a tooth for a women of nobility which was provided from the mouth of her ladies in waiting, this is allogenic transplant and have not been shown to be very successful (3).

Hunter in 1771 laid down the principles for the transplantation of teeth like: The use of only healthy teeth, the transfer should be with the least possible delay, the tooth must be immobilized with silk or wire and frequent recall to check the tooth (4). Widman in 1915 auto transplant unerupted maxillary canines into their correct positions with good results (5).

Since this time a considerable number of papers have been published describing the results of the autogenous transplantation of canines with and without root filling.

When the transplanted tooth has open apex, the vital component within the pulp chamber have potential of being totally replaced through a process of revascularization. Once a root approaches apical closure, the potential for complete revascularization becomes compromised, irreparable necrosis places the tooth at risk for infection and rejection. For this reason, endodontic treatment is always required for transplants of mature teeth with complete root formation (1,3).

Impacted maxillary canine causes a great problem in treatment planning and it is a common reason for referral to both the orthodontist and oral surgeon. Autotransplantation is a useful alternative treatment in selected patients, many patients reject the orthodontic treatment because of esthetic, cost, long treatment time. In addition, some of deeply impacted maxillary canines fail to be treated orthodontically (6).

Since there is no previous study done in Kurdistan Region, especially in Erbil city, regarding this subject, the study was designed to evaluate 14 cases of maxillary canines’ autotransplantation in young patients.

MATERIALS AND METHODS

A. Clinical and radiographic examination

This study was conducted on 14 healthy patients with partially erupted or impacted maxillary canines at Department of Oral Surgery, College of Dentistry, University of Salahaddin. They were five males and nine...
females with the age ranged from (17-30) years. The candidates must be in good health, non smoker, able to follow post-operative instructions, available for follow up visits, demonstrate an acceptable level of oral hygiene and must have a suitable recipient site and donor tooth. There must be sufficient alveolar bone support in all dimensions with adequate attached keratinized tissue to allow for stabilization of the transplanted tooth. In addition, the recipient site should be free from acute infection and chronic inflammation. The donor tooth should be positioned such that extraction will be as atraumatic as possible. Abnormal root morphology was contraindicated. The radiographic examination was performed by Orthopantomograph (OPG), occlusal and periapical radiographs. The position of canine in the alveolar process (labial, palatal and transversal direction), the angulations, the relation to the neighboring teeth and the root anatomy, were analyzed.

B. The surgical technique

Local anesthesia was sufficient for the surgical procedure once sufficient anesthesia was obtained, the tooth extracted and the recipient socket prepared with dimensions similar to those required for the donor tooth. Care must be taken to avoid the adjacent root structures by at least (1-2mm) when preparing the recipient site, it is also helpful to have about (0.5-1 mm) of bone both labial and lingual to die transplant tooth. When the donor tooth is unerupted, extraction involves flap elevation and bone removal (labial approach for the labially impacted canines, palatal approach for the palatally impacted canines, labial and palatal approach for the transversal teeth which present between the roots of adjacent teeth). The donor tooth is carefully removed to ensure minimal trauma to the periodontal ligament by touching the crown only. The tooth is placed in the recipient socket, minimal delay needed to ensure maintenance of periodontal ligament vitality. If further adjustment of the recipient socket is required, the donor tooth stored in it's original socket.

The transplant should be placed deep to allow the surrounding gingival tissue to be placed coronal to the cementoenamel junction with respect to occlusion and articulation. The occlusion is checked and if needed adjusted using a high speed finishing bur. The tooth should be in slight infra-occlusion to allow it to erupt into proper occlusion over the next few months. When proper position is obtained, the flap was sutured in it's original position, the stabilization of the transplanted tooth was performed with wire splint and postoperative antibiotic and analgesic were prescribed (Amoxicillin capsule 500mg, and paracetamol tablet 500mg, three times daily for five days). A soft diet should be followed for two days after surgery and the patient should be instructed to avoid mastication on the transplant and maintain optimal oral hygiene. The patients must be seen the day after surgery to ensure that the transplant has retained it's new position, the splint is stable and the swelling, edema, and hematoma formation are within normal limits, and after one week for removal of suture. The patients then seen after one, two months and every six months for two years follow up.

However, endodontic treatment is always required for transplants of mature teeth with complete root formation; endodontic therapy begins approximately one month post operatively with instrumenting of the canals. Gutta percha filling is completed two months post transplantation and the wire splint is removed in this time.

RESULTS

The sample used in this study was 14 patients consisted from five males (35.71%) and nine females (64.29%), age of the individuals ranged between 17-30 years. The number and percentage of partially erupted and impacted canines with its position in the alveolar ridge is seen in table 1. The percentage of impacted canines was 71.43% and for the palatally positioned canine was 64.29% is higher than the other types. No post operative complications such as infections or severe pain were observed in the day after transplant and most patients were suffered from either mild or moderate pain. After two months, the appearance of the mucosa around the transplanted teeth was normal and the gingiva was free from inflammation and firmly attached to the
teeth, the wire splint was removed (figure 1). The periapical radiograph of the same tooth before obturation showed that the alveolar bone had been developing in the vicinity of root (figure 2). The observation was continued in the following months and at the end of two years, (12) cases showed that the clinical tooth mobility was similar to that of the adjacent teeth. Radiographically there was normal lamina dura and periodontal ligament space (figure 3), and two cases showed inflammatory resorption about (2-3mm) with widening of the periodontal space and tooth mobility.

Table 1: The positions and number of donor teeth.

<table>
<thead>
<tr>
<th>Position</th>
<th>No. impaction</th>
<th>No. partial eruption</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Palatal</td>
<td>7</td>
<td>2</td>
<td>9</td>
</tr>
<tr>
<td>Labial</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Transversal</td>
<td>2</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>4</td>
<td>14</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Although auto transplantation has not been established as a traditional means of replacing a missing tooth, the transplant can replace missing teeth after appropriate patient selection, presence of a suitable donor tooth and recipient site. The average age of patients on whom auto-transplant was
performanced was similar to that recorded in most other studies because most patient in late teens or early twenties become a ware of a misplaced tooth(11).

If tooth transplantation is to succeed, it is crucial to preserve the vitality of the cells on the root surface of the tooth transplant. Insufficient postoperative nutrition to the cells on the root surface of the tooth transplant was thought to contribute to their devitalization of these cells. Impaired nutrition may be a result of poor contact between the recipient bed and the root surface of the transplanted tooth and the development of an interposed blood clot (12). The current study indicates that there was complete bone healing regardless the amount of bone removed, if the cementum of the tooth is not injured. This comes in agreement with the result of Nethander (12). The root canal therapy is not attempted at the time of surgical procedure in order to reduce handling of the tooth during the procedure. Therefore it's better to postpone for about two months, in addition, the absence of infection in the root canal in the majority of teeth, the risk of contact with saliva and exposure to microorganisms is minimal with the operative procedures and thus, there was also less need of immediate root canal treatment (13). In this study, the formation of lamina dura was considered an important radiographic finding and was equated with healing to reform a normal periodontal ligament. All the teeth formed a complete lamina dura were those which did not show resorption radiographically. These findings are in agreement with most reports like Graham and Peter (14).

REFERENCES
Effect of oral hygiene education on adults with and without subsequent orthodontic treatment

Abeer S. Al-Rawi  B.D.S. M.Sc. (1)
Iman Al-Sheakli  D.S. M.Sc. (2)

ABSTRACT
Background: Poor oral hygiene in orthodontic patients is responsible for the final poor gingival results. The present study was designed to determine the relative effect of individual oral hygiene education on patient with fixed orthodontic appliances (test group) by measuring, Plaque index (PLI), Gingival index (GI) and Bleeding on probing (BOP), then to compare these parameters of the test group with patients without an orthodontic treatment (control group).

Materials and methods: A sample of 23 patients attending the Department of Orthodontics, College of Dentistry / Baghdad University, with an age range between 18-25 years old scheduled for fixed orthodontic treatment and another 23 control persons with the same age were selected for this study. Plaque and gingival indices and bleeding on probing were taken for four surfaces of all teeth of both test and control groups. These were measured for a period of twelve weeks.

Results: The mean of PLI for the control group was 0.4 at day zero for males and 0.3 for females while at the end of study was (0.4 and 0.5) respectively. In the males of test group it was 0.2 and 0.3 for females at 0 day and was 0.6 and 0.4 respectively at end of the study. The mean of GI for males and females of the control group at base line was 0.5 and 0.4 respectively and at the end of the study was 0.3 for both. While for the test group it was at 0 day 0.4 for male and 0.2 for female and at the end of the study was 0.6 and 0.5 respectively. The highest percentage of bleeding on probing was 34% for female test group at the second weeks of the study.

Conclusion: The influence of the orthodontic treatment as such did not seem to be of importance regards individual oral hygiene habits.

Keywords: Fixed orthodontic appliances, oral hygiene education, gingivitis. (J Bagh Coll Dentistry 2006; 18(3)67-69)

INTRODUCTION
There is overwhelming evidence that the direct cause of gingivitis is accumulation of microbial plaque on and near the cervical region of the teeth. (1-4) The plaque accumulation is accompanied by increasing severity of gingivitis and plaque removal reverses the process (5). Orthodontic treatment may cause an alteration in the ecological system of the oral cavity by introducing new stagnation areas available for bacterial colonization and retention of substructure. (6) It can not be denied that orthodontic appliances make more difficult the maintenance of good oral hygiene and retention of plaque being influenced by the type and the number of attachments and archeries in fixed appliance. (7-13) The short-term effects of orthodontic appliances on the periodontium are gingivitis and gingival enlargement which occurs after placement of appliances (14).

MATERIALS AND METHODS
A test group of 23 patients (14 female and 9 male) with an age range between 18 to 25 years old scheduled for fixed orthodontic treatment. The control group consists of another 23 adults with the same age of test group (14 female and 9 male). Non of both group had a history of any systemic disease which might affect their periodontal status, persons with crowded teeth had been excluded from this study. Orthodontic treatment was performed in both dental arches with fixed orthodontic appliances [edge wise orthodontic appliances (dentaurum,891 -220,Germany).

Two weeks before any orthodontic treatment was began both groups were participated in program of oral hygiene education delivered by a periodontist, it included motivation in regard the oral health benefits of effective plaque control. The program was given individually to each one in both groups. These sessions also included instruction in proper oral hygiene measure using the bass techniques of tooth brushing supplemented by a single tufted interdentally tooth brush for gaining access in particular to those areas lying adjacent to the marginal gingival (15). All the participants in this study received supragingival prophylaxis consisting of scaling and polishing one week before orthodontic treatment so that good oral hygiene had been achieved.
The following clinical parameters were recorded using for the four surfaces, buccal, lingual, mesial and distal of all teeth of both groups at baseline (day 0), 2 weeks, 8 weeks and 12 weeks.
1. Plaque index (PL I) was recorded according to Silness and Loe\(^{(16)}\).
2. Gingival index (GI) was recorded according to Loe and Silness\(^{(17)}\).
3. Bleeding on probing (B.O.P) the site gently probed with periodontal probe if bleeding occur within 30 seconds after probing the site given score (1) if bleeding didn't occur score (0) was given.
Prior to recording these parameters, the area was dried with an air syringe and the teeth were examined for plaque using a periodontal probe then the area was carefully inspected for signs of redness or bleeding when periodontal probe was passed along the gingival sulcus.

**RESULTS**
Table 1 shows the mean and standard deviation of PL I of both control and test groups during the twelfth week. The mean at day 0 for the male of control groups was 0.4 and 0.4 in the end of the study while in the female was 0.3 at day 0 and at the end of the study was 0.5 in the male of the test group the mean was 0.2 at day 0 and 0.6 at the end of the study, in the female was 0-3 at day 0 and 0.4 at the end of the study.

The mean and the standard deviation of G.I for the male and female of both groups during the study were shown in Table 2. The mean GI for the control group was 0.5 at day 0 and 0.3 at the end of the study while for female was 0.4 at day 0 and 0.3 at the end of the study. For male of test group was 0.4 and 0.2 for female at day 0 and at the end of the study was 0.6 and 0.5 respectively.
Table 3 shows the percentage of bleeding on probing in the male of control group was 20% and of the test group was 18 % at day 0 while in test group was 14 % at the end of the study it was 10% for male of the control group and 19% in test group. For the females of both control and test groups was 14% and 19% respectively.

By using t- test for comparison we found that there was a non significant difference between males of both groups (P> 0.05) similarly there was non significant difference between female of both groups in plaque and gingival indices. By using Chi-square for comparison of bleeding on probing between males of both groups was non significant differences (P>0.05). Also it was non significant difference in females of both groups.

### Table 1: Descriptive statistics for Plaque index of test and control groups

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Test Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>0</td>
<td>0.2</td>
<td>0.45</td>
</tr>
<tr>
<td>2</td>
<td>1.2</td>
<td>0.83</td>
</tr>
<tr>
<td>4</td>
<td>0.8</td>
<td>0.63</td>
</tr>
<tr>
<td>9</td>
<td>0.5</td>
<td>0.30</td>
</tr>
<tr>
<td>12</td>
<td>0.6</td>
<td>0.89</td>
</tr>
</tbody>
</table>

### Table 2: Descriptive statistics for Gingival index of test and control groups

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Test Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>0</td>
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<td>0.45</td>
</tr>
<tr>
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<td>0.9</td>
<td>0.57</td>
</tr>
<tr>
<td>8</td>
<td>0.8</td>
<td>0.45</td>
</tr>
<tr>
<td>12</td>
<td>0.6</td>
<td>0.55</td>
</tr>
</tbody>
</table>
Table 3: Descriptive statistics for Bleeding on Probing of test and control groups (%)

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Test Group</th>
<th></th>
<th>Control Group</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Males</td>
<td>Females</td>
</tr>
<tr>
<td>0</td>
<td>18</td>
<td>14</td>
<td>20</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>32</td>
<td>34</td>
<td>13</td>
<td>18</td>
</tr>
<tr>
<td>4</td>
<td>23</td>
<td>19</td>
<td>18</td>
<td>17</td>
</tr>
<tr>
<td>8</td>
<td>17</td>
<td>18</td>
<td>19</td>
<td>14</td>
</tr>
<tr>
<td>12</td>
<td>19</td>
<td>19</td>
<td>18</td>
<td>17</td>
</tr>
</tbody>
</table>

DISCUSSION

The effectiveness of oral hygiene program in maintaining adequate dental and periodontal health has been demonstrated excellent results which obtained showing an extremely low plaque accumulation and only minute signs of gingival inflammation at baseline visit. This result was not surprising since PLI scores were mostly in linear relationship with GI scores (16).

It had been noticed that the PLI and GI scores in control group remain within the same limit during the period of the study while there was a slight increase in PLI and GI scores in test group two weeks after placement of the appliance and then the score decrease gradually during the period of the study and had returned to a level close to that found at the base line examination this would indicate that the effectiveness of the program of oral hygiene education on plaque removal and the slight increase of the scores in the beginning of the study was a result of impaired access to the tooth surface with the tooth brush also be attributed to mechanical injury caused by subgingival placement of the orthodontic bands (16).

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Orthodontics, Pedodontics and Preventive Dentistry 69
Nine–year cohort study to predict caries in permanent teeth from caries in primary teeth in the same individuals

Wesal A. Al-Obaidi, B.D.S., M.Sc.(1)

ABSTRACT
Background: Prevalence and severity of dental caries vary in different populations and fluctuate with time. Past caries experience is probably the most common used factor in the assessment of caries risk. The aim of this study was to determine whether caries status of the primary dentition can be used to predict caries in the permanent dentition.

Materials and methods: A sample of 128 kindergarten children of 4-5 years old were examined for primary teeth caries experience in the baseline study based on WHO criteria, then re-examined after 8 years to assess the caries experience in permanent teeth.

Results: Statistically significant associations were observed between the caries experience in primary and permanent teeth by using different indicators. The sensitivity was found to be higher than specificity, while positive and negative predictive values were 81% and 66% respectively.

Conclusion: The primary teeth caries experience play an important role in predicting permanent teeth caries. More attention was suggested to be paid to the children with more primary teeth decayed.

Keywords: Predict dental caries, primary permanent dentition.

INTRODUCTION
The early years of life are considered to be of great importance in the prevention of oral diseases (1). It is valuable to the parents and to the clinician in dental diagnosis to know whether the prevalence of caries lesion in primary teeth permits one to predict future caries activity in the permanent teeth. Clinical signs and history are as important as the tests for caries risks in the prediction and assessing of the main causes of caries. Past caries experience continues to be the best predictor of future caries in children (2-4). Few authors stated that the dental status of primary teeth may be reflected in the permanent dentition (6-8). There are no previous Iraqi studies available regarding predictions of dental caries. Therefore, this study was planned to investigate the caries experience in primary teeth as a predictor for future caries in permanent teeth in the same individuals, such knowledge aids in planning dental preventive program and to be a baseline data.

MATERIALS AND METHODS
A total of 150 kindergarten children, 4-5 years old were examined for dental caries in primary teeth in the baseline study using dental probes and mirrors. The examination was registered according to both surface and tooth.

Only 128 children were available for re-examination after 8 years when their ages became 13-14 years to estimate caries experience for permanent teeth. The rest were missed, therefore their baseline data were excluded. The 128 children were subject to data analysis.

The examinations were done using the same WHO diagnostic criteria 1997 (9) and under the same physical conditions. No radiographs were taken. A particularly unique aspect to this project was that it was longitudinal, that is, the same children were examined in comparing the experiences between primary and permanent teeth. Correlation coefficient was applied for statistical analysis. Sensitivity, specificity, positive predictive value and negative predictive values were calculated (10, 11).

RESULTS
Table 1 demonstrates the primary and permanent teeth caries experience. Table 2 shows the distribution of children by caries in primary and permanent teeth. It was found that only 3.1% of the children did not have dental caries in both sets of dentition while 78.1% had. However, the sensitivity was found to be 98%, while the specificity was 15%, positive predictive value was equal to 81% and the negative predictive value was equal to 66%.

The correlation coefficient between caries experience in primary and permanent teeth were estimated. Positive correlations were found between different variables which were statistically significant except for M/m.

(1) Assistant professor, Department of Pedodontic and Preventive Dentistry, Dental College, University of Baghdad.
component. The association between FT/ft could not be calculated because ft=zero (Tables 3-4). The relation between caries experience in primary and permanent teeth was illustrated in Table 5. In general, the means of caries experience of permanent teeth were higher than that for primary teeth, especially, at the high risk group.

**Table 1: Caries experience (mean±SD) in primary and permanent teeth**

<table>
<thead>
<tr>
<th>Caries experience</th>
<th>Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>dmft</td>
<td>4.95</td>
</tr>
<tr>
<td>DMFT</td>
<td>6.2</td>
</tr>
<tr>
<td>dmf</td>
<td>7.7</td>
</tr>
<tr>
<td>DMFS</td>
<td>8.64</td>
</tr>
<tr>
<td>dmfs(E)</td>
<td>2.6</td>
</tr>
<tr>
<td>dmfs(DE)</td>
<td>5.07</td>
</tr>
<tr>
<td>DMFS(sixes)</td>
<td>4.96</td>
</tr>
</tbody>
</table>

**Table 2: Distribution of children by caries in primary and permanent teeth**

<table>
<thead>
<tr>
<th>DMFT</th>
<th>+No. %</th>
<th>−No. %</th>
<th>No. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>No.</td>
<td>100</td>
<td>22</td>
<td>122</td>
</tr>
<tr>
<td>%</td>
<td>78.1</td>
<td>17.2</td>
<td>95.3</td>
</tr>
<tr>
<td>Total</td>
<td>102</td>
<td>26</td>
<td>128</td>
</tr>
<tr>
<td>%</td>
<td>79.7</td>
<td>20.3</td>
<td>100</td>
</tr>
</tbody>
</table>

**Table 3: Spearman correlation coefficients between caries experience in primary and permanent teeth**

<table>
<thead>
<tr>
<th>DMFS</th>
<th>All Teeth</th>
<th>1st Molars (6)</th>
<th>DMFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>r</td>
<td>0.38*</td>
<td>P = 0.0001</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>0.32*</td>
<td>P = 0.0001</td>
<td></td>
</tr>
<tr>
<td>2nd Molars E</td>
<td>r = 0.29*</td>
<td>P = 0.001</td>
<td>0.32*</td>
</tr>
<tr>
<td>Molars DE</td>
<td>r = 0.38*</td>
<td>P = 0.0001</td>
<td></td>
</tr>
<tr>
<td>dmft</td>
<td>r = 0.46*</td>
<td>P = 0.0001</td>
<td></td>
</tr>
</tbody>
</table>

* Highly significant

**Table 4: Spearman correlation coefficients between the DMF/dmf components in primary and permanent teeth**

<table>
<thead>
<tr>
<th></th>
<th>r</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>dt</td>
<td>0.47*</td>
<td>0.0001</td>
</tr>
<tr>
<td>DT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ds</td>
<td>0.39*</td>
<td>0.0001</td>
</tr>
<tr>
<td>DS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>mt</td>
<td>0.01</td>
<td>0.87</td>
</tr>
<tr>
<td>MT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ms</td>
<td>0.12</td>
<td>0.17</td>
</tr>
<tr>
<td>MS</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Highly significant

**Table 5: Primary teeth caries experience in relation to permanent teeth caries experience**

<table>
<thead>
<tr>
<th>Dmft</th>
<th>No.</th>
<th>DMFT Mean±SD</th>
<th>Dmfs</th>
<th>No.</th>
<th>DMFS Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>26</td>
<td>3.5</td>
<td>0</td>
<td>26</td>
<td>4.8</td>
</tr>
<tr>
<td>1-3</td>
<td>24</td>
<td>5.7</td>
<td>1-4</td>
<td>30</td>
<td>8.1</td>
</tr>
<tr>
<td>4-6</td>
<td>42</td>
<td>6.1</td>
<td>5-9</td>
<td>34</td>
<td>9.2</td>
</tr>
<tr>
<td>7-9</td>
<td>18</td>
<td>7.8</td>
<td>10-15</td>
<td>20</td>
<td>8.3</td>
</tr>
<tr>
<td>≥10</td>
<td>18</td>
<td>9.3</td>
<td>≥16</td>
<td>18</td>
<td>14.2</td>
</tr>
</tbody>
</table>

**DISCUSSION**

Although different indicators were used, statistically there was an association between caries in primary and permanent teeth with the highest correlation coefficient value for dmft/DMFT and dt/DT. The weak association between m/M component may be attributed to the dental treatment knowledge. The association result was in accordance with other studies (2, 6- 8, 12) the latter was a cross sectional study. A positive correlation between caries in primary teeth and caries in the first permanent molars was in agreement with many previous studies (6, 13, 14).

A high severity of dental caries was found for both primary and permanent dentitions. The higher permanent teeth caries prevalence than primary teeth caries prevalence may be due to the long time exposure to the oral environment. More than half of the severity of primary teeth was related to the posterior teeth. On the other hand, nearly half of the severity of the permanent teeth decay was related to the sixes, which may be attributed to the earliest eruption time of the sixes, besides, generally, anatomical features differ from that of the anterior teeth (15). The study showed that the sensitivity was very high which means a high accuracy to correctly identify disease from a diseased
population \(^{(11)}\). Besides, a high positive predictive value was recorded. This result is in accordance with previous studies \(^{(7,16)}\). In spite of the low value recorded for the specificity, but clinically it is more important to know how often disease is absent when the test results are negative \(^{(11)}\). Therefore, the negative predictive value was estimated which was 66\% a test can be trusted.

This prospective study demonstrated that caries status in the primary teeth can be used as a risk indicator for predicting caries in the permanent teeth. The dental profession has the tools to prevent dental caries, increasing the importance of dental sealants and fluoride treatments for decay prevention to the high risk groups for permanent teeth decay.

REFERENCES

Salivary Candida albicans in relation to oral health status among 4-5 years old children in Baghdad city

Zaheda J. Al-Jboori B.D.S., M.Sc. (1)
Wesal A. Al-Obaidi B.D.S., M.Sc. (2)
Ahlam T. Al-Mashhadani B.D.S., M.Sc. (2)

ABSTRACT

Background: Candida albicans is a common inhabitant of human oral cavity. The aim of the present study was to investigate the relation between Candida albicans counts in the stimulated saliva and caries experience, PlI, GI, salivary flow rate and pH.

Materials and methods: A sample of 100 children 4-5 years old was examined for dmfs according to WHO criteria. Salivary samples were collected. PlI, GI, salivary flow rate and pH were estimated. Candida count was enumerated 48 hours after aerobic incubation at 37°C.

Results: Salivary Candida albicans was isolated from about 25% of children. Mean Candida albicans was higher among females than that among males. Levels of Candida albicans were found to be enhancing with increasing dental caries and with reducing salivary flow rate and pH. The mean count of candida albicans was higher in mild stage of PlI and GI in both sexes.

Conclusion: Candida albicans is prevalent in a low percentage among children.

Keywords: Candida albicans, saliva, oral health, children.

INTRODUCTION

Candida albicans is responsible for a wide spectrum of diseases, ranging from superficial mucosal infection to fatal systemic involvement (1). Candida albicans is a common inhabitant of human oral cavity and its opportunistic pathogens (2). It invades the mucosa only when there is a changing in the oral environment or state of resistance, such changes can be brought about by the administration of antibiotics, xerostomia or systemic diseases. A low pH in the oral cavity due to sparse secretion of saliva promotes the growth of Candida albicans (3). The value of salivary yeasts in caries prediction has been little studied. Pienihakkinen et al evaluated the caries predictive value of salivary counts of Lactobacilli and yeasts (Candida species) in 6-11 years old children over a period of three years (4). The predictive power was somewhat higher than that in studies using Lactobacilli alone, and salivary yeasts were better predictors than Lactobacilli (5).

There is no available Iraqi study that investigated the relation between salivary Candida albicans and oral health in children.

The aim of this study was to determine the relationship between salivary Candida albicans and dental caries, salivary flow rate and pH in addition to gingival condition and oral hygiene status among a group of children in Baghdad to obtain more information related to this subject.

MATERIALS AND METHODS

The sample was composed of 100 children with an age of 4-5 years old of both sexes. The children were with no history of any systemic disease or drug intake. Oral examination was carried out by using sickle shaped probe (No.00) and dental mirror (No.4) with artificial light source under standardized condition. Plaque index (6) was used for assessment of oral hygiene and gingival index (7) was used for assessment of gingival condition. Diagnosis and recording of dental caries according to the criteria of WHO (8).

Salivary samples were obtained at 10-12 a.m., about two hours after breakfast. A piece of paraffin wax was chewed for 2 min. and the saliva collected was expecturated, then the paraffin wax was chewed for another 2 min. and the saliva collected in a sterile graduated vials. Immediately after collection, the salivary pH was estimated using pH meter (type CG 701 W. Germany). Then the flow rate was calculated and expressed as ml/min. Within 2 hours, saliva samples were agitated, dispersed and ten fold serial dilutions were prepared. An inoculum of (0.1 ml) was spreaded (in duplicate) on Sabouraud agar (Difco) to which
sodium benzyle penicillin 1.5 mg/ml and streptomycin sulfate 5mg/m had been added to inhibit bacterial growth. Candida count was enumerated after 48 hours aerobic incubation at 37°C. Candida colonies were identified by morphology and Gram’s staining. Statistical analyses were performed using Student’s t-test.

RESULTS

The study sample composed of 100 children (58 boys and 42 girls). Table 1 shows the occurrence of Candida albicans in the total sample. It was found that the (+ve) occurrence of Candida albicans was 18.9% in boys and 33.3% in girls. Table 2 illustrates the relationship between (PII, GI, salivary flow rate and pH) with the occurrence of Candida albicans. Although there were differences between presence or absence of Candida albicans and other variables but they were not significant (p>0.05).

Figure 1 demonstrates the relationship between dmfs index (decay, missing and filling surface) with the mean counts of Candida albicans, which was the highest in children with dmfs > 10. Severity of plaque index (PII) according to the presence or absence of Candida albicans in both sexes was shown in Figure 2, the mean counts of Candida albicans was the highest in the mild stage of PII for both genders. However this was nearly similar to the gingival index (GI) as the highest level of Candida albicans count was found in the normal gingival for girls and mild stage for boys (Figure 3).

The mean count of Candida albicans was increased with reducing salivary flow rate in both genders (Figure 4). However the same result was found for salivary pH as it was decreased with enhancing Candida albicans count (Figure 5).

DISCUSSION

Candida has the ability to colonize different oral surfaces and a variety of factors predispose the host for Candida colonization and subsequent clearance or penetration and infection. Candida albicans isolated in about 25% of children in the present study which was lower than the rate found by other study among children under 6 years of age which involved infants also it was lower than Al-Jboori study which estimated the prevalence among old ages which may be due to the fact that old ages and infancy are more prone to Candida or may be due to the difference in the sampling techniques. The prevalence of Candida albican among female was higher than that among males. This result was in accordance with Al-Jboori study. Results of this study showed that the growth of Candida albicans was enhanced with increasing dental caries, this could be due to that open carious lesions were reported to favor the growth of Candida albicans as these cavities may lead to food impaction and will act as a hidden area that provide a good nourishment or Candida albicans.

The present study revealed an increase in Candida level for both genders in mild stage of plaque and gingival indices, which might be due to that salivary counts of Candida albicans and other microorganisms were significantly intercorrelated, it is likely that intercorrelation of these microorganisms are due to their acidogencity and acidurity as Candida affected by some strains of Streptococci by competing for attachment sites.

In accordance to previous reports enhanced Candidal growth in saliva with reducing salivary flow rate and pH had been observed in this study, which could be explained by the fact that Candida albicans is well tolerated to acidity as their growth in whole saliva is dependent upon the presence of an exogenous carbohydrate source and this growth is accompanied by acid production and pH drop. However, further studies are needed in order to confirm good information concerning this subject.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Yes</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>11</td>
<td>18.9</td>
</tr>
<tr>
<td>Females</td>
<td>14</td>
<td>33.3</td>
</tr>
<tr>
<td>Both</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

Table 1: The occurrence of Candida Albicans in total sample
Table 2: Relationship between occurrence of Candida Albicans and other variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>+ve Occurrence of Candida</th>
<th>-ve Occurrence Candida</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean* ± SD</td>
<td>Mean* ± SD</td>
</tr>
<tr>
<td>PLI</td>
<td>1.91 ± 0.55</td>
<td>1.77 ± 0.44</td>
</tr>
<tr>
<td>G.I</td>
<td>0.83 ± 0.36</td>
<td>0.80 ± 0.38</td>
</tr>
<tr>
<td>Salivary Flow rate</td>
<td>1.66 ± 0.40</td>
<td>1.65 ± 0.34</td>
</tr>
<tr>
<td>Salivary PH</td>
<td>7.20 ± 0.50</td>
<td>7.10 ± 0.33</td>
</tr>
</tbody>
</table>

* The values expressed at level of $10^3$ cfu/ml saliva

**Figure 1: Dmfs index in relation to Candida Albicans**

* The values expressed at level of $10^3$ cfu/ml saliva

**Figure 2: Severity of PLI in Relation to Candida Albicans**

* The values expressed at level of $10^3$ cfu/ml saliva
Figure 3: Severity of GI in relation to Candida Albicans
* The values expressed at level of $10^3$ cfu/ml saliva

Figure 4: Salivary flow rate in relation to Candida Albicans
* The values expressed at level of $10^3$ cfu/ml saliva

Figure 5: Salivary pH in Relation to Candida Albicans
* The values expressed at level of $10^3$ cfu/ml saliva
REFERENCES

Orthodontic treatment need of Kurdish teenagers

Akram F. Al-Huwaizi BDS, MSc, PhD(1)
Tara Ali Rasheed BDS, MSc (2)

ABSTRACT
Background: This oral health survey aimed to determine the orthodontic treatment need in Sulaimania governorate in relation to gender and residency.

Subjects and methods: The sample consisted of 998 Kurdish intermediate school students aged 13 years collected from Sulaimania city and five surrounding small villages. A clinical examination was used to determine the orthodontic treatment need according to the Dental Aesthetic Index (DAI).

Results: The registered DAI scores ranged between 13 and 65 with a mean of 25.43, according to these scores, 58.6% of the sample were found to have no or slight treatment need, 18.5% with treatment elective, 12.5% with treatment highly desirable, and 10.3% with very severe (handicapping) malocclusion and treatment mandatory. Highly desirable or mandatory treatment need (DAI \geq 31) was found similarly in males (23.2%) and females (22.6%), but noticeably more in rurals (25.1%) than in urban (20.6%).

Conclusions: The prevalence of malocclusion in Kurds is similar to that of Arabs.

Keywords: Angle classification, molar relation, overjet, overbite, Kurdish (J Bagh Coll Dentistry 2006; 18(3)78-84).

INTRODUCTION
Most people undergo orthodontic treatment to improve their dental appearance. In relation to facial aesthetics it has been shown that, from the point of view of the patient, teeth were second in importance only to background facial appearance. Most individuals who have had orthodontic treatment feel that they have benefited, even though dramatic changes in facial appearance are not always evident.

During the 1970s, the importance of psychological factors in the assessment of malocclusion was acknowledged in the USA and internationally. In response to the demand for an orthodontic index that includes psychosocial criteria in assessing need for orthodontic care and for use in epidemiological surveys, Cons et al approached the index problem from purely the appearance standpoint and developed the DAI. They generally used the opinions of the lay public as to what constituted unacceptable dental arrangements from the aesthetic standpoint, the DAI has been accepted by the WHO as a screening tool and it has two components: a clinical component and an aesthetic component, it links the clinical and aesthetic components mathematically to produce a single score that combines the physical and the esthetic aspects of occlusion.

The DAI regression equation calls for the measured components of the DAI to be multiplied by their regression coefficients (weights), the addition of their products and the addition of a constant number (13) to the total. The resulting sum is the DAI score.

Because the DAI score combines both the esthetic and physical aspects of occlusion, there is no need to use the photographic stimuli that were used in the development of the DAI as a separate measure of esthetic impairment.

After an individual’s score has been calculated, it can be placed on a scale to determine the point at which the score falls between most and least socially acceptable dental appearance. The further a DAI score falls from most acceptable dental appearance the more likely the occlusal condition is both socially and physically handicapping.

The DAI has decision points along the DAI scale defining case severity levels that approximate the judgment of orthodontists. The DAI scores of 25 and below represent normal or minor malocclusions with no or slight treatment need. The DAI scores of 26 through 30 represent definite malocclusions with treatment elective. The DAI scores 30 through 35 represent severe malocclusions with treatment highly desirable. The DAI scores 36 and higher represent very severe or handicapping malocclusions with treatment considered mandatory.

The DAI can be useful in both epidemiological surveys and as a screening device to prioritize subsidized orthodontic
treatment in public programs where resources are insufficient to meet the demand. Epidemiologists need a method for determining unmet need for orthodontic care in populations. The DAI is currently being employed by the World Health Organization (WHO) as an epidemiological tool to assess unmet need for orthodontic care in its International Collaborative Study of Oral Health Outcomes ICS II. (8)

Reliability of the DAI: A DAI score can be obtained intraorally without the use of radiographs in about 2 minutes by trained dental auxiliaries. The reliability of dental auxiliaries in measuring DAI scores was assessed by Cons et al. (5) and Spencer et al. (9) to find that auxiliaries are highly reliable in obtaining DAI scores.

Validity of the DAI: Studies in the United States as well as internationally, showed the validity of the DAI. (9-12)

Since the DAI is based on perceptions of dental aesthetics in the USA, it can be used without modification on other ethnic groups only where perceptions of dental aesthetics are similar to those in the USA. Studies were performed to determine whether perceptions of dental aesthetics as rated by students in eleven diverse groups are similar to those of students in the USA and concluded that these perceptions were very similar to the perceptions of USA students. Therefore the standard DAI can be used internationally without modification. (13-16)

Because Kurds are split up in Iraq, Syria, Iran, Turkey and Azerbaijan, very few epidemiological studies have been carried out on them. Hence, there is no base line data for orthodontic treatment need.

SUBJECTS AND METHODS

The sample consisted of 998 thirteen-year-old students collected from 20 intermediate schools from Sulaimania and surrounding villages according to a multi-stage stratified sampling technique described in detail in an earlier report (17). Half of the students were urban and the other half were rural.

The DAI was chosen in this research because:
1. It is simple.
2. It is reliable. (5,9)
3. It is valid. (9-12)

4. It is relatively fast (about 2-3 minutes for each student). (18)
5. It accounts for both function and aesthetics.
6. It was adopted by the WHO making it a universally accepted index.
7. The DAI scale has decision points differentiating treatment priority.

The DAI is an equation or formula in which ten measured components are multiplied by their regression coefficients (weights). The addition of their products and the addition of a constant number ‘13’ to the total gives the DAI score (Table 1).

The following hypothetical case illustrates the calculation of a DAI score using rounded regression coefficient (weights). Traits present in the hypothetical case include:

<table>
<thead>
<tr>
<th>Trait</th>
<th>Regression Coefficient</th>
<th>DAI Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crowding–mandibular incisal segment only</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Largest irregularity in maxilla is 3mm</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Largest irregularity in mandible is 2mm</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Maxillary overjet is 7mm</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>Molar relation is one full cusp</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Add the constant number ‘13’ to the total</td>
<td>13</td>
<td>13</td>
</tr>
<tr>
<td>The total is the DAI score</td>
<td>39</td>
<td></td>
</tr>
</tbody>
</table>

After the students’ scores were calculated, they were rank-ordered on a continuous scale from 13 and above. The higher the DAI score, the more likely the occlusal condition is both socially and physically handicapping.

The DAI has decision points along the DAI scale defining case severity levels that approximate the judgment of orthodontists (Table 1). All the DAI scores were classified according to these decision points.

Some of the dental orthodontic measurements needed for the dental aesthetic index have been previously described and would be described briefly while other variables have been described in the DAI (5) in a different manner than by Björk et al. (19) and Baume et al. (20) and so will be described in the following text with some detail.

1. Missing visible teeth: This is the number of missing permanent incisor, canine and premolar teeth on the maxillary and mandibular arches. This was done by counting the teeth present starting at the right
second premolar moving forward to the left second premolar. There should be 10 teeth present. If there were less than 10 the difference was the number missing. It was recorded on line 1 of the registration form (Figure 4). A history of all missing anterior teeth was obtained to determine whether extractions were performed to improve aesthetics. If spaces are closed, the missing teeth were not counted.

If a primary tooth was still in position and its successor was not yet erupted, the missing tooth was not counted. If a missing incisor, canine or premolar tooth was replaced by a fixed prosthesis; the missing tooth was not counted.

2. Crowding in the incisal segments of the arch: Both maxillary and mandibular incisal segments were examined for crowding. Crowding in the incisal segment was the condition in which the available space between the right and left canine teeth was insufficient to accommodate all four incisors in normal alignment. Teeth might have been rotated or displaced out of alignment in the arch (Figure 7). The number of incisor segments (each incisal segments consists of four incisors in either the maxillary or mandibular arch) with crowding was recorded as: 0 (no segment crowded), 1 (1 segment crowded), or 2 (2 segments crowded). When in doubt the lower score was assigned. If the four incisors were in proper alignment but either or both canines were displaced, the incisal segment was not marked as crowded.

3. Spacing in the incisal segments of the arch: Both maxillary and mandibular incisal segments were examined for spacing. Spacing in the incisal segment was the condition in which the available space between the right and left canine teeth exceeds that required to accommodate all four incisors in normal alignment. If one or more incisor teeth had proximal surfaces without any interdental contact the segment was recorded as having space. The number of incisal segments in both arches with spacing was recorded as either: 0, 1 or 2. When in doubt the lower score was assigned.

4. Maxillary central diastema: The measurement can be made at any level between the mesial surfaces of the central incisors to the nearest whole millimeter.

5. Largest anterior irregularity on the maxillary arch: Irregularities may either rotations out of, or displacements from, normal alignment (Figure 7). The four incisors were visually scanned to locate the greatest irregularity between adjacent teeth and it was measured using a metric ruler to the nearest whole millimeter (Figure 8). Irregularities may occur with or without crowding. If there was sufficient space for all four incisors in normal alignment but some were rotated or displaced that segment was not be marked as crowded, only the largest irregularity was recorded.

6. Largest anterior irregularity on the mandibular arch: Measurement will be the same as on the maxillary arch except that it was done on the mandibular arch. The greatest irregularity between adjacent teeth on the mandibular arch was located and measured as described before.

7. Anterior maxillary overjet: The largest maxillary overjet was recorded with a metal ruler or vernier to the nearest whole millimeter as mentioned before. This trait was not recorded if all maxillary incisors are missing or in lingual crossbite.

8. Anterior mandibular overjet (negative overjet): This trait was recorded when any mandibular incisor protruded labially to the opposing maxillary incisor (inverted). The largest negative overjet of any of the incisors in the mandibular arch was recorded to the nearest whole millimeter.

If a mandibular incisor was rotated so that one part of the incisal edge was in crossbite (was labial to the maxillary incisor) but another part of the incisal edge was not in crossbite negative overjet was not measured.

9. Vertical anterior open bite: The largest lack of vertical overlap between the opposing pairs of incisors was recorded to the nearest whole millimeter as described before.

10. Antero-posterior molar relation: This assessment most often was based on the relation of the permanent maxillary and mandibular first molars. If the assessment cannot be based on the first molars because one or both are absent, not fully erupted, or misshaped because of extensive decay or fillings, the relations of the permanent canines and premolars are assessed.

The right and left sides are assessed with the teeth in occlusion as described before (Figure 9) and only the side with the largest deviation from normal molar relation was recorded. The score was as follows:
0 = Normal molar relation
1 = Mandibular first molar on either side is half cusp either mesial or distal to the maxillary first molar
2 = Mandibular first molar on either side is one full cusp or more either mesial or distal to the maxillary first molar

When in doubt the lower score was assigned.

Table 1: Treatment need registration form for the Dental Aesthetic Index (DAI)

<table>
<thead>
<tr>
<th>DAI component</th>
<th>Score</th>
<th>Weight</th>
<th>Sum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Missing visible mandibular and maxillary incisor, canine and premolar teeth (No. of teeth)</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Crowding in the incisal segment (Number of crowded segments 0, 1 or 2)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Spacing in the incisal segment (Number of spaced segments 0, 1 or 2)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Maxillary diastema (in mm)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Largest maxillary anterior irregularity (in mm)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Largest mandibular anterior irregularity (in mm)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Anterior maxillary overjet (in mm)</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Anterior mandibular overjet (in mm)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Vertical anterior open bite (in mm)</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Antero-posterior molar relation (0=normal, 1=½ cusp, 2=full cusp)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Total (add lines 0 through 10)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2: Decision points on the DAI scale defining case severity levels that approximate the judgment of orthodontists.

<table>
<thead>
<tr>
<th>DAI scores</th>
<th>Case sensitive level and relative treatment need</th>
</tr>
</thead>
<tbody>
<tr>
<td>13 – 25</td>
<td>Normal or minor malocclusion; No treatment need or slight need</td>
</tr>
<tr>
<td>26 – 30</td>
<td>Definite malocclusion; Treatment elective</td>
</tr>
<tr>
<td>31 - 35</td>
<td>Severe malocclusion; Treatment highly desirable</td>
</tr>
<tr>
<td>36 and higher</td>
<td>Very severe (handicapping) malocclusion; Treatment mandatory</td>
</tr>
</tbody>
</table>

Calibration:

Before the study was started inter-examiner and intra-examiner calibration were performed to ensure the consistent application of the diagnostic criteria. The results showed no statistically significant difference.\(^{(2)}\)

Statistical Analysis:

Entering of data and its analysis was carried out using SPSS 14 program. Student t-test was used to examine the differences between males and females and between urbans and rurals.

P values of 0.05 or more were regarded as statistically insignificant whereas values less than 0.05 were considered as significant and those values less than 0.01 were considered as highly significant.

RESULTS

The total number of examined students was 1020; from which 22 casesheets were excluded because of incomplete or inaccurate information or incorrect age or currently undergoing orthodontic treatment, giving a valid sample of 998; 497 males (249 urbans and 248 rurals) and 501 females (251 urbans and 250 rurals).

The distribution of the scores of the dental aesthetic index (DAI) for the total sample is displayed in table 44 and figure 25 and 26. The lowest DAI score registered in this study was 13 and the highest DAI score registered was 65 and the most commonly registered DAI score was 19 (9.9%) followed by 20 (9%) as shown in table 3.

According to the DAI scores, normal or minor malocclusion with no treatment need or slight need (DAI 13-25) was found in 58.6% of the sample, definite malocclusion with treatment elective (DAI 26-30) in 18.5%, severe malocclusion with treatment highly desirable (DAI 31-35) in 12.5%, and very severe (handicapping) malocclusion with treatment mandatory (DAI ≥36) was found in only 10.3% of the sample.

DAI scores of 31 and more where there is severe malocclusion and treatment is highly desirable or mandatory were found similarly in males (23.2%) and females (22.6%) of the total sample, but more in the rurals (25.1%) than in the urbans (20.6%) as shown in figure 4.

Considering the mean DAI score, rural males showed the highest mean (26.403 ± 10.040mm) followed by rural females (25.704 ± 9.577mm), then urban males (24.880 ± 8.701mm), and lastly urban females (24.745 ± 8.356mm) as shown in table 43 and
DISCUSSION

The only published studies presenting detailed DAI score distribution are Jenny et al. (21) published in more detail in a later paper (12) and Al-Huwaizi. (22,23) The range of DAI score registered was 13 to 65, which is identical to that found by Al-Huwaizi (23) whereas Jenny et al. (12) found a range of 15 to 66.

The most commonly registered DAI scores were 19 (9.9%) and 20 (9%). This was comparable to that of Jenny et al. (12) which was 19 (9.3%) and 21 (6.6%) and that of Al-Huwaizi (23) which was 21 (13.1%). This result showed that the Iraqi and American samples had comparable median, lower and upper limits on the DAI scale showing that the DAI score can be used on the Iraqi population with relatively the same precision as on the American population on whom it was constructed.

According to the DAI scores, 58.6% of the sample were found to have no or slight treatment need, 18.5% with treatment elective, 12.5% with treatment highly desirable, and 10.3% with very severe (handicapping) malocclusion with treatment mandatory. When comparing these results with those found by others (Table 5) our Iraqi sample seems to have lower orthodontic treatment need than that of samples taken from American Whites, Native Americans, New Zealanders or Japanese. However, Otuyemi et al. (24) in his Nigerian sample and Al-Huwaizi (23) in his Iraqi Arab sample reported lower treatment need than that of the present sample. These results support the theory of environmental effect on the presence of malocclusion especially the effect of modernization/industrialization. (25) Also it may be due to the deficiency in orthodontic services in Iraq.

The non-significant difference found in this study agrees with previous studies (22,26,31) but differs from others who found a significant gender difference. (27,30,32)

DAI scores where there is severe malocclusion and treatment is highly desirable or mandatory were found more in the rural sample than in the urban sample. This agrees with the findings of Al-Huwaizi (23) and Esa et al. (30) but contradicts those of Ansai et al. (28) and Baca-Garcia et al. (31) who found that in his sample urban students had significantly higher DAI scores than rural students.

Table 3: Distribution (%) of the total sample according to their DAI scores by residency and gender.

<table>
<thead>
<tr>
<th>DAI score</th>
<th>Urban</th>
<th>Rural</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Males</td>
<td>Females</td>
<td>Total</td>
</tr>
<tr>
<td>13-25</td>
<td>59.8</td>
<td>60.6</td>
<td>60.2</td>
</tr>
<tr>
<td>26-30</td>
<td>19.7</td>
<td>18.7</td>
<td>19.2</td>
</tr>
<tr>
<td>31-35</td>
<td>10.8</td>
<td>12.4</td>
<td>11.6</td>
</tr>
<tr>
<td>36-65</td>
<td>9.6</td>
<td>8.4</td>
<td>9.0</td>
</tr>
<tr>
<td>Total</td>
<td>59.8</td>
<td>60.6</td>
<td>60.2</td>
</tr>
</tbody>
</table>
Table 4: T-tests between both genders and residencies (urban and rural) for DAI score.

<table>
<thead>
<tr>
<th>Gender difference</th>
<th>Residency difference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban</td>
</tr>
<tr>
<td>t value</td>
<td>0.176</td>
</tr>
<tr>
<td>d.f.</td>
<td>498</td>
</tr>
<tr>
<td>p</td>
<td>NS</td>
</tr>
</tbody>
</table>

NS: not significant; * significant (p<0.05)

Figure 1: Distribution of the total sample according to their DAI score.

Figure 2: Distribution of the total sample according to the severity of their DAI scores.

Figure 3: Distribution of DAI scores by residency and gender.

REFERENCES
Table 5: Reported orthodontic treatment need using the DAI

<table>
<thead>
<tr>
<th>Author</th>
<th>Sample</th>
<th>DAI scores (%)</th>
<th>Mean DAI score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jenny et al.</td>
<td>American White Native Americans</td>
<td>133</td>
<td>46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>485</td>
<td>19</td>
</tr>
<tr>
<td>Ansai et al.</td>
<td>Japan</td>
<td>409</td>
<td>32</td>
</tr>
<tr>
<td>Jenny et al.</td>
<td>America</td>
<td>1306</td>
<td>45.7</td>
</tr>
<tr>
<td>Jenny and Cons</td>
<td>America</td>
<td>7500</td>
<td>45.8</td>
</tr>
<tr>
<td>Otuyemi et al.</td>
<td>Nigeria</td>
<td>703</td>
<td>77.4</td>
</tr>
<tr>
<td>Johnson and Harkness</td>
<td>New Zealand</td>
<td>1519</td>
<td>62.6</td>
</tr>
<tr>
<td>Esa et al.</td>
<td>Malaysia</td>
<td>1519</td>
<td>62.6</td>
</tr>
<tr>
<td>Al-Huwaizi</td>
<td>Iraq</td>
<td>6957</td>
<td>65.8</td>
</tr>
<tr>
<td>Baca-Garcia et al.</td>
<td>Spain</td>
<td>744</td>
<td>58.6</td>
</tr>
<tr>
<td>van Wyk and Drummond</td>
<td>South Africa</td>
<td>6142</td>
<td>47.7</td>
</tr>
<tr>
<td>Foster Page and Thomson</td>
<td>New Zealand</td>
<td>430</td>
<td>39.5</td>
</tr>
<tr>
<td>Bernabe E and Flores-Mir</td>
<td>Peru</td>
<td>267</td>
<td>41.9</td>
</tr>
<tr>
<td>Present study</td>
<td>Iraq-Sulaimania</td>
<td>998</td>
<td>58.6</td>
</tr>
</tbody>
</table>

New Member in the Editorial Board

The Journal of Baghdad College of Dentistry is honored to welcome Prof. Gutmann in the editorial board of the journal. He is a very distinguished member in the field of endodontics and we are sure that his presence in the editorial board would enhance the scientific standard of the journal. This is his personal curriculum vitae.


A native of Wisconsin, Dr. James L. Gutmann received his D.D.S. in 1970 from Marquette University School of Dentistry and his Certificate of Advanced Specialty Training in Endodontics from the University of Illinois College of Dentistry.

- After serving two years in the military at Ft. Lee Virginia, he spent one year in full-time private endodontic practice in Springfield Massachusetts.
- Assistant Professor of Endodontics at the Medical College of Virginia in 1975.
- In 1976 he was appointed as Chairman of the Department of Endodontics at the Baltimore College of Dental Surgery, University of Maryland at Baltimore.
- In 1982, he was appointed as a tenured Professor and Chairman of the Department of Endodontics at Baylor College of Dentistry in Dallas Texas.
- In 1992, he was Professor and Director of the Graduate Endodontic Program within the Department of Restorative Sciences at Baylor.
- In 1998 he was awarded an honorary Ph.D. from the University of Athens, Athens, Greece for his contributions to dentistry and endodontics.
- He holds honorary memberships in dental societies in Colombia, Lebanon, Greece, Costa Rica, Mexico, Thailand and South Africa, in addition to memberships in Alpha Sigma Nu National Jesuit Honorary Fraternity, Omicron Kappa Upsilon Dental Honorary Fraternity and Delta Sigma Delta International Dental Fraternity.
- He has presented over 750 lectures, papers, and continuing education courses in the United States and 48 foreign countries on six continents.
- He authored or co-authored over 250 articles in both dental journals and texts that address scientific, research, educational, and clinical topics.
- He received the Distinguished Dental Alumnus Award for 2000 from his alma mater Marquette University School of Dentistry.
- He served as President of the American Association of Endodontists from 2000-2001.
- In 2002 in New Orleans, Dr. Gutmann received the Award of Distinction for Continuing Education Activities from the Academy of Dentistry International and was inducted as a Fellow of the Academy in 2003.
- Recently, he was named as one of the top dentists/endodontists in the greater Dallas/Fort Worth area in “D” Magazine for 2004, 2005 & 2006.
- In 2005 he was awarded an Honorary Professorship at the School of Stomatoloy, Wuhan University, Wuhan, China.
- Presently he is in private practice limited to Endodontics in Dallas, Texas and serves as a Consultant to Dentsply Tulsa Dental. Dr. Gutmann is a Diplomate of the American Board of Endodontics, serves on the Editorial Board of the Journal of the History of Dentistry, Dental Traumatology, and as an Associate Editor of the International Endodontic Journal.
Some societies of dental specialities

Societies of Endodontics
1- American Association of Endodontists (AAE)
   http://www.aae.org/
2- American Board of Endodontics (ABE)
   http://www.aae.org/ABE1.html
3- American Endodontic Society (AES)
   http://www.aesoc.com/
4- Australian Society of Endodontology (ASE)
5- British Endodontic Society (BES)
   http://www.britishendodonticsociety.org/
6- Canadian Academy of Endodontics (CAE)
   http://www.caendo.ca/
7- European Society of Endodontology (ESE)
   http://www.e-s-e.org/
8- Hong Kong Endodontic Society (HKES)
   http://www.hkes.org.hk/
9- Malaysian Endodontic Society (MES)
10- Turkish Endodontics Society
    http://www.turkishendodontics.org/

Societies of Forensic Odontology
1- British Association for Forensic Odontology (BAFO)
   http://www.bafo.org.uk/

Societies of General Dentistry
1- Academy of General Dentistry (AGD)
   http://www.agd.org/

Societies of Oral and Maxillofacial Surgery
1- Academy of Oral Surgery - Chalmers J. Lyons
   http://www.cjlyons.org/
2- American Association of Oral and Maxillofacial Surgeons (AAOMS)
   http://www.aaoms.org/
3- American Board of Oral and Maxillofacial Surgery (ABOMS)
   http://www.aboms.org/
4- American College of Oral and Maxillofacial Surgeons (ACOMS)
   http://www.acoms.org/
5- Association of Oral & Maxillofacial Surgeons of India (AOMSI)
   http://www.aomsi.com/
6- Australian and New Zealand Association of Oral and Maxillofacial Surgeons (ANZAOMS)
   http://www.anzaoms.org/
7- British Association of Oral and Maxillofacial Surgeons (BAOMS)
   http://www.baoms.org.uk/
8- Canadian Association of Oral and Maxillofacial Surgeons (CAOMS)
   http://www.caoms.com/
9-Hellenic Association for Oral and Maxillofacial Surgery (HAOMS)
http://www.haoms.org/
10-International Association of Oral and Maxillofacial Surgeons (IAOMS)
http://www.iaoms.org/
11-Oral and Maxillofacial Surgery Foundation (OMSF)
http://www.omsfoundation.org/

Societies of Oral Diagnosis
1- American Academy of Oral and Maxillofacial Pathology (AAOMP)
   http://www.aaomp.org/
2- American Academy of Oral and Maxillofacial Radiology (AAOMR)
   http://www.aaomr.org/
3- American Academy of Oral Medicine (AAOM)
   http://www.aaom.com/
4- American Board of Oral and Maxillofacial Pathology (ABOMP)
   http://www.abomp.org/
5- American Board of Oral and Maxillofacial Radiology (ABOMR)
   http://www.aaomr.org/
6- Australasian Society of Oral Medicine And Toxicology (ASOMAT)
   http://www.asomat.org/
7- British Society for Oral Medicine (BSOM)
   http://www.bsom.org.uk/
8- European Association for Oral Medicine (EAOM)
   http://www.eastman.ucl.ac.uk/~eaom/
9- European Society for Oral Laser Applications (ESOLA)
   http://www.esola.at/
10- Indian Academy of Oral Medicine and Radiology (IAOMR)
    http://www.iaomr.tripod.com/index.htm
11- Organization for Teachers of Oral Diagnosis (OTOD)
    http://www.otod.org/

Societies of Orthodontics
1- Academy of GP Orthodontics (AGpO)
   http://www.academygportho.com/
2- Academy of Interdisciplinary Dentofacial Therapy (IDT)
   http://www.dental-idt.com/
3- American Association of Orthodontists (AAO)
   http://www.aaortho.org/
4- American Board of Orthodontics (ABO)
   http://www.americanboardortho.com/
5- American Lingual Orthodontics Association (ALOA)
   http://www.ormco.com/lingual/
6- American Orthodontic Society (AOS)
   http://www.orthodontics.com/
7- Asian-Pacific Orthodontic Society (APOS)
   http://www.ap-os.org/
8- Australian Orthodontic Institute (AOI)
9- Australian Society of Orthodontists (ASO)
10- Association of Orthodontists - Singapore
    http://www.aos.org.sg/
11-Association of Philippine Orthodontists (APO)  
http://www.apo.com.ph/
12-British Lingual Orthodontic Society (BLOS)  
http://www.blos.co.uk/
13-British Orthodontic Society (BOS)  
http://www.bos.org.uk/
14-Canadian Association of Orthodontists (CAO)  
http://www.cao-aco.org/
15-Charles H. Tweed International Foundation  
http://www.tweedortho.com/
16-College of Diplomates of the American Board of Orthodontists (CDABO)  
http://www.cdabo.org/
17-Egyptian Orthodontic Society (EOS)  
http://www.egortho.org/
18-European Federation of Orthodontic Specialists Associations (EFOSA)  
http://www.efosa.org/
19-European Federation of Orthodontics (FEO)  
http://www.fco-online.org/
20-European Orthodontic Society (EOS)  
http://www.eoseurope.org/
21-European Society for Lingual Orthodontics (ESLO)  
http://www.eslo.de/
22-Greek Orthodontic Society  
http://www.grortho.gr/
23-New Zealand Association of Orthodontists (NZAO)  
http://www.orthodontists.org.nz/
24-Orthodontic National Group, The  
http://www.orthodontic-ong.co.uk/
25-Orthodontic Society of Ireland (OSI)  
http://www.orthodontics.ie/
26-South African Society of Orthodontists (SASO)  
http://www.saso.co.za/
27-World Federation of Orthodontists (WFO)  
http://www.wfo.org/

Societies of Osseointegration
1-European Association for Osseointegration (EAO)  
http://www.eao.org/

Societies of Pediatric Dentistry
1-American Academy of Pediatric Dentistry (AAPD)  
http://www.aapd.org/
2-American Board of Pediatric Dentistry (ABPD)  
http://www.abpd.org/
3-Korean Academy of Pediatric Dentistry (KAPD)  
http://www.kapd.org/
Researches of the Postgraduate students in the years 2005-2006 in the College of Dentistry

Department of Conservative Dentistry

1-Evaluation of Shear Bond Strength of Composite Resin Bonded to CO₂ Laser-Treated Dentin with Three Different Adhesive Systems
   By: Huda Abbas Abudallah B.D.S
   Supervised by: Prof. Dr. Walid Al-Hashimi B.D.S M.Sc.

2-Assessment of the black seed oil extract as an intracanal medicament (A microbiological, histopathological, and immunological study)
   By: Manhal Abdul-Rahman Majeed B.D.S, M.Sc.
   Supervised by: Prof. Dr. Walid Al-Hashimi
   Prof. Dr. Nidhal Abdul-Muhaymen.

3-Manufacturing and evaluation of refractory die used for direct sintering of ceramic inlay
   By: Abdul Rahman Mohammed Saleh B.D.S., M.Sc.
   Supervised by: Prof. Dr. Ali H. AL-Khafaji B.D.S., M.Sc.D

4-The Influence of Caries Detector Dye On Shear Bond Strength of Dentin Using Two Dentin Adhesive Systems (In vitro study)
   By: Salma Issa Daheem BDS
   Supervised by: Professor Dr. Kholood Safar BDS, MSc

5-The Influence of Different Photo –Activation Methods on the Shear Bond Strength of Composite to Dentin
   By: Sebeha mehdy Kanaan BDS
   Supervised by: Prof. Dr. Inas Issa Al-Rawi BDS, MSc

6-A Comparison of Four Types Inlay Materials Fracture Strength
   By: Wisam Adil Najim B.D.S.
   Supervised by: Professor Ma’an Rasheed Zakria B.D.S., M.S.

7-Development and Assessment of New Restorative Filling Material (Polyphosphonate Glass Ionomer)
   By: Raid Fahim Salman B.D.S., M.Sc.
   Supervised by: Prof. Dr. Ali AL-Khafaji BDS, MSc

8-Assessment of Salvadora Persica (Siwak) Aqueous Extract as an New Endodontic Irrigant in Comparison to Sodium Hypochlorite (Bacteriological, Histopathological, and Immunological Studies)
   By: Abdulla Muhammed Wajeeh Al-Shamma BDS, MSc
   Supervised by: Prof. Dr. Ali H. Al-Khafaji BDS, MSc
   Prof. Dr. Nidhal Abdul-Mohaymen

Department of Prosthetic Dentistry

1- The Significance of Biomimetic CalciumPhosphate Coating on Commercially Pure Titanium and Ti-6Al-7Nb Alloy
   Supervised by: Dr. Salem A.L. Salem Professor B.D.S., H.D.D., Ph.D.
   Dr. Thair L. Al-Zubaydi Scientific Researcher M.Sc., Ph.D.

2- Complete Denture Complaints In Geriatric Patients
   By: Mohammed Riyadh Abdul Jabbar B. D. S.
   Supervised by: Prof. Dr. Mohammed K. AL-Bazirgan B. D. S, M. Sc.
3- Finite Element Stress Analysis and Radiographic Follow-up of mandibular implant retained-overdenture.

PhD
By: Raghdaa Karim Jassim B. D. S, MSc.
Supervised by: Prof. Dr. Ibrahim Khalil Ibrahim BDS, PhD

4- The Effect of Cobalt Chromium and Acrylic Removable Partial Dentures on Taste Sensation

By: Reem Abdul - Rahim Al-Obaidy B.D.S.
Supervised By: Assist. Prof. Dr. Abdul-Jabbar Al-Dahir BDS, PhD

5- Tomographic evaluation of condyle-fossa relation at different Maxillo-Mandibular relationships

By: Tahseen Ali Hussien Al- Obaidi B.D.S.-H.D.D
Supervised by: Prof. Dr. Ibrahim K. Ibrahim BDS, PhD

6- Evaluation of muscular activity of masseter and temporalis muscle of Class I, II,and III subjects at different mandibular positions (comparative electromyographic study).

By: Areej Shihab A. AL-Bayati B.D.S.
Supervised By: Prof. Dr. Ibrahim K. Ibrahim BDS, PhD
Prof. Dr. Fakhir S. AL-Ani

7- Tissues reaction to different types of acrylic denture base resin implants in Golden Hamsters and New Zealand Rabbits
By: Dr. Ziad Telfah AL-Aani B.D.S
Supervised by: Prof. Suza Abdul-Aziz Faraj BDS, MSc
Assist. Prof. Salwa mohammad sharif

Department of Periodontology

1-Periodontal Health Status And Specific Salivary Analysis for Patients with Asthma at Different Treatment Modalities

By: Suzan Ali Salman Alysari B.D.S.
Supervised by: Professor Dr. Khalid B. mirza FDSRCS

2-Measurements of periodontal temperature and its comparison to the crevicular fluid in the assessment of periodontal disease severity

By: Enas Shakir Hamad B.D.S
Supervised by: Assis. Prof. Dr. Maha Shukri BDS, MSc

3-Antiplaque Effect of Mastic Chewing gum

By: Mohammed Shawket Attyia B.D.S
Supervised by: Prof. Khalid Mirza FDSRCS

4-Periodontal Health Status Among Patients With Chronic Renal Failure- (Clinical And Biochemical Study)

By: Harith Fahim Kamil Al-Sahaf B.D.S
Supervised by: Prof. Dr. Khulood Al-Safi BDS, MSc

5-Periodontal health status and Biochemical study of saliva and Gingival Crevicular fluid among Diabetics and non Diabetics (Comparative study)

By: Raghad Fadhil Abaas B.D.S
Supervised by: Assistant Prof. Dr. Leka’a M.Ibrahim BDS, MSc

Department of Oral and Maxillofacial Surgery

1-Comparative Study for the Role of Pepgen P-15 and Algipore on Closure of Oroantral Fistula (Experimental Study)

By: Ali Thabit Salman B.D.S.
Supervised by: Prof. Dr. Khalid Yousef Igzeer M.Sc., F.F.D.R.C.S.I

2- Clinical and Radiographical Evaluation of Amalgam and Mineral Trioxide Aggregate as a Retrograde Filling in Periapical Surgery (A Comparative Study)

By: Mayada Madhi Al-Douri B.D.S.
Supervised by: Assist. Prof. Dr. Anwar A. Al-Saeed B.D.S., M.Sc.

3- Evaluation of gunshot injuries, effects, diagnosis and early management of facial injuries at the present conditions

By: Besme Kamal Ahmed B.D.S.
4- **Limited Mouth Opening Diagnosis & Treatment**  
By: Saleh乔 Jany BDS  
Supervised by: Mohamed Hashim Al-Hashimi FICSM, BDS

5- **Evaluation of Immediate Implant Placement in Fresh Extraction Sockets with and without the Use of Frios Algipore (Clinical and Radiographical study)**  
By: Zeyad Faisal Al-Huwaizi B.D.S.  
Supervised by: Assist. Prof. Dr. Amwar Abdul-Hussain Al-Saeed B.D.S., M.Sc.

6- **Clinical evaluations of complications following the treatment of nasal fractures**  
By: Nagham Hussain Ali B.D.S.  

7- **The role of spiral CT in the management of patients suspected of having orbital blowout fracture.**  
By: Dr. Zainab Saad Abdul-Hussain BDS.  
Supervised by: Prof. Issam A.A. Ali B.D.S., M.Sc, F.F.D.S.R.C.S.I

8- **Crestal bone changes around dental implant (computerized analysis)**  
By: Afyaa Sahib Diab B.D.S  
Supervised By: Prof. Dr. Khalid Yousif Igzeer FFDSRC SI

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**Department of Orthodontics**

1- **The Effect of Bracket Ligation Methods on Canine Retraction (An In-Vitro Study)**  
By: Esráa Salman Jassim B.D.S.  
Supervised by: Assist. Prof. Akram Faisal Al-Huwaizi , BDS, MSc, PhD

2- **Evaluation of Shear Bond Strength of Bonded Molar Tubes (In Vitro Comparative Study)**  
By: Layth Mohammad Kareem Karam B. D. S.  
Supervised by: Prof. Dr. Nidhal H. Ghaib BDS, MSc

3- **The Effect of Fluoride Prophylactic Agents on Load Deflection of Nickel Titanium Orthodontic Wires (An in vitro study)**  
By: Mustafà Monim AL-Khatieeb B.D.S  
Supervised By: Prof. Dr. Fakhri Abd Ali B.D.S, M.Sc.

4- **The Relationship between Mandibular Antegoni al Notch Depth and Craniofacial Morphology in Iraqi Sample Aged 18 – 25 Years**  
By: Ali Mohammad Hameed AL-Attar B.D.S.  

5- **Pharmacological control of orthodontic pain (a clinical study)**  
By: Thaira Abbas Jassim B.D.S.  
Supervised by: Prof. Dr. Nidhal H. Ghaib BDS, MSc  
Assist. Prof. Dr. Abdul Rasoul M. Wayyes

6- **The Effect of Pulsed Electro-magnetic Field on Orthodontic Tooth Movement (An Experimental Study)**  
By: Samir Ramzi Matti Halabiya BDS  
Supervised by: Prof. Dr. Fakhri Abid Ali B.D.S, M.Sc.  
Assist. Prof. Dr. Balkees Taha Garib B.D.S, M.Sc., Ph.D.

7- **The Effect of Fluoride Prophylactic Agents on Load Deflection of Nickel Titanium Orthodontic Wires (An in vitro study)**  
By: Mustafà Monim AL-Khatieeb B.D.S  
Supervised By: Prof. Dr. Fakhri Abd Ali B.D.S, M.Sc.

8- **Contributing factors of median diastema in Iraqi adults**  
By: Zahraa Mousa Hashim B.D.S  
Supervised by: Prof. Dr. Fakhri Abd Ali BDS, MSc

9- **Rate of Force Decay for Different Types of Extra-Oral Elastics(A Comparative in Vitro Study)**  
By: Anas K. Al-Qasim B.D.S  
Supervised by: Prof. Dr. Nidhal H. Ghaib B.D.S, M.Sc.

10- **Force Degradation of Elastic ligatures during Chlorhexidine Application "In Vitro Study "**  
By: Ahmed Jabbar Al-Khafaji B. D. S.  
Supervised by: Assist. Prof. Dr. Nagham Al- Muthaffar BDS, MSc

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11- Mandibular Symmetry In Patients Sample Aged 16 - 31 Years [Clinical, Cross-Sectional Study]
   By: Zina Zuhair Al-Azawi B. D. S.
   Supervised by: Assist. Prof. Dr. Nidhal H. Ghaib BDS, MSc
   Prof. Dr. Ali F. Al-Zubaidee FFDSRCSCI

12- The Relationship between Mandibular Antegonial Notch Depth and Craniofacial Morphology in Iraqi Sample Aged 18 – 25 Years
   By: Ali Mohammad Hameed AL-Attar B.D.S.

13- A Rhinomanometric and Cephalometric Assessment of Dentofacial Patterns in A Sample Aged (9-18) Years with Nasal Obstruction (A Comparative Study).
   By: Rima Imad Kamil Kesso B.D.S.
   Supervised By: Prof. Dr. Ausama AL-Mulla,BDS, PhD
   Prof. Dr. Nabeel AL-Mukhtar.

14- The microhardness measurement and polarized light microscopic evaluation for enamel surface after debonding of brackets using different orthodontic adhesive materials (A comparative in vitro study)
   By: Saad Ali Al-Masshadany B. D. S.
   Supervised by: Assist. Prof. Dr. Nidhal H. Ghaib BDS, MSc

Department of Pedodontics and Preventive Dentistry

1- A comparison of two non-vital bleaching methods on discolored teeth and their effect on microleakage of composite restorations in children (in vitro study)
   Pediatric Dentistry
   By: Eman R. Kalloub B.D.S
   Supervised by: Prof. Dr. Ban Ali Salih B.D.S. M.Sc.

2- Evaluation of the Efficacy of New Modified Carisolv™ Gel on Removal of Artificially Induced Caries-Like Lesion in Primary Teeth (In vitro Study)
   Pediatric Dentistry
   By: Treeva Abdul–Kadir Ali B.D.S.
   Supervised by:Prof Dr. Zainab A.A. Al-Dahan B.D.S., M.Sc.

3- Evaluation of the antibacterial effect of some endodontic materials, irrigants, and antibiotics on open apex root canals bacterial isolates (In Vitro study)
   Pediatric Dentistry
   By: Maha Abdul-Kareem AL-Mashhadany B.D.S
   Supervised by: Prof. Dr. Ban A Salih. BDS, MSc
   Assist. Prof.Talib. K ALMofarji

4- Effect of fixed orthodontic appliances on oral microflora and the caries activity in children.
   Pediatric Dentistry
   By: Zainab Abbas AL-Shami AL-Shaibani B.D.S.
   Supervised By: Prof. Dr. Zainab AL-Dahan BDS, MSc
   Assist. Prof. Abbas S. AL-Mizrakchi MSc, PhD

5- Oral Health Status of 10-12 Years Old Insulin-Dependent Diabetic Patients in Relation to Salivary Streptococci and Mutans Streptococci
   Preventive Dentistry
   By: Zaid Naji Al-Shaibani B.D.S
   Supervised By: Ass.Prof.Dr.Lamia Al- Azzawi B.D.S., M.Sc., Ph.D
   Dr.Husham AL-Eedani F.I.C.M.S.

6- Oral health status, treatment needs among Behcet's disease patients in comparison to healthy controls in Iraq.
   Preventive Dentistry
   By: Hara Al-Hadithi BDS

7- Sucrose taste functions and dental caries among 15-years old students in the province of Baghdad-Iraq.
   Preventive Dentistry
   BY: Wissam Mohammad Al-Ugaili BDS
Department of Oral Diagnosis

1- Comparison between diagnostic accuracy of panoramic and bite-wing radiography for the detection of proximal caries in posterior caries in posterior teeth of Iraqi sample.
   Oral Radiology
   By: Fatin Khudheir BDS
   Supervised By: Prof. Dr. Widad Al-Sahhar BDS, MSc

2- Differential expression of intracellular apoptotic signalling molecules (Procaspase-3, Fas, Fasligand, Nuclear Factor kB and C-myc)
   Oral Pathology (PhD)
   By: Muna Salih Merza B.D.S., M.Sc.
   Supervised by: Prof. Dr. Nazar G. Al-Talabani BDS, PhD
   Prof. Dr. Faiza A. Al-Rawi

3- Glycoconjugates profile in hyperplastic, dysplastic and neoplastic lesions of the oral mucosa.
   Oral Pathology (PhD)
   By: Nadia Sabri Yass BDS, MSc
   Supervisors: Prof. Suad A. Al-Ani BDS, MSc
   Prof. Anam R. Al-Salihi

4- Oral health status of Iraqi diabetic patients salivary and microbial analyses
   Oral Medicine (PhD)
   By: Abdullah Ibrahim Hamad Al-Sagri B.D.S., M. Sc.
   Supervised By: Assist. Prof. Dr. Riyadh Othman Alkaisi B.D.S., M.Sc., Ph. D.

5- Serum and Salivary levels of proinflammatory cytokines and polyamines as potential biomarkers in the diagnosis of oral squamous cell carcinoma
   Oral Medicine (PhD)
   By: Shanaz Mohammad Gaphor B.D.S., M.Sc.
   Supervised by: Prof. Dr. Nazar G. Al-Talabani BDS, PhD
   Prof. Dr. Abdul-Wahab R. Hamad

6- Evaluation of proliferation (by KI-67 and AgNOR), apoptosis (by proto-oncogen BCL2 protein and in situ detection of apoptotic DNA fragmentation tunnel assay) and angiogenesis (by vascular endothelial growth factor and CD34 endothelial cell marker) in ameloblastoma.
   Oral Pathology (PhD)
   Supervised by: Ass. Professor Dr. Balkees T. Garib B.D.S., M.Sc., Ph.D
   Dr. Alaa G. Hussein M.Sc. F.I.C.M.S

7- Effects of Diphenhydramine Hydrochloride and Lidocaine Hydrochloride Injection on Oral Mucosa (Histological, Histochemical and Ultrastructural Comparative Study on Rabbits).
   Oral Histology and Biology (PhD)
   Supervised by: Prof. Dr. Athraa Y. Higazi BDS, MSc, PhD
   Prof. Dr. Ali F. Al-Zubaidy FFDSRCRCSI

8- Proinflammatory cytokines, inflammatory markers, some biochemical parameters and oral indices in Type I diabetic children and adolescents.
   Oral Medicine (PhD).
   By: Sura Ali B.D.S., M.Sc.
   Supervised by: Prof. Dr. Suad Al-Ani BDS, MSc
   Assist Prof. Dr. Ibtisam Al-Oubosi

9- The shape, appearance and position of the mental foramen on panoramic radiograph in a selected baghdadi subjects.
   Dental Radiology
   By: Samier Hatem Abdulhaleem B.D.S.
   Supervisor: Prof. Dr. Wedad F. Al-Sahhar BDS, MSc
10- Cytological, cytogenetic and Biochemical analysis of Behçet’s disease and recurrent aphthous ulceration in Iraqi patients.
Oral medicine (PhD).
By: Fawaz Dawood Al Aswad M.Sc.
Supervised By: Prof. Dr. Nazar G. A. Talabani BDS, PhD
Dr. Nahi Y. Yaseen.

11- An Analytical and Histological Study of a New Root Canal Filling Material Composed of Iraqi Propolis, Beeswax and Vanillin
Oral Pathology (PhD)
By: Manar Mudhafar Al-Nema B.D.S, M. Sc.
Supervised by: Professor Dr. Nazar G. A. Al-Talabani BDS, PhD
Dr. Tahani A. G. Al-Sandook