Validity & reliability of cephalometric measurements in traditional versus digitized cephalometry

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Abstract

Aim: Film digitization is generally used to prevent potential damage or loss of original films. The method of film processing has been changing from wet to dry processing due to recent trends toward digitization of medical imaging.

Materials & Methods: 50 Lateral cephalometric radiograms were used in this study. All radiographs were viewed under standardized conditions & traced. Eleven landmarks were selected to calculate 12 variables (9 angles & 3 linear measurements). These traced radiographs were photographed when digitized using scan jet scanner & the same variables were measured using Dimaxis pro\ classic imaging software.

Results: There were no statistically significant differences between traditional & digitized Linear & angular measurements except for upper incisor-Frankfort plane angle & upper incisor-lower incisor angle.

Conclusion: Angular & linear measurements in digital images were comparable with that of original radiograph & are clinically acceptable. This will substantiate the benefits of digitized cephalometry in term of reliability of cephalometric analysis.

Keywords: Digital Imaging, Cephalometry, Film digitization

Introduction

Radiographs are used not only in diagnosis, but also for various purposes, such as education, presentation & recording medical histories. In these cases, film digitization is generally used to prevent potential damage or loss of original films.

The storage of cephalometric radiographs requires space & staff-time; this could be reduced with the archiving of digital images. Archiving cephalometric radiographs would be of particular benefit in studying craniofacial growth or assessing the effect of treatment, where large numbers of radiographs analyzed.

Computer-based filing systems for patient's records have the benefits of image storage, transmission & processing. Computer-aided cephalometric analysis on digitized cephalogram could substantially reduce the potential mechanical errors, since it can totally eliminate it in drawing line between landmarks & in measurements with protractor. However, the inconsistency in landmark identification is still an important source of random error in computer-aided digital cephalometry. For digitized cephalometry to be better tool in clinical orthodontics, the cephalometric analysis, represented by widely used linear & angular measurements, must be as comparable & reliable as it is on conventional
radiographic film.

The aim of this study was to measure the effect of film digitization on reliability & validity of some angular & linear cephalometric measurements.

Materials and methods

Fifty lateral cephalometric radiograms were used in this study. They were selected from the records of the post-graduate clinic of the orthodontic department in college of dentistry, university of Baghdad.

The selected radiographs were of good quality to get better digitization, providing that all radiograms having a standardized millimetric ruler.

All radiographs were viewed under standardized conditions & traced on to acetate overlays with 0.3mm HB lead pencil.

Eleven landmarks were selected in this study as shown in fig. (1)& table (1).

From these landmarks (12) variable were calculated (9 angles & 3 linear measurements)

In both horizontal & vertical planes as shown in table (2).

Image capturing

Radiographs are mounted on a light box & captured using photographic camera (Minolta SLR). The camera & radiographs are enclosed in a light-proof box to ensure maximum contrast during image capturing.

Two photographs were taken for the cephalograms, one with tracing & the other without

Tracing using a stand in a fixed distance (1 meter).

The processed photographic color films (negative) were then converted into digital (positive) images through using HP scanjet 5530 photosmart scanner at 200 dpi resolution.

The captured images are then manipulated by the computer using Dimaxis proclassic imaging software (version 3.2.1 ) for landmarks identification & variable calculations.

The results of measurements were transferred to a Microsoft Excel XP™ spreadsheet program.

The mean & standard deviation of some angular & linear parameters between the original films & digitized images were calculated for each of the (12) variables.

The statistical significance of difference between the two groups was checked with paired student t-test.

Results

The mean & standard deviation for each of the (12) angular & linear measurements on original radiographs & their digitized counterparts are presented in table (3 & 4). There was no statistically significant difference between conventional & digitized measurements among all angles examined except for upper incisor-Frankfort plane & upper incisor- lower incisor angles (table 3).

However, the mean differences were less in linear measurements which showed non-significant statistical differences between conventional & digital methods of analysis with & without tracing (table 4).

Generally, the mean values & standard deviation of cephalometric measurements in digitized images was comparable with those in the original radiographs. The mean difference in the original radiograph ranged from zero to 2.48 degree for angular measurements & from 0.2 to 0.7 mm. for linear measurements. It was noted that the mean differences between the two methods were less than one
millimeter or degree in 10 out of 12 cephalometric measurements which is generally within one standard deviation of norm values.

Discussion

In clinical orthodontics, cephalometric analysis has long been used as an important clinical tool in diagnosis, treatment planning & evaluation of growth or treatment results. Many parameters were proposed to analyze the relationship of teeth to teeth, teeth to jaws & jaws to cranial base & the inter jaw relationship. Linear measurements may be affected by the inclination of the reference line & angular measurements can not indicate correctly the jaw relationship in the case of extreme facial divergence. Therefore, it is reasonable to evaluate a set of structural relationship by multiple cephalometric parameters rather than a single parameter.

The major error associated with conventional cephalometry includes projection errors & tracing errors. The most important source of tracing errors is uncertainty in landmark identification. The mechanical errors introduced by drawing lines between landmarks manually & by measuring with a ruler & a protractor were common in conventional cephalometric analysis. When we take advantage of digital cephalometry, it is important to be certain that the digitized image yields the similar performance to conventional film in terms of cephalometric measurements.

The results of the present study are at least partly in agreement with the findings of Macri & Wenzel. They reported that it was possible to achieve reliability in digital images comparable to that obtained with conventional radiographs with good quality. In contrast, Geelen et al. reported that the precession of landmarks recording was lower for enhanced monitor-displayed images than for film-enhanced hardcopies.

In this study, the differences in dental measurements were generally larger than those in the skeletal measurements especially the angular dental measurements (upper incisor-Frankfort plane & upper incisor-lower incisor angles) which are in agreement with the findings of Chen et al. The differences in these dental measurements may be associated with wider range of variation in both original & digitized modalities.

The cephalometric radiographs used in this study were randomly selected & represented the quality of daily routine work. Chen et al. expected that the powerful tool of digitized image processing could help with landmarks identification on poorly defined structures. However, it was reported that the landmark reliability in digitized radiographs of lower quality could not be improved by digital processing. There are several ways of acquiring a digitized cephalometric images & the image quality would depend on how the image was acquired. In this study, the digitized images were secondarily captured by a film scanner. Inevitably, image signal deterioration would occur in the digitization process. In this case the quality of the digitized images would be less than that of the original images on film. However, the results of this study imply that that the parameter setting for our digitized cephalographs was almost adequate in term of performance of cephalometric analysis, which was demonstrated by the low level of measurement differences between the conventional & digitized radiographs. The inferiority of the digitized images in two out of 12 measurements may have
little impact in our application of digitized cephalometry.

**Conclusion**

The reliability of landmarks identification, angular & linear measurements in digitized images was comparable with that of original radiographs except for 2 angles. So these 2 angles should be scrutinized more carefully when we take potential advantages of the use of digital cephalometry. Moreover, this simple method of film digitization can be applied for archiving all radiographs in a computer to be used as baseline data & to conserve the old data from deterioration or loss.

**References**


Figure (1): Landmarks Identification.

Table (1): Landmarks Identification

<table>
<thead>
<tr>
<th>Landmark</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Sella: the midpoint of hypophyseal fossa.</td>
</tr>
<tr>
<td>N</td>
<td>Nasion: the most posterior point of fronto-nasal suture in the median plane.</td>
</tr>
<tr>
<td>A</td>
<td>Point A: the most posterior point on labial surface of maxilla between anterior nasal spine &amp; alveolar process.</td>
</tr>
<tr>
<td>B</td>
<td>Point B: the most posterior point in the outer contour of the mandibular alveolar process in the median plane.</td>
</tr>
<tr>
<td>Or</td>
<td>Orbitale: the lowest point on the infraorbital margin.</td>
</tr>
<tr>
<td>Po</td>
<td>Porion: the upper most point of the bony external auditory meatus.</td>
</tr>
<tr>
<td>Me</td>
<td>Menton: the lowest point on the bony outline of the mandibular symphysis.</td>
</tr>
<tr>
<td>Go</td>
<td>Gonion: the most lateral external point at the junction of ascending ramus &amp; mandibular body.</td>
</tr>
<tr>
<td>ANS</td>
<td>Anterior nasal spine: the tip of anterior nasal spine.</td>
</tr>
<tr>
<td>PNS</td>
<td>Posterior nasal spine: the tip of the posterior spine of palatine bone in the hard palate.</td>
</tr>
<tr>
<td>Ar</td>
<td>Articulare: the point of intersection of the posterior margin of ascending ramus &amp; the outer margin of the cranial base.</td>
</tr>
</tbody>
</table>

Table (2) Angular & Linear variables definition:

<table>
<thead>
<tr>
<th>Angular variables</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 SNA</td>
<td>Angle between S-N &amp; N-A</td>
</tr>
<tr>
<td>2 SNB</td>
<td>Angle between S-N &amp; N-B</td>
</tr>
<tr>
<td>3 ANB</td>
<td>Angle between A-N &amp; N-B</td>
</tr>
<tr>
<td>4 Frankfort-Mandibular plane</td>
<td>Angle between Frankfort &amp; Mandibular planes.</td>
</tr>
<tr>
<td>5 Maxillary-Mandibular plane</td>
<td>Angle between Maxillary &amp; Mandibular plane.</td>
</tr>
<tr>
<td>6 Upper incisor-Frankfort plane</td>
<td>Angle between the long axis of upper incisor &amp; Frankfort plane.</td>
</tr>
<tr>
<td>7 Upper incisor-Maxillary plane</td>
<td>Angle between the long axis of upper incisor &amp; Maxillary plane.</td>
</tr>
<tr>
<td>8 Lower incisor-Mandibular plane</td>
<td>Angle between the long axis of Lower incisor &amp; Mandibular plane.</td>
</tr>
<tr>
<td>9 Upper incisor-Lower incisor</td>
<td>Angle between the long axis of upper incisor &amp; the long axis of</td>
</tr>
</tbody>
</table>
### Linear variables: Definition

1. **S-N (Anterior cranial base)**: Distance between S & N.
2. **Go-Me (Mandibular body)**: Distance between Go & Me.
3. **Ar-Go (Ramus height)**: Distance between Ar & Go.

### Table (3): Comparison between conventional (manual) & digitized angular measurements:

<table>
<thead>
<tr>
<th>Variables</th>
<th>Analysis</th>
<th>Mean</th>
<th>SD</th>
<th>P-value</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA</td>
<td>Conventional</td>
<td>81.37</td>
<td>5.17</td>
<td>0.07</td>
<td>N.S</td>
</tr>
<tr>
<td></td>
<td>Digital</td>
<td>81</td>
<td>5.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNB</td>
<td>Conventional</td>
<td>79</td>
<td>4.09</td>
<td>0.05</td>
<td>N.S</td>
</tr>
<tr>
<td></td>
<td>Digital</td>
<td>79</td>
<td>4.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ANB</td>
<td>Conventional</td>
<td>2.37</td>
<td>2.7</td>
<td>0.07</td>
<td>N.S</td>
</tr>
<tr>
<td></td>
<td>Digital</td>
<td>2.75</td>
<td>2.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frankfort-Mandibular plane</td>
<td>Conventional</td>
<td>32.46</td>
<td>6.43</td>
<td>0.07</td>
<td>N.S</td>
</tr>
<tr>
<td></td>
<td>Digital</td>
<td>33.06</td>
<td>6.35</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maxillary-Mandibular plane</td>
<td>Conventional</td>
<td>29.35</td>
<td>6.11</td>
<td>0.08</td>
<td>N.S</td>
</tr>
<tr>
<td></td>
<td>Digital</td>
<td>32.93</td>
<td>18.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper incisor-Frankfort plane</td>
<td>Conventional</td>
<td>109.56</td>
<td>12.01</td>
<td>0.001</td>
<td>H.S</td>
</tr>
<tr>
<td></td>
<td>Digital</td>
<td>108.52</td>
<td>12.16</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper incisor-Maxillary plane</td>
<td>Conventional</td>
<td>112.51</td>
<td>10.6</td>
<td>0.4</td>
<td>N.S</td>
</tr>
<tr>
<td></td>
<td>Digital</td>
<td>112.44</td>
<td>10.84</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower incisor-Mandibular plane</td>
<td>Conventional</td>
<td>93.13</td>
<td>7.56</td>
<td>0.19</td>
<td>N.S</td>
</tr>
<tr>
<td></td>
<td>Digital</td>
<td>93.08</td>
<td>7.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper incisor-Lower incisor</td>
<td>Conventional</td>
<td>125.82</td>
<td>13.7</td>
<td>0.005</td>
<td>H.S</td>
</tr>
<tr>
<td></td>
<td>Digital</td>
<td>125.22</td>
<td>14.07</td>
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</tr>
</tbody>
</table>

### Table (4): Comparison between Conventional (Manual) & Digital linear measurements

<table>
<thead>
<tr>
<th>Variables</th>
<th>Digital with tracing</th>
<th>Conventional</th>
<th>Digital without tracing</th>
</tr>
</thead>
<tbody>
<tr>
<td>S-N</td>
<td>71.62 ± 2.98</td>
<td>72.01 ± 2.04</td>
<td>72.99 ± 2.3</td>
</tr>
<tr>
<td></td>
<td>P ≥ 0.05</td>
<td>P ≥ 0.05</td>
<td>P ≥ 0.05</td>
</tr>
<tr>
<td>Me-Go</td>
<td>71.18 ± 6.37</td>
<td>71.42 ± 5.98</td>
<td>72.47 ± 6.37</td>
</tr>
<tr>
<td></td>
<td>P ≥ 0.05</td>
<td>P ≥ 0.05</td>
<td>P ≥ 0.05</td>
</tr>
<tr>
<td>Ar-Go</td>
<td>49.33 ± 5.28</td>
<td>50.05 ± 5.8</td>
<td>49.95 ± 5.37</td>
</tr>
<tr>
<td></td>
<td>P ≥ 0.05</td>
<td>P ≥ 0.05</td>
<td>P ≥ 0.05</td>
</tr>
</tbody>
</table>
CRESTAL BONE LOSS AROUND DENTAL IMPLANT "COMPUTERIZED ANALYSIS"

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Dr. Afya Sahib Diab  B.D.S, M.Sc.

Abstract

The present study evaluates crestal bone loss around dental implants (retrospectively and prospectively) and determines the prognosis of dental implant through bone level estimation. Bone level was measured around 354 implants in 88 patients retrospectively and 97 implants in 31 patients prospectively, digital panoramic radiograph were taken during recall appointments, and analysis with a computer software associated method to measure the actual bone loss in mesial and distal side of the implant during these periods.

Overall, the studied implants, experienced most of its crestal bone loss during the preloading period, followed by dramatic decrease in bone loss rate through the subsequent study intervals. The result of the present study showed that there is significant positive correlation between crestal bone loss and age, female showed significantly higher amount of bone loss than male in stage-1, while the apposite figure found in stage-2. Data analysis during preloading time indicates significant bone loss with implant location, while highly significant bone loss had been detected with maxillary arch, fine trabecular bone density, immediate implant, complete edentulous cases, While implant length, implant diameter and implant stability had a non significant effects on crestal bone loss.

Key words: - Dental implant, bone level crestal bone.

Introduction

During the past decade, implant have become one of the most exciting and rapidly developing topics in dental practice and nowadays they provide a proper treatment alternative to conservative prosthodontics. Dental implant treatment has also been discussed as a specific mean to preserve alveolar bone after tooth loss and well accepted as a means of dental rehabilitation. Even with a high integration success rate, crestal bone loss may occur.

Osseointegration depends on the relationship between biologic factors of bone and various clinical factors associated with dental implant treatment. External pressure on the mucoperiosteum is believed to result in external resorption. It appears that to preserve all of the alveolus, the load transmission into the mandible or maxilla should be similar to the natural relationship of teeth in the dentate patient. Endosseous implants appeared to be the solution to both maintaining alveolar bone by osseointegration and preserving that bone by allowing functional stress distribution into the medullary space.

Pham et al. in 1994 confirmed that more crestal bone loss accrued during the first six-months (during healing period). The mean rate of bone loss for all measurable implant sites...
during the preloading phase was 0.16 ± 0.01mm/month which if extrapolated to six months produces an average bone loss of 0.96mm prior to loading. No significant differences were noted for bone loss for either jaw or implant type for the observations made during the 12-24 months period. Regardless of any other factor, all implants exhibit more bone loss in the first 6 months, and over all the marginal bone level remain stable around implants and never surpassing 2.2 mm, even after 15 year.\(^8\)

Early crestal bone loss around dental implant is a common radiographical finding, the oral implantologist usually uses a panoramic radiograph for the evaluation of bone tissue around implants \(^9,10\) Hermann et al.\(^11\) in 1997 compared between radiographic and heptametrical level which showed that radiographic measurement of peri-implant crestal bone level is more accurate.

Earlier studies tended to assess and report bone loss following loading, some of the more recent studies have given attention to the period immediately following implant insertion.\(^8,12, 13\) The purpose of this study is to evaluate crestal bone loss around dental implants (mesial and distal) retrospectively and prospectively and to determine the factors affecting crestal bone loss during preloading time.

**Material and method**

The sample was collected from Maxillofacial Surgery unit at Specialized Surgeries Hospital and AL-Karkh General Hospital.

The total sample was (119) patient with (451) implants, 31 patients with 97 implants fulfilled the criteria for the study prospectively, while retrospectively only 88 patients with 354 implants selected for the present study. Special case sheet forms included questions and information concerning the disease state have been adopted and filled for every patient. Also dental and radiographic evaluation was made for every patient.

The total implants consists of 188 implants in maxilla (41.7 %) and 263 implant in mandible (58.3 %); 137 implants in anterior region (30.4 %) and 314 implants in posterior region (69.6 %); 22 cases with complete denture (18.5 %), 74 cases with partially edentulous (62.2 %) and 23 as single (19.3 %). The distribution of implants by age, sex, arch and anterior/posterior are illustrated in Table (1).

A rational theater maneuver was followed strictly before surgery. Regardless of surgery performed in maxilla or mandible, anterior or posterior, the same principles were taken up. The placement of implant was then done in ordinary manner including the following steps:

1-Flap design and reflection.
2-Preparation of the alveolar crest.
3-Pilot preparation.
4-Widening the pilot channel with the twist drill.
5-Implant length.
6-Parallel indicator.
7-Selecting the simultaneous bur.
8-Implant in, suturing.
9-Post operative instruction.

A digital panoramic radiograph was obtained. Radiographs were taken by using dimax system at each of the clinical procedure appointments including immediately after implant placement (surgical day), uncovering surgery (gingival former placement), final prosthesis insertion, after 4-6 months of loading and at follow up appointments. Each radiograph was subjected to image scanning and setting, all measurements required
appear at one screen with the (real distances in mm).

**Measurements:**
Vertical measurements of bone level adjacent to the implants were made at the implant insertion, a baseline measurement was established so that any loss in bone level at subsequent appointments can be accounted. Calibration of the measured increments of bone loss is necessary in determining actual bone loss from radiographic measurements. The measurement from the apex of the implant to the point of the bone implant interface is calibrated using the "known" and "radiographically" measured length of the implant. This calibration involves multiplying the vertical bone height measurements by ratio of the known implant length to the measured implant length, these calibrated (i.e. actual) measurements from baseline and follow-up appointments were compared for a given implant to determine vertical bone height loss at the mesial and distal site, figure (1,2,3,4)

**Statistical analysis:**
Data were translated into codes using a special designed coding sheet and then entered into a computerized database structure. Statically analyses were done using SPSS. Version 10 (statistical package for social sciences) and Microsoft Excel XP computer soft wares.

Statistical methods used to analyze and assess the result were:
1-Descriptive statistics: Mean, Standard Deviation (SD), Range (min / max).
2-Inferential statistics: T-test, ANOVA test, Correlation coefficient (r-values).

**Result**

The difference of bone loss between stages are shown in Table (2) which illustrates that the maximum mean of crestal bone loss occur in stage-2 (between implant uncovering and prosthesis placement) which is 1.07mm, followed by stage-1 (between implant placement and uncovering) which is 0.68mm then in stage-3 (after 4-6 months of loading) the mean bone loss was 0.09 mm, while in the second year of placement, the mean bone loss was 0.07 mm.

Table (3) shows a positive significant correlation of vertical bone loss with age in stage-1 of healing, but with the time in stage-2 of healing a non-significant correlation was found. Concerning gender Table (4) illustrates a highly significant difference in vertical bone loss between male and female in both stages of healing in which females has more vertical bone loss during 1st stage of healing and the apposite picture found in stage-2 of healing. The mesial side of implant has highly significant higher amount of vertical bone loss than the distal side in stage-1 of healing and non-significant in stage-2 of healing (Table 5). The implants in maxillary jaw show a highly significant vertical bone loss than implants in mandibular jaw during stage 1 of healing while there is non-significant difference in stage 2 of healing (Table 6). The same table shows that during stage-1 of healing the amount of vertical bone loss around implant in anterior region of both jaws were higher than the posterior region, these differences were highly significant around implants in maxillary jaw, while non significant around implants in mandibular jaw. Concerning 2nd stage of healing, the opposite figure were shown for the implant in mandibular jaw as the amount of vertical bone loss around implants in posterior region was higher than the anterior region, these differences as well as for implants in maxillary jaw were not significant.

Bone quality (as evaluated during the implant placement for prospective
cases only) have highly significant effect on the amount of vertical bone loss in stage-1 of healing as the D4 bone density (Fine trabecular bone) has the greatest amount of bone loss and D1 (Dense compact bone) have the lowest, while during stage-2 of healing, D2 bone density (Dense to thick porous compact and coarse trabecular bone) shows higher bone resorption than other types, but these differences were not significant (Table 7). In Table (8) the study shows that the amount of crestal bone loss was highly significantly differ between different case type (complete, partial fixed prosthesis and single) in the first stage of healing while this difference was not significant in stage-2 of healing. The single prosthesis shows that the lowest value of bone loss in 1st stage of healing and highest value in the 2nd stage.

Table (9) represents the crestal bone loss for mobile and immobile implants (for prospective cases only) in which the mobile implant has a higher bone loss in the first stage and the opposite in stage-2 but this was non significant in both stages. The immediate type of implant in the present study shows a higher amount of crestal bone loss than the conventional case when compared the amount of bone loss between conventional cases during "stage 2" of healing with "4-6 month" after placement of immediate cases (Table 10).

Discussion

The data showed loss of crestal bone immediately after implant insertion, this agree with Jung et al (12) who found bone loss around implant in the first 3 months. This period (stage-1) is followed by a relatively rapid bone loss in stage-2 after uncover the implant( the bone loss reach 1.75 mm) this agree with Herman et al (13) in1997 who stated that the bone loss of implant after uncovering is about 1.5-2mm epically as well as agree with Pham et al (7) 1994 who confirm more crestal bone loss occurred during the first six – months (healing period), these could be attributed to that during the uncovering procedures, micro damage and inflammation will happen, that well activate the repair processes, just like the manifestation of the first response to clinical loading (14). These periods followed by dramatically decrease in the amount of bone loss in which it reach 0.09 mm, this agree with Testori et al (15) 2001 and Astrant et al (16) 2000 who found significant bone loss before loading while the mean bone loss after loading was 0.1 mm. While bone loss stabilized significantly in the second year of placement which agrees with criteria proposed for implant success by Albrektsson et al. (17) 1986, who suggested that the annual bone loss is less than 0.2, after the first year of service, bone loss should be less than 0.2 mm annually (18).

The present study showed a highly significant difference in bone loss between mesial and distal side of implant, this is in agreement with Eliasson and Palmquist (19) 2000. Females in the present study has a significant higher value than males in 1st stage and this agree with Schliephoke et al (20) 1997 and disagree with Dao et al (21) 1993 who stated that osteoporosis should not affect the process of osseointegration, but Williamson (22) 1996 suggested that the osteoporosis may have some definite influence on remodeling. More rate of bone loss appears to be associated with implants placed in the maxilla than the mandible with a highly significant difference, this is in agreement with Pham et al (7) 1994, this may be due to the difference in
bone density (the mandible bone more dens than maxillary bone). In the maxilla the differences by anterior/posterior show highly significant more dramatic differences in the interval up to 6 months follow up, and this is in agreement with Kopp (23) 1989; Jaffin and Berman (24) 2000. While in mandible there is more bone resorption in anterior than posterior but with a non significant difference value, although the anterior mandible is the best area for implantation and high success rate and survivability, this could be attributed to that always the patient loss his posterior teeth early in life so the remodeling process is complete, while the lower anterior teeth always are the last teeth to be lost so the normal remodeling process continuous and relatively more bone loss was observed, while in the second stage it was found that the posterior teeth have more bone loss than anterior, this could be partially explained by the bone quality score that may interrelated with implant placement location variable in which in anterior mandible (with bone density D1 to D2) have the lowest mean value of bone loss.

In stage -1 the largest value of bone loss were detected among patient with complete denture cases and this could be attributed to that wearing removable complete denture during the submerged period may cause trauma from occlusion to the implant–bone interface that may compromise implant success or increase bone loss around the implants during initial bone healing (25), while in stage -2 after uncovering the highest level of bone resorption is detected in single tooth this may be due to that the unsplited implants are subject to rotational forces that create shear stresses at the bone implant interface (26).

The present study showed a high rate of bone loss around mobile implant in stage –1, this results disagree with Orenstein et al in 2000 (26).

Although the immediate implants have relatively a higher value of bone loss than conventional implant but this value is small comparing with the amount of bone loss that the residual ridge resorbed before and after implant placement for conventional implant. This indicate an excellent small bone loss for the immediate implant, on the other hand for immediate implant, primary stability may some time be difficult to achieve (26), since the coronal aspect of the extraction site is often wider than the implant being placed, but the present study used bicortical implant for immediate placement so the implant is engaged at least by one cortical layer so the study have relatively good stability at placement. The amount of bone resorption after healing time was found in the present study to be 1.4 ± 1.17 mm which is relatively higher than that found by Chow in 2001 (27).

Conclusions
1- The maximum mean of bone changes occur in stage 2 (between implant uncovering, and prosthesis placement) followed by stage 1 (between implant placement and uncovering).
2- The amount of bone loss after loading not exceeds 0.1 mm annually.
3- Age and implant location affect significantly vertical bone loss.
4- Highly significant difference of vertical bone loss found with gender, bone density, implant design, case type, modification type of surgery (sinus lift, bone filler bone splits).
5- Implant length, diameter and implant stability found to have no affect vertical bone changes.
6- Immediate implant is a good procedure for preserving alveolar bone from resorption
7- The higher effect of smoking (tobacco effect) appears after uncovering and exposes the implant to oral environment.
8- Mandible has better response to dental implant (less bone loss) than maxilla in both anterior and posterior segment.
9- Number of implant in partial fixed prosthesis did not seems to affect crestal bone loss
10- Modification type of surgery like bone expansion and bone splits did not affect crestal bone loss.

References
20- Schliephake H, Neukmann F, Wichmann M: Survival analysis of osseous


Table (1) Distribution of implant by age, sex, arch and anterior/posterior among all patients (retrospective and prospective patients).

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<th>Ant Both</th>
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Table (2) Vertical bone changes for five study interval in all patients (retrospective and prospective patients).

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Table (3) Crestal bone loss for study interval by age

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* - Significant

Table (4) Crestal bone loss for study interval by gender

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** - Highly significant

Table (5) Crestal bone loss for study interval in mesial and distal site of implant.

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** - Highly significant
Table (6) Crestal bone loss for study interval by arch and Anterior/posterior position.

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Table (7) Crestal bone loss for study interval by bone density.

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** - Highly significant

Table (8) Crestal bone loss in study interval by case type

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** - Highly significant

Table (9) Crestal bone loss for study interval by implant mobility.

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Table (10) Crestal bone loss for study interval by implant type (Immediate implant, Conventional implant).

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PDF created with pdfFactory trial version www.pdffactory.com
Fig (1) Storing the scanned radiograph in a special folder.

Fig (2) The radiographic magnification ratio is determined using the measured radiographic implant length to the known implant length.
Fig (3) The measurement from the apex of the implant to the point of the bone implant interface.

Fig (4) The actual bone level were determine
A comparison of apical sealing and extrusion between Thermafil and Lateral condensation techniques

Dr. Jamal A. Mahdi, B.D.S., M.Sc. (Assistant Prof.)

Abstract

One hundred Thirty two canals from 66 mesial roots of extracted human mandibular molars were instrumented with Protaper and K-file crown-down technique and divided into two groups. The group I was obturated with Thermafil technique and group II was obturated with lateral condensation technique. Topseal sealer was used in both groups. Apical extrusion, apical microleakage, time for instrumentation and time for obturation were recorded in each sub group. Six molars were used as control teeth. All specimens were stored in 100% humidity for 1 week, coated with nail polish, except for the apical 2mm, and were suspended in methylene blue dye for 72h. Linear dye leakage was statistically different (ANOVA) test, while apical extrusion between techniques was not statistically different (Chi-square test).

Key words: Thermafil technique, apical seal, apical extrusion, Protaper system.

Introduction

Complete obturation of the root canal with an inert filling material and creation of a hermetic apical seal are the goals of successful endodontic treatment (1). Further more, the integrity of the root canal filling in the apical few millimeters is one of the criteria believed to be important for achieving successful endodontic treatment (2).

Lateral condensation of gutta-percha is one of the most accepted root canal obturation methods. However, its ability to conform to the internal surface of the root canal has been questioned. Brayton et al (3) reported voids, spreader tracts, and incomplete fusion of the gutta-percha cones and lack of surface adaptation from the lateral condensation technique. Eguchi et al (4) reported that this technique results in excessive amount of sealer and apical voids. Peter (5) demonstrated that some sealer used in lateral condensation techniques may resorb with time. This might decrease the effectiveness of the root canal obturation.

Nearly 60% of all endodontic failures have been attributed to incomplete obturation of the root canal system (6). Most of the new obturation techniques use thermally softened gutta-percha to better fill all canal spaces and isthmuses (7). One of the methods of obturation using warmed gutta-percha is the Thermafil endodontic obturator device (Dentsply, Maillefer, Ballaigues, Switzerland).

Thermafil obturator is made of plastic cores coated with so-called alpha-phase gutta-percha (8). This stereo form of gutta-percha is considered to have better flow characteristics when molten than beta-phase gutta-percha, from which conventional gutta-percha cones are made (8). After heating in a special oven, the gutta-percha surrounding the Thermafil carrier becomes plasticized, and the obturator is inserted into the prepared canal. The carrier remains in the root canal as apart of the root canal
filling. This technique has been shown to be comparable to cold lateral compaction of gutta-percha with respect to apical sealing (9,10). Gutman et al. (11), Clark and ElDeeb (12) showed that the Thermafil technique produced a significantly greater incidence of apical extrusion of gutta-percha compared with the lateral condensation technique. However, Dummer et al. (9) found that there were no significant differences on curved canals.

Apical microleakage results from failure to obturate the canal space fully. Therefore, adapting the filler to the canal walls, including canal fins and cul-de-sacs, is a parameter for success. This filling quality has been evaluated clinically and radiographically (13).

Since the end of the 1980s, files made from NiTi become available (14), which have more elastic flexibility and superior resistance to fracture, relatively maintaining original canal curvature and less aberration in comparison with similar size stainless steel file (15). The recent introduction of rotary instruments made from NiTi with different design and taper found to be effective to over come problems associated with hand instruments like zipping, elbow, perforation and loss of working length (16). Many types of rotary instruments is know available in the market like: Profile taper 04 and taper 06, Profile GT, Quantec and Protaper. In response to the problems associated with step back technique, the rotary instrument recommended to be used with crown-down technique, which involves preparation of the canal from the cervical aspect to the apex rather than classical aspect from the apex to the crown (17).

The aim of this study was the comparison of the Thermafil and lateral condensation techniques with regard to apical sealing and extrusion.

Materials and methods

Sixty-six extracted human mandibular first molars were selected and stored in a 10% formalin solution. In addition, all mesial roots had two separated canals and separated apical foramen with similar shape and curvature. The distal roots were removed and crowns were not sectioned to simulate clinical situation. All teeth were numbered and stored for 48h in a 5% sodium hypochlorite solution to remove attached soft tissue before access preparation. Canals were divided into two groups. For group I, 60 canals were obturated using Thermafil obturation technique. For the group II, 60 canals were obturated using the lateral condensation technique. Twelve additional canals of six molars were used as control teeth.

Canal length was determined visually by passing a size 10 K-File into the canal until was flush with the root surface at the apical foramen. Working length was established by subtracting 1mm from this length. Periapical radiographs were taken with file in each canal to verify the working length. All the mesiobuccal canals were prepared mechanically with the Protaper system (Maillefer, Ballaigues, Switzerland) according to the manufacturers recommendations, using a low speed hand piece (300rpm) with crown- down technique. For coronal portion of the canal start with shaping file S1 (Purple colour) to achieve straight line access with brushing movement once resistance felt remove the file and force against the canal walls on its removal , this action performed just to remove any cervical interference. After that shaping file SX is used with the same manner. When the canal is patent and working length is confirmed shaping file S1 is reused to the working length with brushing motion, followed by shaping file S2.
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(white colour ring) used with the same manner till it reached the working length, followed by irrigation and recapitulation. The apical portion is prepared with finishing files, first start with F1 file (yellow ring) to working length its tip size equal to #20 file followed by F2 file (red ring) to the working length. Finally, use F3 file (blue ring) is used to working length its tip size equal to #30 file, with that instrument the preparation of the apical portion is completed. A 5% sodium hypochlorite solution was used to irrigate the canals between usages of each instrument.

The mesiolingual canals were instrumented by Step-back instrumentation protocol in the apical third. The coronal two-third was enlarged with Gates-Glidden drills to accomplish flaring of the coronal root canal (crown down technique). A wet environment with 5% sodium hypochlorite was maintained in all canals during instrumentation. The same person performed all the instrumentation. Prepared specimens were dried with paper points.

The total time of canal preparation was recorded in minutes for the both instrumentation procedure. This included the active instrumentation, irrigation and time used to exchange the instruments. After instrumentation, the canals were divided into two groups (30 teeth for each), group I was obturated with the Thermafil plus technique and a group II was obturated with lateral condensation technique. Topseal sealer (Maillefer, Ballaigues, Switzerland) was used in both groups and was mixed according to the manufacturers instructions.

The canals of the Thermafil group (group I) were obturated as specified by the manufacturer. We selected a Thermafil obturator the same size as the size of the verifier which is size 30. A rubber stop was adjusted to coincide with the working distance taken from the root. The obturator was heated in the Therma Prep oven (Dentsply, Maillefer). Sterile paper points were used to coat the walls of the canal of the working length with Topseal sealer. The Thermafil obturator was inserted in the canal to the established working length. The shaft level was severed with the orifice using a tungsten carbide inverted cone bur in a high-speed hand piece. The carrier was stabilized with the index finger. The total time was measured from the checking of obturator until shaft removal.

In group II, A master cone was selected according to the last file used (06, gutta-percha). Snipping the tip until tug back was achieved and placing it at the working length customized it. The inner walls of the canals were also coated with sealer and then seated into place. A size 20 finger spreader (Dentsply, Maillefer) was used for lateral condensation. The spreader was remained in the canal until a fine accessory gutta-percha cone was ready to be put in place. Accessory cones were added until the spreader reached the coronal third of the canal. This was followed by vertical condensation using a plugger. The total time was measured from master cone selection until vertical condensation with a plugger.

After obturation of all specimens, access preparation was sealed with Coltosol (Coltene, Alsatten, Switzerland) and teeth were then stored in 100% humidity for 1 week to ensure the setting of the sealer. The same person performed both obturation techniques. Radiographs were taken from the buccal and mesial aspect of each root to visually evaluate the obturation. For positive control, the canals of 3 teeth were enlarged as described above, but the root canals were not filled. In the 3 teeth serving
as negative controls, the root canals were prepared and filled as described and then were completely covered with nail varnish and subjected to leakage testing.

The apex was observed with a magnifying glass and the observation recorded using the following parameters:-

0 rating-no sealer or gutta-percha at the foramen.
1 rating- sealer and/ or gutta-percha only at the foramen.
2 rating-sealer and/ or gutta-percha beyond the foramen (Table I).

The obturated roots were dried and coated on their external surfaces with nail varnish; except for the apical 2mm. After the varnish had dried the specimens were immersed in methylene blue 1% at 37°C for 72h. They were then thoroughly washed with water, the varnish was carefully removed with a Lacron, and the teeth were dried. Using a diamond disk, two grooves were made longitudinally on the roots were then splitted in half by placing the edge of Lacron carver in the grooves and applying a gentle pressure. Linear apical dye penetration was measured for each specimen using Stereomicroscope at X10 magnification. The resulting measurements of time, dye leakage and apical extrusion were subjected to statistical analysis.

Results

The minimum and maximum values of mean and standard deviation values for each technique are presented in table II. ANOVA test (table III) showed a highly significant difference among the groups at P<0.001. And also the T-test showed a highly significant difference between the time for obturation of the Thermafil technique and lateral condensation technique (table IV).

LSD test were used to see the differences in apical microleakage between the sub groups (Protaper and K-file, crown-down technique) in a Thermafil group, and in lateral condensation group. The test showed no significant difference between the two techniques (Fig. I).

The percentage of canals with extruded sealer and/or gutta-percha in each technique is given in table I. The extrusion was evaluated using a $\chi^2$ (Chi-square) and showed no significant difference between the methods at P>0.05.

Discussion

Besides proper cleaning and shaping of the root canal, the complete and hermetic obturation of the root canal system is a major objective in root canal treatment. Several techniques have been developed to improve the seal of the prepared root canal. Currently, the most accepted and common technique is the cold lateral compaction of gutta-percha in combination with an insoluble root canal sealer (8). In many studies, this method served as a known standard to compare new obturation techniques against (18).

The mean leakage and standard deviation values for each technique are presented in table (II). ANOVA test (table III) showed a highly significant difference among the sub groups (P<0.001). The Thermafil sub groups showed less microleakage than lateral condensation technique. This come in agreement with Leuny and Gulabivals (19) study found that the Thermafil sealer is a significantly better method than the lateral condensation
technique. This in agreement with Beatty et al. (20) and Gencoglu et al (12) which found that the Thermafil technique resulted in less leakage than did the lateral condensation technique. Gutman et al (11) study showed no significant difference between the two techniques at each time interval. Kytridou et al (22) found that both obturation techniques filled irregular canal well. They found no significant difference in leakage between the two techniques.

Our result came in disagreement with Lares and ElDeeb study (23). They found mean leakage value was less in molars obturated with the lateral condensation technique than the Thermafil technique.

One of the concerns with respect to the Thermafil technique is shrinkage associated with gutta-percha phase transformations. Techniques that use thermo plasticity but that do not include vertical compaction or techniques that subject apical gutta-percha to temperatures above 45°C, are predisposed to shrinkage, irrespective of the type of gutta-percha used (24). Apparently, if shrinkage of the thermo plasticized, gutta-percha in the Thermafil group was a significant factor; it would contribute toward a greater apical dye penetration. It is possible that the presence of the sealer could help off set any contraction of the Thermafil mass (25). It could also be hypothesized that the solid plastic core that accounts a major portion of the Thermafil obturator device could prevent a significant shrinkage of the outer mass of gutta-percha.

Assessment of linear dye penetration is a common method to explore apical leakage of root fillings after splitting the roots or after cleaning them (26). The microleakage technique that was used in this study was a passive dye penetration. There appears to be no significant differences between the amounts of leakage obtained by passive or by negative-pressure penetration methods. Even if entrapped air exists in the root canal filling, it does not inevitably exert an influence of the dye penetration (27). After root canal filling, all teeth were radiographed to standardize obturation consistency between the specimens and to assure the radiographic quality of obturation.

A T-test was done for measuring the time used for the preparation procedure of the sub groups between the Protaper and hand instrument using k-file, crown-down technique and showed highly significant difference at P<0.001 (table IV). Preparation of the canals with most rotary instruments using contra-angle hand piece at low speed (300 rpm) with crown-down technique as recommended from the manufacturer. The result showed that the time use to prepare the canal with Protaper rotary instrument required less time and effort to prepare the canals than hand instrument with k-file, crown-down technique which exhibited higher time of canal preparation because it needs more effort and pressure exerted during preparation (16) and this agree with Ruddle (28), Hyung and Kim (29).

A T-test was done to measure the time need for obturation the canals between the Thermafil procedure and lateral condensation technique. We found that a highly significant difference between Thermafil and lateral condensation technique at P < 0.001, and this came in agreement with Coyne (30).

Many factors influencing acceptance of Thermafil, which are clinical handling, ease of use and time for obturation. Clinical evaluations of products provide important information. Schoenrock (31) reported the finding of the Mid West Dental Evaluation Group (MDEG), which
evaluated Thermafil with other obturation techniques. MDEG recommendations were that Thermafil is the most complete system among other groups and its easy to use, easily removed with peeso reamers at any time for post preparation, save time and dose not cause root fracture. Clinical Research Associates Newsletter has reported that Thermafil is fast, predictable, easy to use, and useful in small or curved canals (32).

Chi-square test showed no significant difference in apical extrusion between Thermafil and lateral condensation technique. This came in agreement with Pathomvanich et al (33), Gutman et al (11), Clark and ElDeeb (12) found that the Thermafil obturation resulted in significantly more material extrusion beyond the apical preparation than the lateral condensation technique.

Our investigation was made, unlike Gutman et al, using a mechanical technique, and the root canals were prepared and obturated with a master cone, this resulted in amore homogeneous instrumentation technique and an obturation confined to the canal. Our study agrees with Dummer et al (9).

The canal curvature may restrict the flow of thermo-plasticized gutta-percha over the carrier tip, thereby reducing the incidence of apical extrusion. We also suggest the use of small quantities of sealer to reduce the extrusion even more.

**Conclusion**

Our study showed that apical sealing and extrusion using Thermafil are adequate and not very different from conventional techniques, such as lateral condensation. Therefore, we found that the Thermafil system is a satisfactory alternative to lateral condensation of gutta-percha for any canals.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Thermafil</th>
<th>Lat. Cond.</th>
<th>Chi-square</th>
<th>P-value</th>
<th>Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 Rating</td>
<td>35</td>
<td>45</td>
<td>0.2760</td>
<td>0.5993</td>
<td>N.S.</td>
</tr>
<tr>
<td>1 Rating</td>
<td>10</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Rating</td>
<td>15</td>
<td>5</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
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<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermafil ProTaper</td>
<td>30</td>
<td>0.80</td>
<td>1.20</td>
<td>0.970</td>
<td>0.1337</td>
</tr>
<tr>
<td>Thermofil K-file</td>
<td>30</td>
<td>0.80</td>
<td>1.30</td>
<td>1.090</td>
<td>0.1663</td>
</tr>
<tr>
<td>Lat. Cond. ProTaper</td>
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<td>0.90</td>
<td>1.50</td>
<td>1.270</td>
<td>0.1767</td>
</tr>
<tr>
<td>Lat. Cond. K-file</td>
<td>30</td>
<td>1.10</td>
<td>1.60</td>
<td>1.390</td>
<td>0.2025</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Source of Variation</th>
<th>Sum of Sq.</th>
<th>DF</th>
<th>Mean Sq.</th>
<th>F</th>
<th>Prop.</th>
<th>Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between</td>
<td>1.0440</td>
<td>3</td>
<td>0.3480</td>
<td>15.1304</td>
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<td>H.S.</td>
</tr>
<tr>
<td>Residual</td>
<td>0.6210</td>
<td>27</td>
<td>0.0230</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1.6650</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table(IV): T-test (Time in Second)

<table>
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<tr>
<th>Groups</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>P-value</th>
<th>Sign.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ProTaper Vs K-file</td>
<td>335</td>
<td>360</td>
<td>347</td>
<td>7.888</td>
<td>87.993</td>
<td>0.000</td>
<td>H.S.</td>
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<tr>
<td></td>
<td>720</td>
<td>755</td>
<td>737.5</td>
<td>10.865</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermafil Vs Lat.Cond.</td>
<td>52</td>
<td>68</td>
<td>59.6</td>
<td>5.641</td>
<td>-62.443</td>
<td>0.000</td>
<td>H.S.</td>
</tr>
<tr>
<td></td>
<td>240</td>
<td>266</td>
<td>252.5</td>
<td>8.462</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Figure(I): LSD test

|------------------------------|-----------------------------|----------------------------------------|--------------------------------------|

References


Dental Status and Prosthodontic Treatment Need and Demand among University Students in Some Iraqi Colleges

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Dr. Faiza Muhammed Hussaing B.D.S. M.Sc. **
Dr. Zainab Muhammed Hussain B.D.S. M.Sc. ***

Abstract

This cross-sectional investigation was designed to establish the prevalence of caries and edentulous areas as well as the need and demand for prosthodontic treatment among the 4th year students in Dentistry, Education and Engineering colleges.

A sample composed of 237 subjects, (82) students from Dentistry college, 75 students from Education college and 80 students from Engineering college.

The result showed a high percentage of students with carious teeth reported in Education group, the majority of missing teeth ranged between 1-3 teeth among students in 3 college groups, a higher percentage of students in 3 colleges did not consider that replacement of teeth was aesthetically and functionally important.

CI III represented most frequent condition in both upper and lower arches in all college groups and in both sexes. CI I and CI II were rare and found only in Education group.

Introduction

Prosthodontic treatment need is usually prescribed for functional as well as cosmetic purposes, although the patients motivating force in seeking treatment is most often cosmetic, (1), (2), (3)It is difficult for a prosthodontist in practice to assess the current needs of the public, because the practitioner only sees those patients who seek treatment and is unable to evaluate the total range of needs and demands in a given population. This type of evaluation can be done only by a population survey, (4) (5). Assessment of the need for prosthodontic treatment may also serve as a measure of the effect of changes in dental treatment and its consumption. (6)

In this study a cross-sectional epidemiological survey among a sample of Iraqi students at 4th year stage from Dentistry (Baghdad University), Education (Baghdad University / chemistry department and Engineering (AL-Mustansiria University) colleges will be conducted.

Materials and methods

The present study was carried out during the period from January 1999 to 25 April for the same year. It covered a sample of 4th year students of colleges, Dentistry, Education / Department of chemistry and Engineering. The sample was predetermined to represent 1 in 5 of the total number of the 4th year student in each colleges so the sample were 82, 75 and 80 for...
Dentistry, Education and Engineering college respectively.

The data was recorded on a pre-typed form from Figure (1). Questions were formulated as far as possible to be answerable without help; however, help was available in case any question appeared to be vague.

A short medical history was obtained including presence of any chronic disease, medical compliant or drug intake. Oral examination was carried out using a mouth mirror and dental probe. Natural or artificial light was used throughout the survey.

**Recording of missing teeth.**

Missing teeth already replaced with a bridge were regarded as missing, while those teeth with only the root remaining or with advanced periodontal disease, which in the clinical judgment of the examiner could not be restored to a firm and functional state by periodontal therapy were regarded as.

Impacted teeth and congenital missing teeth (other than third molars) were all regarded as missing.

**Recording of partially edentulous areas**

The classification adapted for this study was based on the Kennedy classification which has been recognized for several years. (2)

**Prosthodontic treatment needs index**

Application of Eichners index for estimation of the prosthodontic treatment need used by Mohlin et al in 1979 (6) was undertaken including:

A - The need for prosthodontic treatment for occlusion rehabilitation - OR index include the following:

Grade 4: very urgent, Grade 3: A great need, Grade 2: A moderate need, Grade 1: little need, Grade 0: No need for treatment.

B - The need for prosthodontic treatment for aesthetic rehabilitation - ER - index includes five scales:

- Grade 4: That 11/ and 21 are missing with remaining spacing exists in one or both jaws.
- Grade 3: That 12 and / or 22 are missing or all mandibular front teeth are missing.
- Grade 2: That the crowns of maxillary front teeth have an oblique fracture or atypical shape or lower incisor crowns are missing.
- Grade 1: That one mandibular incisor crown is missing or the first upper premolar is missing.
- Grade 0: No need for prosthodontic treatment for rehabilitation.

C - The overall need for prosthodontic treatment PT index:

These include the following scales:

- Grade 4: An urgent need.
- Grade 3: A pronounced need.
- Grade 2: A moderate need.
- Grade 1: Little need.
- Grade 0: No overall need for prosthodontic treatment.

**Replacement care for missing teeth:**

This criterion was based on the guidelines the Californian Dental Association C D A (7), W H O (8). These were recorded as:

A. Needs for fixed bridge.

- If the edentulous span is short and bounded by abutment teeth with good periodontal support and good occlusion.

B. Need for partial denture.

- If the patient had conditions revealed during the clinical examination which contraindicated
replacement of missing teeth with fixed prosthetic appliances.

**Statistical analysis:**

The differences between variable were analyzed using the chi square test (X2) then correlation was studied. The level of significance used was at 0.05.

**RESULT**

As previously stated, 237 subjects were included in this study, from Dentistry college (82) student (37) males and (45) females, from Education college (75) student (37) males and (38) females while from Engineering college (80) students (39) males and (41) females.

**Statistical analysis of the results of missing teeth**

X 2 test showed no significant differences between men and women in all colleges [X 2 = 2.6956 d.f == 2 P<0.25] as well as there was no significant different between Engineering and Education groups [X 2 ==2.0824 d.f =2 P< 0.35] and no significant differences was found between Dentistry and Engineering groups [X 2 = 13.429 dif- 2 P < 0.001] as Shown in Table 1 .when compared together

**Attitudes towards teeth replacement (Questionnaire)**

The result showed that majority of participants from both sexes in three colleges appeared to prefer fixed bridge replacement rather than removable appliances. In Table-2- a significant difference was found between men and women. X test illustrated that there was a non significant different between college groups.

**Reason of no dental replacement (Questionnaire)**

Table (3) shows that a higher percentage of student in three colleges did not consider that replacement of teeth to be aesthetically and functionally important. This Table also presented that there was no significant different between each of two college groups.

**Prevalence of partially edentulous area**

CI III represented most frequent condition in both upper and lower arches in all college groups and in both sexes. Cl II and cl I were rare and found only in Education group in both upper and lower arches . No one student in these groups presented with Cl IV. X test for upper and lower Kennedy classification presented a significant different between men and women for CI III Kennedy classification, for upper Kennedy classification X 2 54.0795 d.f=2 p< 0.0001 and for lower arch X 2=38.908 d.f=2 P<0.0001.

**Relation ship between upper and lower Kennedy classes**

This relation was calculated in Table (5) for students with no missing teeth, student with Cl III and students with Cl II. There was a statistically significant difference between upper and lower arches (When comparing the differences between different college groups in prevalence of partial edentulous areas , a significant difference between each of two college groups was found when compared separately

**Occlusal supporting zones:**

Results in table (6) showed that in Dentistry and Engineering colleges all men and women 100% had occlusal
contacts in all four supporting zones (Eichner index category A). In education college, 100% men and 94.8% women had occlusal in all four supporting zone, the remaining percentage of 5.2 % women had occlusal contact in three supporting zone and less (category B of Eichners index). None was found to fill category C of Eichners index. In statistical analysis there was a high significant different between Dentistry and Education groups ($\chi^2 = 32.95$ d.f=5 $P < 0.00004$). As well as there was a significant different between Education and Engineering groups ($\chi^2 = 4.6645$ d.f = 5 $P < 0.02$) while no significant different was found between dental and Engineering groups ($\chi^2 = 13.39$ d.f =5 $P<0.45$).

Replacement care for missing teeth

In Table (7) it appeared that in the upper and lower jaws the higher percentage of total number of subject having missing teeth in the three colleges needed fixed bridges. Where in the lower jaw a higher percentage than in upper jaw. The need for removable partial denture in upper and lower jaws were rare and it was recorded as four cases in Education college group, (one case in the upper jaw, and three cases in lower jaw)

DISCUSSION

The sample of present study composed of student of three colleges (Dentistry, Engineering and Education). The selection of students based on that every fifth student examined, in alphabetical order (this participation rate is comparable with other epidemiological studies). In order to ensure more reliable comparisons of the clinical observations within the sample where only one examiner conducted the examination.

Attitudes towards teeth replacement Questionnaire

The questionnaire study indicated that the majority of participant from both sexes in the three different colleges appeared to prefer fixed bridge replacement this is in agreement with other result AL-Rawi, Hugoson this might be due to that properly constructed fixed restoration are usually more physiologically and psychologically acceptable to the patient.

Reason of no dental treatment (Questionnaire)

A higher percentage of students in the three different colleges did not consider that replacement of teeth was aesthetically and functionally important this was in disagreement with result of AL-Rawi (1993) this might be due to those missing teeth were mainly posterior cl III.

Prevalence of partial edentulous area

A fairly high prevalence of Kennedy cl III was found in maxillary and mandibular arch in both sex as the 3 different colleges which is probably due to the relative early disappearance of molars and premolars this in agreement with other studies AL-Rawi, Bjom et al, Luan et al, Spartley, Widstorm. No Kennedy class IV classification recorded in this study while for Cl I and Cl II only few cases in Education group, having very low numbers as compared with AL-Rawi results.
Bjom (1979) this is probably because their sample was composed of older age group where cl I and cl II seemed to be more frequent and more extensive.

In testing the differences between sexes in the Kennedy classification, a statistically significant different was found between men and women for the upper jaw this was in agreement with AL-Rawi (1993) while for the lower jaw the result were in disagreement with AL-Rawi (1993) this may be due to the fact that our sample consist of young age group only and the missing teeth were not replaced by bridges.

**Relationship between upper and lower Kennedy classes**

Statistically significance difference between upper and lower Kennedy classes and for the 3 different colleges. A high percentage of classification in lower and this were in agreement with the result of AL-Rawi (1993). And Widstorn (1982).

College of Education showed a higher percentage when comparison between different colleges groups was estimated this might be due to that attitude of students of Education of college directed toward extraction of teeth rather than treat them.

**Occlusal supporting zones**

In Dentistry college group men and women 100% Engineering college group men and women 100% and Education men 100% and women 94.8% having occlusal contact in all four supporting zone Eichners index (category A) this result were similar to the result obtained by Zimmerman et al (1990) (17). Also for this index it was appeared that three colleges don’t show acategory C of Eichners index this was in disagreement with result obtained by AL-Rawi (1993) . Hellden et al (1989) this might be due to the fact that the sample used in this study of young age group.

For the education college of it appeared that the group of women 5.2% had occlusal contact in three supporting zone and less (category B of Eichner index ), this result appeared significantly different from Dentistry and Engineering college groups this may be due to the high number of teeth extracted in education college group due to less care.

**Replacement care for missing teeth**

The result showed that there was a significant difference between upper and lower jaws also there was a significant difference between Dentistry and Education college group as well as between Dentistry and Engineering. The higher percentage of total number of subjects who had had missing teeth in the three different colleges needed fixed bridges. In the lower jaw the percentage was higher than that in in upper jaw this was in agreement with result obtained by AL-Rawi (1993) while for Widstorn (1982) a low percentage of fixed bridge this could be explained by the lower rate of use of dental services which was due to lack of interst , low social status of subjects as well as high costs .the latter reason was also mentioned by Tervomen (1988).

**Conclusion**

1- a. The frequency of carious and missing teeth was high in Education college group followed by engineering group while the number of filled teeth was relatively high in Dentistry group.
b. Most common partially edentulous area (Kennedy classification) was the Cl III and only four cases of Cl II and Cl I were recorded that was in the education college.

2- A high percentage of students all of the different college in three groups needed fixed bridge replacement sex seemed to have no direct effect on the results.

3- The causes of absence of dental treatment in spite of need were due to poor dental education, as well as low use of dental services which was in turn related to lack of interest, low social status of subjects and high cost.

4- More educational programs of improvement of dental health care are needed to increase the level of awareness for all students in Iraq and at different educational levels.

5- There was a significant different in Cl III Kennedy classification

References


16- Widstrom E: loss of teeth and the frequency and condition of


Table 1 Differences between sex group of all colleges and among colleges (Dentistry, Education, and Engineering)

<table>
<thead>
<tr>
<th>Groups</th>
<th>X2</th>
<th>D.f</th>
<th>P. Value</th>
<th>Sig</th>
</tr>
</thead>
<tbody>
<tr>
<td>M&amp;W all college</td>
<td>2.6956</td>
<td>2</td>
<td>P &lt; 0.25</td>
<td>N.S</td>
</tr>
<tr>
<td>En &amp; Ed</td>
<td>2.0824</td>
<td>2</td>
<td>P &lt; 0.35</td>
<td>N.S</td>
</tr>
<tr>
<td>Dent &amp; En</td>
<td>13.429</td>
<td>2</td>
<td>P &lt; 0.001</td>
<td>N.S</td>
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</table>

Table 2 percentage of subjects according to preferable prosthodontic replacement for Dentistry, Education and Engineering colleges

<table>
<thead>
<tr>
<th>Preferable Prosthodontic Replacement</th>
<th>Men</th>
<th>Women</th>
<th>Total</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>D %</td>
<td>Ed %</td>
<td>Eng %</td>
</tr>
<tr>
<td>Fixed bridge</td>
<td>45.9</td>
<td>45.9</td>
<td>53.8</td>
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<tr>
<td>Removable denture</td>
<td>21.6</td>
<td>13.6</td>
<td>10.2</td>
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<td>No differences</td>
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<td>0</td>
<td>2.6</td>
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<tr>
<td>Don’t Know</td>
<td>32.5</td>
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<tr>
<td>Total</td>
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Table 3 Frequency and relative distribution of the factors affecting teeth replacement according to type of college

<table>
<thead>
<tr>
<th>Reasons of dental replacement</th>
<th>Total No.237</th>
<th>D No. 82</th>
<th>Ed No. 75</th>
<th>Eng No. 80</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
</tr>
<tr>
<td>Financial</td>
<td></td>
<td>^, 4, 7</td>
<td>^, 4, 7</td>
<td>^, 4, 7</td>
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<tr>
<td>Not affected</td>
<td>^, 4, 7</td>
<td>^, 4, 7</td>
<td>^, 4, 7</td>
<td>^, 4, 7</td>
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<tr>
<td>Has no idea about replacement</td>
<td>^, 4, 7</td>
<td>^, 4, 7</td>
<td>^, 4, 7</td>
<td>^, 4, 7</td>
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<tr>
<td>unwillingness</td>
<td>^, 4, 7</td>
<td>^, 4, 7</td>
<td>^, 4, 7</td>
<td>^, 4, 7</td>
</tr>
<tr>
<td>Total</td>
<td>^, 4, 7</td>
<td>^, 4, 7</td>
<td>^, 4, 7</td>
<td>^, 4, 7</td>
</tr>
</tbody>
</table>

Table 4 Differences between man & women for cl III Kennedy classification presented a significant different between men and women Kennedy classification

<table>
<thead>
<tr>
<th>Group</th>
<th>X²</th>
<th>D.f</th>
<th>P. value</th>
</tr>
</thead>
<tbody>
<tr>
<td>(M&amp;W) upper</td>
<td>54.07</td>
<td>2</td>
<td>P &lt; 0.0001</td>
</tr>
<tr>
<td>(M&amp;W) lower</td>
<td>38.90</td>
<td>2</td>
<td>P &lt; 0.0001</td>
</tr>
</tbody>
</table>
Table (5) Frequency and relative distribution of upper and lower Kennedy classification for Dentistry, Education and Engineering colleges. (cl IV excluded from Table because no one has cl IV Kennedy classification).

<table>
<thead>
<tr>
<th>Kennedy classification</th>
<th>Lower NO.</th>
<th>D=82</th>
<th>Ed=75</th>
<th>No missing</th>
<th>C1 III</th>
<th>C1 II</th>
<th>C1 I</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper NO. D=82,Ed=75,Eng=80</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>%</td>
<td>((\gamma,\sigma))</td>
<td>((\gamma,\tau))</td>
<td>((\gamma,\tau))</td>
<td>((\gamma,\tau))</td>
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<tr>
<td>No Missing area D Ed. Eng.</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1 III</td>
<td>D Ed. Eng.</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1 II</td>
<td>D Ed. Eng.</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C1 I</td>
<td>D Ed. Eng.</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>D Ed. Eng.</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
<td>((\gamma,\gamma))</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

No missing X2= 29.28 d.f=2 p< 0.0001 S
X2 Cl III = 55.75 d.f=2 p< 0.0001 S
X2 C1II =0.625 d.f=2 p<0.7 S.
X2CII=0 d.f=2 p<1
X2 (D x Ed) = 232.92 d.f=2 p<0.0001 S.
X2(DxEng) =1.651 d.f=2 p<0.7 S.
X2(EdxEn)=2247 d.f=2 p<0.0000.5 S.

Table (6) Relative distribution of Eichner's Index according to sex and type of college

<table>
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Table (7) Frequency and relative distribution of replacement care for missing teeth according to type of college.

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<tr>
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<td>(\gamma,\gamma)</td>
<td>(\gamma,\gamma)</td>
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\(X^2 = (\text{maxilla}, \text{mandible}) 10.58971 \text{ d.f}=2 p<0.05022 \text{ S}\)
X² (D , Ed) = 10.415 df= 2 P < 0.0548 S
X² (D , En) = 4.623 df= 2 P < 0.09912 S
X² (Ed, En) = 0.528 df==2 P<0.7679 NS

1-No. of student Name:---------- Sex : ......... Age in year .......
2-College name ----------------Date of examination ------------------
3- Address ---------------------------.
4- General medical history ------------------------ .
5- What kind of replacement do you prefer if you have loss teeth?
   C- No difference fixed or removable. D- Do not knows.
6-Missing tooth (teeth) not replaced by artificial ones what are the reasons (more then one reason can be chosen).
   A- Financial reasons. B- Not affected aesthetically or functionally by tooth (teeth) loss.
   C- No information about obtaining dental treatment .D- Un willingness or other reasons.
12- If you have been supplied with prosthesis, what kind is it?

**Clinical Examination**

**Dentition status**

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Eichner Index  - OR Index  -ER Index  -PT Index

- Kennedy classification
- Presence of fixed prosthesis
- Presence of removable prosthesis
- Kennedy classification of RPDs
- Replacement care for missing teeth

**(Figure -1- Pre typed from)**
Dento-Skeletal dimensions in individual with skeletal CL I and variations in the lower anterior facial height

Dr. Sami K. Al. Joubori B.D.S , M.SC

Abstract

Aims of the study: This study is designed to evaluate some of the dental and skeletal dimensions of individuals with normal and excessive lower anterior facial height and to establish the effect of these two groups (normal and excessive lower anterior facial height) on dento-facial structures for Iraqi adult sample at 18-25 years of age with skeletal and dental CL I occlusion.

Material and Method: The sample consisted of (80) previously taken lateral cephalometric radiographs (40 males and 40 females). The sample was divided into two groups (normal lower anterior facial height group and excessive lower anterior facial height group) each of them composed of 40 subjects (20 males and 20 females).

Results: The results showed that all linear measurements were significantly larger in males than females in two groups. No significant differences in most of dento-skeletal dimensions were found between the two groups. Highly significant differences for lower anterior dental height (LADH) and upper posterior dental height (UPDH) were found between the two groups.

Conclusion: Four anatomical parts were responsible for the variation of the lower anterior facial height upper anterior dental height (UADH), lower anterior dental height (LADH), upper posterior dental height (UPDH) and the inclination of the mandibular plane in relation to the anterior cranial base (SN-MP angle).

Introduction

The description of the dento-facial relationship of people with normal and abnormal facial morphology is one of the most common subjects in orthodontic literature\(^1,2\). Due to the large variation that in the exists in the population, many studies have been made to describe the variations of the human face, including a system that identifies the various facial types, this classification is of great importance in the diagnosis and treatment planning of craniofacial and dental discrepancies (3).

The facial type (short, average and long faces) in relation to morphological characteristics is an important factor to be considered in orthodontic treatment, because facial type influences growth predication of the maxillofacial system in the anchorage system that is used during treatment for the goals of orthodontics treatment(4).

There is a negative correlation between the average growth rate of the upper anterior face height with the lower anterior face height suggesting that some children show accelerated growth in the lower face height in the relation to the upper face height and vice versa(5).

The effect of orthodontic treatment on the lower face height (ANS-Me) is a factor of great importance, to be confirmed by the orthodontist, however, the facial type should be considered when planning treatment with or without extraction.(6) Lower anterior face proportion used to demonstrate that non extraction treatment showed downward and backward rotation of the mandible and an increased lower face height. On the
other hand, extraction treatment is not associated with change in the ANS-Me measurements.

The anterior face proportion is an instrument could be used in the orthodontic diagnosis, instead of using only numerical vertical measurements (7).

Creekmore (8) said that any one technique or philosophy of treatment is inadequate, when used without consideration of the facial type of the patient. The vertical growth should be stimulated or inhibited i.e. redirected according to the needs of the individual patient. Thus, the importance of knowledge of facial types and their characteristics in relation to the growth pattern is clear.

Material and Method

The sample consist of eighty lateral cephalometric radiographs (40 males and 40 females) that previously taken in orthodontic department at the College of Dentistry of Baghdad University.

In the selection of the sample were skeletal class I (ANB angle between 0-4 degree(9), bilateral class I canine and molar relation-ships, full set of permanent teeth excluding third molar, no history of abnormal habit , no history of previous orthodontic treatment or maxillofacial surgery and no clear facial asymmetry.

The sample was divided into two groups according to facial third proportions obtained by linear measurements of anterior face height (N-Me) and lower anterior face height (ANS-Me) based on the measurements suggested by Wylie and Johnson (1952) with the proportion of 55% for (ANS-Me) distance. (ANS-Me) values were defined ranging from (55%-56%) for the normal lower anterior face height group, values greater than 56% for the excessive lower anterior face height group. The groups were composed of 40 subjects (20 males and 20 females) in the normal lower anterior face height group and other 40 subjects (20 males and 20 females) in the excessive lower anterior face height group.

Cephalometric landmarks:-

The following cephalometrics landmarks were used in this study according to Enoki (17):
- Sella (S) (center of sella turcica)
- Nasion (N) – Anterior point on the frontonasal suture
- Point A – Deepest point on the concave outline of the upper labial alveolar process.
- Point B –The deepest point on the bony curvature between the crest of the alveolus and the pogonian.
- Anterior nasal spine (ANS) –The tip of the anterior nasal spine
- Posterior nasal spine (PNS) – The tip of the posterior nasal spine.
- Point Is (Is) – maxillary incisal edge.
- Point Ii (Ii) – mandibular incisal edge.
- Point 6s (6s) – mesiobuccal cusp of the upper first molar.
- Point 6i (6i) – mesiobuccal cusp of the lower first molar.
- Menton (Me) – The lowest point on the lower border of the mandibular symphysis
- Gonion (Go) – The mid point at the angle of the mandible.
- Articulare (Ar) – Intersection of the lateral radiographic image of the posterior border of the ramus with the occipital bone.

Measurement technique

The following cephalometric measurements were taken according to (12),Fig (1,2)
1- N-Me (anterior facial height)
2- ANS-Me (lower anterior face height)
3- Go-Me (mandibular length)
4- ANS-PNS( Maxillary length)
5- Ar-Go (ramus height)
6- UADH (upper anterior dental height)
   linear distance from the incisal edge
   of the maxillary central incisor along
   a perpendicular to the palatal plane.
7- LADH (lower anterior dental height)
   linear distance from the incisal edge
   of the mandibular central incisor
   along a perpendicular to the
   mandibular plane.
8- UPDH (upper posterior dental
    height). Height of the maxillary first
    molar measured as a perpendicular to
    the palatal plane through the
    mesiobuccal cusp.
9- LPDH (lower posterior dental
   height): Height of the mandibular
   first molar measured as a
   perpendicular to the mandibular
   plane.
10- SN-OCCP: angle formed by the
    intersection of (SN) and the occlusal
    plane (OCCP)
11- SN-MP: angle formed by the
    inclination of the mandibular plane
    (GO-Me) in relation to the anterior
    cranial base (SN)
12- Is-PP: angular measure formed by
    the intersection of the maxillary
    incisors in relation to the palatal
    plane.
13- Ii-MP: angular measure formed by
    the intersection of the mandibular
    incisors in relation to the mandibular
    plane.
14- ANB angle: angle formed by the
    intersection of N-A and N-B.

Results

The result showed that the mean
values were greater in males than
females for all linear measurements for
the normal group with a highly
significance except upper anterior
dental height (UADH) and upper
posterior dental height (UPDH) were a
non significant difference between
them while the angular measurement
showed a non-significant difference
between males and females except
(SN-OCCP) which appeared with a
significant difference with females
more than males. (Table -1-)

Concerning the excessive large
lower anterior facial height group, the
results showed a larger mean values for
males than females with a highly
significance for most linear
measurements except lower posterior
dental height (LPDH) and upper
anterior dental height (UADH) were
only a significant difference. But there
was a no significant difference
between both genders for angular
measurements. (Table-2-)

Table-3 showed the comparison of
significance between two groups for
each gender and total sample,
concerning the difference between the
two groups (for males): the results
showed a non-significant difference for
most of variable except (ANS-Me),
(LADH),(UADH),(UPDH) which
appeared with a highly significant
difference with larger mean values in
the excessive lower anterior facial
height group. While the difference
between the two groups (for females).

The result showed a non-significant
difference for most variable except
(LPDH), (UADH) which appears a
significant difference while (ANS-Me),
(LADH) showed a highly significant
difference with a greater mean values
for excessive lower anterior face
height group.

The difference between the two
groups (for total sample): The result
showed a non-significant difference for
most variables except (ANS-Me),
(LADH), (UPDH) which appearance
with a highly significant difference and
(SN-MP) with only a significant
difference with a greater mean values
in the excessive lower anterior face
height group.
Discussion

The vertical facial growth pattern is a very important factor to consider in orthodontic treatment, especially with reference to the dental and skeletal characteristics of facial types in relation to the lower face height.

The results showed that males in both groups had a larger facial and dental linear dimensions than females and this comes in agreement with Coben (11,12) who explained that males had a larger facial proportion than females also it comes in agreement with profit(13) who reported that males showed highly significant values for all vertical planes indicating larger facial proportions.

Comparison of the skeletal linear measurements:

The results showed that there was a no significant difference in the mandibular length (GO-Me) and the maxillary length (ANS-PNS) among the two groups, this indicating that the increase in the anterior lower facial height had no effect on both mandibular and maxillary length and this comes in agreement with (3,21), whom they found a non significant differences in the maxillary and mandibular length among the normal and long face groups.

The height of the mandibular rami was not significantly different among the two groups, demonstrating that this linear measurement does not influence the dimensions of the lower anterior face height as concluded by Nanda (15) who reported that posterior face height and ramal height do not significantly differ between facial types. Concerning the total anterior face height (N-Me) , no significant between the two groups although there was a larger mean values for long face group in contrast to Fields et al (1) study who found that total anterior face height are significantly larger in long face than in normal faces.

Comparison of the dental linear measurements:-

For UADH and LADH, there was a highly significant differences between the two groups with a larger mean values for the excessive lower anterior facial height group than the normal group for both genders and total sample and this comes in agreement with (7,16,17) whom observed that all anterior dental heights were larger in the group with excessively larger lower anterior face height compared to the normal group.

For UPDH and LPDH, the results showed a greater mean values for both UPDH and LPDH in the excessive lower anterior facial height group compared with normal group and this difference is ranged between a not significant for LPDH when we compare between total normal and total excessively large lower anterior face height. While it was showed a highly significant for UPDH when we compared between total normal and total excessively larger anterior face height and this comes in agreement with (1) who observed that posterior dental heights were larger in the long face type compared with the normal type.

Comparison of skeletal Angular measurements:-

There was no significant differences of the SN-MP angle between the two groups for both genders but when we compare between the total sample, the result, showed a significant differences with larger mean values for excessive group and this comes in agreement with(1) who found, in long face, the (SN-Mp) angle is significantly larger than in normal faces. Also it comes in agreement with (18,19) who reported that the SN-MP
angle can not be the sole criterion in the selection and diagnosis of long face. Concerning the SN-OCCP angle, there was no significant difference between the two groups, in agreement with the findings of Nanda (20).

Comparison of the Dental Angular Measurements:

The axial inclination of the upper and lower central incisors of the present study showed no significant differences, in contrast to the findings of (14,21) who observed more tendency toward accentuated dental axial inclinations in the normal lower face height group than in the group with long faces, suggesting a more tendency toward uprightening position of the incisors in the normal group.

It was possible to conclude that four anatomical parts were responsible for the variation of the lower anterior facial height. UADH, LADH, UPDH, SN-MP angle. There fore these measurements may indicate the variation of the lower anterior face height rather than only the analysis of the proportion of the anterior facial height.

References

8- Creek more TD: Inhibition or stimulation of the vertical growth of the facial complex, its significance to treatment. Angle orthod (1967) 37: 285-297.


Figure (1): Dental and skeletal linear measurements.

Figure (2): Dental and skeletal angular measurements.
Table (1): A comparison of significance between males and females for normal group.

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Linear measurements

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Angular measurements

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H.S.= Highly significant at P< 0.01
S.= P< 0.05
N.S.= Not Significant at significant at P> 0.05
Number of individual= 40 person

Table (2): A comparison of significance between males and females for excessive lower anterior facial height group.

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Linear measurements

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Angular measurements

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<td>5.59</td>
<td>114.60</td>
<td>5.66</td>
<td>113.83</td>
</tr>
<tr>
<td>Li- MP</td>
<td>93.45</td>
<td>5.45</td>
<td>93.20</td>
<td>7.61</td>
<td>93.32</td>
</tr>
</tbody>
</table>

H.S.= Highly significant at P< 0.01
S.= Significant at P< 0.05
N.S.= Not significant at P< 0.05
Number of individual= 40 person
Table (3): A Comparison of significance between normal and excessive groups for each gender and total sample:

<table>
<thead>
<tr>
<th>Variables groups</th>
<th>Go- Me</th>
<th>N- Me</th>
<th>ANS-M</th>
<th>Ar- Go</th>
<th>LADH</th>
<th>LPDH</th>
<th>UADH</th>
<th>UPDH</th>
<th>ANS- PNS</th>
<th>SN- MP</th>
<th>SN- OccP</th>
<th>IS- PP</th>
<th>li- MP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal male x excessive male</td>
<td>0.356 (N.S.)</td>
<td>0.265 (N.S.)</td>
<td>0.000 (H.S.)</td>
<td>0.292 (N.S.)</td>
<td>0.003 (H.S.)</td>
<td>0.560 (N.S.)</td>
<td>0.005 (H.S.)</td>
<td>0.002 (H.S.)</td>
<td>0.192 (N.S.)</td>
<td>0.101 (N.S.)</td>
<td>0.770 (N.S.)</td>
<td>0.122 (N.S.)</td>
<td>0.863 (N.S.)</td>
</tr>
<tr>
<td>Normal female x excessive female</td>
<td>0.391 (N.S.)</td>
<td>0.266 (N.S.)</td>
<td>0.001 (H.S.)</td>
<td>0.523 (N.S.)</td>
<td>0.001 (H.S.)</td>
<td>0.020 (S.)</td>
<td>0.046 (S.)</td>
<td>0.229 (N.S.)</td>
<td>0.256 (N.S.)</td>
<td>0.099 (N.S.)</td>
<td>0.882 (N.S.)</td>
<td>0.671 (N.S.)</td>
<td>0.950 (N.S.)</td>
</tr>
<tr>
<td>Total normal x total excessive</td>
<td>0.327 (N.S.)</td>
<td>0.870 (N.S.)</td>
<td>0.000 (H.S.)</td>
<td>0.301 (N.S.)</td>
<td>0.000 (H.S.)</td>
<td>0.057 (N.S.)</td>
<td>0.001 (N.S.)</td>
<td>0.005 (H.S.)</td>
<td>0.115 (N.S.)</td>
<td>0.022 (S.)</td>
<td>0.769 (N.S.)</td>
<td>0.362 (N.S.)</td>
<td>0.948 (N.S.)</td>
</tr>
</tbody>
</table>

H.S.= Highly significant at P< 0.01
S.= Significant at P> 0.05
N.S.= Not significant at P> 0.05
Number of individual= 80 person
Successful Endodontic Treatment of Maxillary Lateral Incisor two canal

Dr. Walid Al-Hashmi B.D.S. M. Sc.
Dr. Abdul-Karim Jassim Al-Azzawi, B.D.S. M.Sc.

Abstract

A 21 year old female referred with a symptomatic maxillary left lateral incisor which previous root canal treatment radiographs from different angulations had revealed a second canal which has been missed during previous treatment. The extra canal was located and obturated in the proper way.

Introduction

Occurrence of multiple canals in maxillary lateral incisors is extremely rare. Previous studies showed that 100 of maxillary incisors have single canal. Anatomical variations in maxillary incisors are considered to be the result of developmental anomalies. Gemination is anomaly in which the tooth germ divides during development of the tooth resulting in the formation of a double crown with a single root. In case of fusion, the crowns of two separate tooth buds fuse during development resulting in a bifid crown with two root canals in one root. Concrescence, a rare condition occurs when the roots of two separate teeth fuse following crown development. The incidence of these anomalies which result in either a single larger crown or a fused or joined crown is highest in the anterior deciduous dentition and are rarely seen in the anterior teeth of the permanent dentition.

Case Report

A 21 year old female referred to the Conservative Department at the Baghdad Dental School for endodontic consultation. Her chief complaint was pain and swelling in the maxillary left region. Pain was described as mild and continuous. Clinical examination revealed pain on percussion in the maxillary left lateral incisor which was endodontically treated by an undergraduate student 3 weeks ago. The labial cortical plate was slightly tender to palpation. No response was elicited from either hot or cold application. All adjacent teeth were vital. Taking radiographs from different angulations revealed a relatively well circumscribed radiolucent area associated with the apex of the maxillary left lateral incisor and the presence of a second canal which had been left unfilled. Under local anesthesia and after a rubber dam was placed, access opening was made. The previous root canal filling was removed, the pulp in the second canal was extirpated using a barbed broach and the working lengths were determined (Fig. 2). The canals were irrigated with sodium hypochlorite and dried using a paper point. Camphorated para mono chloroprene (C.M.C.P) medication was used as an intracranial medication, and sealed with zinc oxide-eugenol temporary filling. At the second appointment the patient...
reported that there had been an improvement in the symptoms. Instrumentation was done up to "60 file in series using reaming and filing action. The canals were obturated by lateral condensation of master gutta-percha with auxiliary points (Fig.3) at the follow up evaluation 4 weeks after treatment the patient reported no complaints.

Discussion

The main objective of endodontic therapy is the thorough mechanical and chemical cleansing of entire pulp cavity and its complete obscuration with an inert filling material. One of the main reasons for endodontic failure is failure to find and obturate the whole root (a) canals system. This report discusses a case of maxillary left lateral incisor in which an extra palatal canal was located instrumented and obturated.

It may be a mistake to look for extra canals and roots only on certain teeth and to ignore their possible prescence on others. Radiograph from different angles prior to beginning the access opening should be done.

References

Fig. Preoperative radiograph

Fig. 2 Working length determination

Fig. 3 Complete obturation of root canal system
Effectiveness of Four Different Light-activated Composites Cure with Different Light Energy Densities

Dr. Ali A. Al-Shekhli  B.D.S., M.Sc., Ph.D.*
Dr. Haitham J. Al-Azzawi  B.D.S., M.Sc.**
Dr. Isra’a A. Al-Aubi  B.D.S., M.Sc.***

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 composites types used in this study.

Materials and methods: This study investigated the hardness of the top/bottom surfaces and hardness ratio of 2-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 curing 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 2-mm thick specimen while, Herculite XRV and Tertric 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 and composite cure.

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 a 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.

### 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 cured 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 curing 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.

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.

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 and curing time for 20 seconds where, there was non significant 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 non significant 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 150 seconds and 600 mW/cm² light intensity and curing time for 150 seconds.
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 Herculan composite cured at 600 mW/cm² light intensity where, there was non significant 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 high 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 energy density or at least the light intensity that should accompanied this curing time.

References

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>
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<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>
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<td>?</td>
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<td>0.80 (0.07)</td>
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<tr>
<td>400</td>
<td>20</td>
<td>0.62 (0.03)</td>
<td>?</td>
<td>0.82 (0.08)</td>
</tr>
<tr>
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<td>40</td>
<td>0.7 (0.05)</td>
<td>?</td>
<td>0.8 (0.09)</td>
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<tr>
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<td>0.73 (0.07)</td>
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<td>0.86 (0.10)</td>
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<tr>
<td>600</td>
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<td>0.83 (0.08)</td>
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<td>0.97 (0.04)</td>
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<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.

Figure 1: Micromet Vickers micro-hardness tester.
Denture Stomatitis in an Edentulous Iraqi Patients

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

Abstract

Denture related stomatitis is an inflammatory process that mainly involves the palatal mucosa when it is covered by complete or partial dentures; it appears frequent among denture wearer and varies widely. Fifty patients were examined in this study, 66% of them had denture stomatitis. This study aimed to evaluate the presence of denture stomatitis in denture wearers' patients, and to know the relation between denture age, denture hygiene, and denture cleansing with denture stomatitis.

Results of the present study showed that poor denture hygiene was associated with high percentage of denture stomatitis.

Also low percent of denture stomatitis appeared in the denture wearers of 3-4 times/day denture cleansing.

The percentage of reduction in the prevalence of denture stomatitis was clear in newly or less years wearing dentures.

Keywords: Denture Hygiene, denture stomatitis, denture cleansing

Introduction

Every surface in the oral cavity, natural or synthetic become covered within about 30 minutes with a (0.5-1.5m) thick precipitate of pellicle (1,2,3)

The pellicle in turn provides a substrate to which oral debris and microorganisms (bacteria and fungi) readily adhere.

Adherence of microorganism and debris is also favored by rough or otherwise irregular surfaces of dentures. (4)

The maintenance of denture prosthesis is important for the health of patients and to maintain an esthetic, odor-free appliance. (4)

Failure to maintain adequate prosthesis hygiene had been shown to be associated with a high level of oral candidal colonization. (4) There was strong relation ship between denture stomatitis and presence of Candida albicans in saliva (5).

The appliance can absorb microorganisms on its surface, this depend on the material used; acrylic appliances retain a denser flora than metal probably because they are slightly porous and easily scratched, producing areas where microbes can be retained, it has been proposed that poor denture cleanliness might predispose to infection of the palatal mucosa. (5). Denture stomatitis was seen more frequently under ill fitting dentures with a traumatizing occlusion; while allergy to denture base material considered the cause of denture stomatitis. Other factors as roughness, bacterial infections and others act as incidence of denture stomatitis (6).

Materials and Methods

A total of 50 denture wearer patients from (40-65) years old, (20 males and 30 females) came to the clinic of institute of Medical
Technology. Suffering from denture stomatitis.

Methods of examinations:-

1- **Questionnaires:** information about denture age, denture hygiene, general health, medical history, taking any medications, frequency of denture cleansing per day (Brushing method).

2- **Oral examination:** Intra oral examination of all subjects was conducted to diagnose denture stomatitis which was classified according to Newton \(^{(7)}\) as:
   A- Type I: Localized palatal pin point hyperemia
   B- Type II: Generalized hyperemia of the entire denture base area.
   C- Type III: Showing papillary hyperplasia of the palate.

3- **Denture hygiene:** Denture examination must be done by using probe (Paulo et al) \(^{(8)}\) as:
   A- Good: Absence of plaque
   B- Fair: Presence of removable plaque on both denture surfaces
   C- Poor: Presence of non-removable plaque on the denture surfaces (inner and outer).

**Results**

There was a relationship between denture age and denture stomatitis (table 1)

Also there was a correlation between denture hygiene and presence or absence of denture stomatitis (table 2).

Table 3 showed number and percentage of denture stomatitis types.

Table 4 revealed the opposite relation between denture stomatitis and frequency of denture cleansing.

**Discussion**

From the results of the present study, it was found that there was clear relationship between denture stomatitis and denture age, because older dentures tended to be related to a higher incidence of denture stomatitis, due to the deterioration of the dentures in time, such as polished surfaces, fit to the underlying tissues and the occlusion, dentures could become more irritant to the mucosa and more open to candidal and bacterial colonization, in addition to that most elderly people do not know how to keep their dentures clean for a period of time\(^{(1)}\).

This study demonstrated high association between denture stomatitis and poor oral hygiene, in that all patients with poor denture hygiene have denture stomatitis\(^{(9,10)}\). poor denture hygiene could increase the frequency of positive cultures for Candida from the dentures, this elucidate the plaque accumulation on the denture surface may create an appropriate environment for yeast growth\(^{(11,12)}\).

In this study, it was found that 66% of the patients were presented with denture stomatitis. Newton type (III) was the most frequent one, this finding come in agreement to jean et al (2003)\(^{(3)}\).

It was found that there was obvious association between stomatitis of oral mucosa and frequency of denture cleansing/ day (1-2) times daily cleansing denture gave high positive percentage, this may be explained by toxic effects of plaque masses in contact with oral mucosa of extended periods with out cleaning are subject to microbial and yeast growth But (3-4) times daily reveal improvement in denture hygiene with few or negative percentage of the denture stomatitis\(^{(12,13)}\).
The tissue fitting surface of dentures usually shows micro-
porosities which encourage the growth of microorganisms, that are difficult to
remove by mechanical or chemical

cleansing\(^{(14,15)}\).

A wide range of variations in the prevalence of denture stomatitis
had been reported, possibly because of variation in the denture wearing
habits and the presence of underlying systemic predisposing
factors in the selected populations\(^{(15)}\).

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Gamonal J.: Prevalence of oral
mucosal lesions in elderly people in
2003; 32:571-75.
Table 1- The relationship between denture stomatitis and denture age

<table>
<thead>
<tr>
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<th>Yes</th>
<th>%</th>
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<tr>
<td>1-2 years</td>
<td>5</td>
<td>10</td>
<td>10</td>
<td>20</td>
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<td>2-3 years</td>
<td>13</td>
<td>26</td>
<td>4</td>
<td>8</td>
</tr>
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<td>&gt;3 years</td>
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Table 2- The relationship between denture stomatitis and denture hygiene

<table>
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<th>Fair</th>
<th>Poor</th>
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<td>No %</td>
<td>No %</td>
<td>No %</td>
<td>No %</td>
</tr>
<tr>
<td>Positive</td>
<td>3</td>
<td>6</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>Negative</td>
<td>5</td>
<td>10</td>
<td>12</td>
<td>24</td>
</tr>
<tr>
<td>Total</td>
<td>8</td>
<td>16</td>
<td>22</td>
<td>44</td>
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</table>

Table 3- Number and percentage of types of denture stomatitis between patients

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<th>Type III</th>
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<td>No %</td>
</tr>
<tr>
<td>10</td>
<td>20</td>
<td>6</td>
<td>12</td>
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Table 4- The relationship between denture stomatitis and frequency of denture cleansing (Brushing method)

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<th>Frequency of Denture Cleansing</th>
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<tbody>
<tr>
<td></td>
<td>1-2 times/day</td>
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<tr>
<td>No %</td>
<td>No %</td>
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<tr>
<td>Positive</td>
<td>25</td>
</tr>
<tr>
<td>Negative</td>
<td>5</td>
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Preoperative antibiotic prophylaxis in oral surgery
Clinical study on 58 Iraqi patients

Dr. Faaiz Y. Alhamdani B.D.S, M.Sc *

Abstract

Preoperative prophylactic protocol in oral surgery is well established practice; still it’s not used in Iraqi surgical centers. The aim of this study is to show that preoperative protocol is reliable surgical practice.

58 patients, selected from the attendant of oral surgery clinic in Alkarama specialized dentistry center/Baghdad, were subjected to various oral surgical procedures 59 operations under local anesthesia. These patient were given single dose antibiotic prophylaxis preoperatively after we divide them into 3 groups, 1st group were given 1 gm amoxicillin (control group),second group were given 1 million i.u. of procaine penicillin; 3rd group were given 500 mg ampicillin vial,. The maximum time for all procedures was 2 hours.

We concluded that preoperative antibiotic prophylaxis can be used safely in outpatient’s oral surgical procedures, on Iraqi patient with minimum complications.

Key words: pre operative, antibiotic prophylaxis, oral surgery

Introduction

Prophylactic antibiotic therapy is defined as 'the administration of any antimicrobial agent that prevents the development of disease (1). Miles and Burke in the late 1950s were able to show that infections could be prevented only when antimicrobials were given prior to or at the time of the infection challenge, which has be proven by several studies in the last two decades and widely accepted. Antibiotic given 3h following a challenge with infectious bacteria were ineffective in preventing infection (2).

Peterson LJ (3) listed the following Principles of antibiotic prophylaxis:
1. The surgical procedure should have a significant risk of infection.
2. The correct antibiotic for the surgical procedure should be selected.
3. The antibiotic level must be high.
4. The timing of the antibiotic administration must be correct.
5. The shortest antibiotic exposure must be employed. Besides that microbiology of the infection should be known to choose the suitable antimicrobial agent (2).

The American college of surgeons considered trans-oral wound is Clean contaminated, That is, Class II, these wounds should receive protection if (a) the patient has depressed host defenses. (b) A prosthetic device is being inserted. (c) The sequel of an infection is serious; and (d) some aspect of the procedure, such as increased duration or decreased local blood supply, makes infection more likely (2). When antibiotic prophylaxis is decided, the antibiotic must be given in a dose high enough to reach a level that is four to five times the MIC for the expected organisms.

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It is important also that the plasma level dose not drop bellow the minimum inhibitory concentration (MIC). In the out patient setting, the concentration remains relatively stable for about 2 hours, falling rapidly after that. The tissue level actually remains higher than the serum level after 2 hours (2).

Materials and methods

58 patients were selected from the attendant of oral surgery department in Alkarama specialized dentistry center between October 2003 to march 2005. Most of the patients are the residence of neighborhood which is an area of relatively low socioeconomic level. No history of systemic disease and/or active infectious process, were recorded in all patient groups.

After thorough history taking, clinical and radiographic examination, 59 oral surgical procedures were done under local anesthesia. These operations were (surgical removal of Impacted lower 3rd molar: 25, Apicectomy: 16, excisional biopsy: 2, inoculation of odontogenic cysts: 10, sub mandibular duct stone removal: 1, excision of high frenal attachments: 1, surgical tooth extraction: 4, surgical removal of supernumerary tooth (mesiodens): 1, which are the usual surgical out patient procedures.

These patients were given single dose antibiotic prophylaxis in 3 groups, 1st group were given 1 gm amoxicillin (28 cases), 2nd group were given 1 million i.u. of procaine penicillin (10 cases), 3rd group were given 500 mg ampicillin vial (21 cases). 31 patients received injectable antibiotics 30 minutes before starting surgery and 28 patients received oral antibiotics 1 hour before surgery, to achieve high tissue concentration at the time of operation. The maximum time for all procedures was 2 hours from the 1st incision to the final stitch.

Meticulous handling of the tissues, avoidance of unnecessary surgical trauma and copious irrigation of the wound before closure to remove foreign bodies and debris, leaving no potential foci for bacterial infections were of crucial importance in our measures to prevent post operative infection. These patients were examined in 2nd post-operative day by the same surgeon, to check the presence of any local and general signs of post operative infection (increased pain or tenderness and post operative swelling at the site of surgery, enlarged tender regional lymph node and fever) also were examined in 7th post operative day (the time of suture removal).

Results

Data collected and analyzed, the results were as follows;

The number of female patients was 32 (54.23 %). male patients were 27 (45.76 %). Patient age groups were recorded as follows (- 10): 0 patient, (11-20): 19 patients (32.20 %), (21-30): 25 patients (42.37 %), (31-40): 10 patients (16.9), (41-50): 3 patients (5.1 %), (51-60): 2 patients (3.38 %). All surgical procedures were done under local anesthesia in oral surgery theater, these procedures categorized as follows; removal of impacted lower 3rd molar: 25, Apicectomy: 16, Excisional biopsy: 2, Cyst enucleation: 10, Sublingual stone removal: 1, Surgical extraction: 4, Removal of supernumerary tooth: 1, Excision of high frenal attachment: 1

No post operative infections were recorded in all 3 groups in our sample. Complications were recorded as follows; one patient from 58 had dry socket following 2 surgical removals of impacted lower 3rd molar surgery procedures (3.3 %).
Discussion

Although some studies found that antibiotic prophylaxis in some oral surgical procedures is controversial (8) (9) (11), it is generally agreed that when antibiotic prophylaxis is decided, the antibiotic must be present in the systemic circulation at a high level at the time of surgery and is usually given as one dose(4) (9) (6).

In spite of the fact that preoperative antibiotic prophylaxis is an established practice (2) (10), oral surgeons in Iraq do not recommend the use of preoperative antibiotic prophylaxis. As they recommend antibiotic prophylaxis after oral surgery because of habitual surgical practice, they find it hard to change from currently used regimen to unfamiliar practice.

There is no consistent protocol for the method or duration of drug administration in oral surgical procedures (5), so our choice in antibiotic selection depend on the choice of antibiotic depend on two factors
1. Most of oral infections caused by penicillin sensitive bacteria (2)
2. The use of penicillin is an established clinical practice in advanced surgical centers (10)

No post operative infections were recorded in our sample, for all patient groups (no difference between parenteral and oral route of administration). Complications were recorded as follows; one patient from 58 (she received 500mg ampicillin) had dry socket following 2 impaction procedures (3.3 %). This is comparable to other studies (8). This shows effectiveness of preoperative prophylactic measure, considering appropriate timing. Beside the rely on aseptic surgical practice instead of multiple post operative dosing, its an established surgical practice in many surgical centers with minimum complication, effective, easier for the patient, less chance for bacterial resistance.

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Figure (1) Histogram shows no. of patients according to gender

Figure (2) Histogram shows the No of patients according to age group

Figure (3) Histogram shows no. of patient according to the type of antibiotic used
Figure (4) Histogram shows No of patients according to route of administration.

Figure (5) Histogram shows the no of various oral surgical procedures.
Impact of dental study on oral health behavior, oral hygiene and gingival health status of Iraqi dental students

Dr. Kadhim Jawad  B.D.S M.Sc. *
Dr. Raed Azeez    B.D.S M.Sc. **

Abstract

The aim of the present study is to determine the impact of dental study on oral health behavior, oral hygiene and gingival health status of dental student as they graduated in their study. The sample was consist of 150 dental students, all of them were healthy and of comparable ages. They were chosen on a random basis and allocated into five groups according to their level of study. They were clinically examined for GI & PLI and filled a questionnaires specially designed for this study. Results of this research indicates an acceptable improvement in all parameters that have been used and the positive effect of dental health education had been proved again, but continuous renewal of the dental health education curricula is still mandatory.

Key words: Oral hygiene. Dental students. Health behavior. Gingival. Periodontal.

Introduction

Prevention of dental and periodontal disease is considered by many to be the primary aim of dental health education, and its effectiveness in achieving this aim was a subject for a large number of studies. (1-6) In general health education is an aspect of health promotion and one of its roles is to provide people with information, skills and experiences through which they can exercise a great degree of control on their own health. (7)

An important point need to be considered in this area is the great differences between information and education. Individuals who are informed about dental health are aware of the consequences of specific health practice, but they may be involved in an unsound course of action. In contrast the persons who are educated are not only well informed, but also use this information in their daily life ideally. (8) From the previously mentioned facts one can conclude that the most vital point in relation to the dental health education is the translation of knowledge into action.

Dental students –because of their study- are logically expected to be extensively involved in dental health education and more liable to be

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affected by the considerable attention that paid to this subject as they graduated in their study. This fact seems to be quite true at least from the outsider point of view. However oral health educational programs have been reported to have a variable impact on the oral health status of program participants. (9)

Although informal and formal components of dental health education are not completely separated entities, (10) but they often perceived simultaneously and both of them were practically being practiced by the dental student through out their graduation in dental study, but many studies revealed that even some dental students, who should know the direct relationship between bacterial plaque and periodontal diseases and should be better motivated than the others, failed to demonstrate effective oral hygiene. So it is difficult to expert an improvement of patient oral hygiene, when the patients have been motivated by students who are unable to perform satisfactory personal oral hygiene themselves. (11)

The previously mentioned fact had necessitated a true demand for a continuous renewal of the dental health curricula implemented for dental students as a part of their study. In this field a new methods of dental health education have been investigated such as Virtual Learning Environment (VLE), (12) which is a web-based database application where the learner uses free text communication on the screen to interact with patient data and a Computer-Aided Learning (CAL), (13) which allows students to work in their own time and pace. Results from these studies had reflected a positive effect of these new approaches in dental health education.

The aim of the present study is to determine the impact of dental study on oral health behavior, oral hygiene and gingival health status of dental student as they graduated in their study.

Material and method

Permission was taken from appropriate authorities to conduct this study on dental students in the University of Al-Mustansiria / college of dentistry. The sample was consist of 150 dental students, all of them were healthy and of comparable ages. They were chosen on a random basis and allocated into five groups according to their level of study. Each group consists of 15 males and 15 females.

The students were examined for Silness & Loe Plaque Index (PLI), 1964 and Loe & Silness Gingival Index (GI), 1967. All present teeth were examined and a mean score per person then calculated for each index. The clinical examinations were conducted on a dental chair by using 30 examination sets consisting of plane dental mirrors and color coded WHO probes. These instruments were properly sterilized and prepared before each examination. All examinations were conducted by a well trained and calibrated professional dentist.

At the time of the clinical examination suitable questionnaires designed specially for this research were filled by the examined students. These questionnaires were designed to estimate the oral health behavior including the self performed plaque control measures as tooth brushing and its frequency and using of different types of interdentally cleaning means.

The statistical methods that used for the analysis of the results of this research include: means, standard deviation and T-comparative significance test.
Results

Results of the present study can be mentioned under two headings; results of the questionnaire and results of the clinical examination. The comparison in these results will always be made between the first three and last two years.

The results of the questionnaire revealed that the number of the students who claimed that they brush their teeth on a regular basis was 88.9% (80 out of 90) in the first three years, while all the students in the last two years were brush their teeth daily on a regular basis as shown in table (1).

In the same table the results also revealed that 56.25% of the students (45 out of 80) in the first three years were brush their teeth once a day, 33.75% (27 students) brush their teeth twice a day, 3.75% (3 students) were brush their teeth three times a day and 6.25% (5 students) brush their teeth less than one time a day.

In the last two years, 96.88% of the students (58 out of 60) were brush their teeth once and twice a day at equal proportions and only 3.32% (two students) brush their teeth three times a day.

Table 2. shows that 76.67% of the students (69 out of 90) in the first three years did not use any type of interdental cleaning measures compared to 23.33% (21 students) who said that they use these measures as a daily routine in the cleaning of their teeth.

In more details; 80.95% (17 students) of those who used these measures were used the dental floss and the rest 19.05% (four students) were used tooth picks for this purpose.

In the final two years 51.67% of the students (31 out of 60) were found to be use the interdental cleaning aids, most of them 90.32% (28 students) were used the dental floss and the rest 9.68% (three students) were used the tooth picks.

Results of the clinical examination revealed that positive differences were recorded for both PLI & GI scores with the graduation of the dental students in their study as shown in Figure 1.

In more details the data related to PLI showed that these positive differences were significant between first & second, highly significant between second & third, also highly significant between third & fourth years and non significant between fourth and fifth years as shown in table 3.

Results related to GI appear to be similar to that of PLI with an exception; the differences of the GI scores between the first and second years were found to be non significant as that of the PLI . And significant between third & fourth year

Discussion

This research can be considered as another application of the knowledge-attitude-behavior model of the dental health education and its results came to support the large number of studies that used this model to demonstrate the effectiveness of dental health education in the improvement of the oral health behavior and status. The dramatic improvement that achieved in all parameters used in this study clearly reflects the positive effect of dental study on oral health behavior and status of dental student as they graduated in their study. The resultant fact that the maximum improvement were achieved when the students were graduated to the fourth year can be simply attributed to the implementation of the course of Periodontology and community dentistry in this year.
according to the dental curriculum that
been followed in Iraq.

Students in the last two years
were found to be strongly affected by
the large number of information and
documented facts related to the nature,
structure and effect of the microbial
dental plaque on oral tissues and its
direct relation to the initiation and
progression of dental and periodontal
diseases. This is why the comparison
in this research always conducted
between the first three and last two
years. Also at these years the dental
students will be in direct contact with
dentally and periodontally ill patients
throughout their clinical course in the
diagnosis and treatment of those
patients. So the students become more
familiar with the hazardous effects of
microbial dental plaque on oral health
status and they see these effects on
reality.

This finding came in
agreement with other study which
suggested that regular patient contact
influences the personal attitude toward
oral hygiene, and that professional
activity and emphasis on different
aspects of the curriculum may be
reflected in the attitude of health
professionals toward oral health.(14)

Using of dental floss and tooth
picks still being the most popular
method for cleaning the interdental
areas while other measures as
interdental brush and irrigators were
not recorded in this research even
among students of the fifth year who
were well informed about such
measures. This finding pointed clearly
to the fact mentioned previously about
the differences between information
and education.

Brushing teeth twice a day
seems to be the most brushing
frequency used by majority of the
students in all years. This can be
explained by the availability of time to
perform such oral health measure at the
morning and evening, while it is
difficult for them to do this action at
the day time because they are almost
busy with their study. Although the
achieved positive changes in both GI &
PLI scores is high at the final year in
comparison to the first three years, but
it was non significant in relation to that
of fourth year. This finding can be
explained by the other shortcoming of
dental health education which states
that the effect of education may result
in a strong alert by the informed person
who tend to perform a suitable
preventive action, but unfortunately
this action may not last for along
period of time. For this reason a
continuous repetition and renewal of
dental health education approaches is
mandatory.

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individuals. A longitudinal evaluation of
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Table 1. Tooth brushing ant its frequency among dental students at different study levels.

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</tr>
<tr>
<td></td>
<td>No (%)</td>
<td>No (%)</td>
</tr>
<tr>
<td>First</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>Second</td>
<td>26</td>
<td>4</td>
</tr>
<tr>
<td>Third</td>
<td>24</td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
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<td>10 (11.1)</td>
</tr>
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<tr>
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<tr>
<td>Total</td>
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Table 2. Using and types of interdental cleaning measures among dental students at different study levels.

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<th>Interdental means</th>
<th>Types of interdental measures</th>
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<tr>
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<td>No (%)</td>
<td>No (%)</td>
</tr>
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<td>Second</td>
<td>7</td>
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</tr>
<tr>
<td>Third</td>
<td>9</td>
<td>21</td>
</tr>
<tr>
<td>Total</td>
<td>21 (23.33)</td>
<td>69 (76.67)</td>
</tr>
<tr>
<td>Fourth</td>
<td>13</td>
<td>17</td>
</tr>
<tr>
<td>Fifth</td>
<td>18</td>
<td>12</td>
</tr>
<tr>
<td>Total</td>
<td>31 (51.67)</td>
<td>29 (48.33)</td>
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Figure 1. Means of PLI & GI according to the level of study

Table 3. Comparative differences of PLI with the graduation of dental students

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<th>STAGES</th>
<th>Mean</th>
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<th>STAGES</th>
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<td>1.1963</td>
<td>.1648</td>
<td>.025</td>
<td>S*</td>
</tr>
<tr>
<td>SECOND</td>
<td>1.1963</td>
<td>.1648</td>
<td>THIRD</td>
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</tr>
<tr>
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<td>.3612</td>
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<tr>
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<td>FIFTH</td>
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<td>.2443</td>
<td>.567</td>
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* S = Significant  ** HS = Highly significant  *** NS = Non significant

Table 4. Comparative differences of GI with the graduation of dental students

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<td>.2289</td>
<td>THIRD</td>
<td>.4615</td>
<td>.3552</td>
<td>.000</td>
<td>HS**</td>
</tr>
<tr>
<td>THIRD</td>
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<td>.3552</td>
<td>FORTH</td>
<td>.2961</td>
<td>.2100</td>
<td>.026</td>
<td>S*</td>
</tr>
<tr>
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<td>.2778</td>
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<td>.671</td>
<td>NS***</td>
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</table>

* S = Significant  ** HS = Highly significant  *** NS = Non significant
The validity of mucolabial reflection in determining occlusal vertical relation

Dr. Mohammed M. Mohammed Ali B.D.S, M.Sc.
Dr. Abdalbasit Ahmed B.D.S, M.Sc
Dr. Mohammed A. Abed Albaki B.D.S, M.Sc

Abstract

Background: Different methods are being used in prosthodontics for determining occlusal vertical dimension. In this study the mucolabial reflection was used as a guide to measure the vertical distance of the maxillary and mandibular central incisors to the vestibules.

Materials and Methods: A total sample of 45 subjects was studied that include (25 female and 20 male). Impression of the maxillary and mandibular arch was made with perforated tray using alginate impression material. Stone casts were made and the distance from the center of the incisal edge for maxillary and mandibular central incisors to the depth of the mucolabial reflection was measured. Also the distance from the depth of the maxillary to mandibular reflection with cast in centric occlusion was measured. The measurements were recorded by the use of a divider and boley gauge to the nearest 0.1 mm.

Results: The mean distance from the incisal edge of maxillary central incisors to the mucolabial reflection was 21.1 mm for females and 21.8 mm for males while the mean distance from the mandibular central incisors to the mucolabial reflection was 16.6 mm for females and 16.9 mm for males. Also the mean distance from the depth of the maxillary to the mandibular mucolabial reflections was 34.9 mm for females and 35.3 mm for males. No statistical significant differences were found between male and female measurements.

Conclusion: The mucolabial reflection provides a good starting point for establishing a tentative occlusal vertical dimension. Also could help for a preliminary arrangement of teeth.

Keyword: Vertical occlusal dimension, teeth arrangements, teeth measurements.

Introduction

Vertical dimension is the distance between two selected points, one on the fixed and one on the movable member (maxillae and mandible). While occlusal vertical dimension (OVD) is the distance measured when the occluding members are in contact. (1)

For a denture to be functionally and esthetically pleasing a correct OVD should be measured and established. (2) There are no universally accepted rules for determining the OVD in edentulous patients because of the wide range of physical characteristics among individuals. (3)

Many authors (4 - 9) have used various techniques for determining OVD. Pre-extraction measurements from the incisal edge of the anterior teeth to the depth of the vestibule or from the maxillary to the mandibular vestibules have been suggested as a means of establishing vertical
Mustansiria DJ  The validity of mucolabial reflection in determining dimensional for complete denture fabrication. (10 - 12)

Mc Grane(10) established a 40 mm occlusal vertical dimension for his patients, the basis for his assessment was the measurements from the mid maxillary to the mid mandibular labial freni. He speculated that the distance from the incisal edge of the maxillary central incisors to the labial vestibule adjacent to the maxillary labial frenum was 22 mm, the corresponding distance for the mandibular incisors was 18 mm. The use of lateral cephalometric radiographs and a radiopaque paste to study the relation of natural anterior teeth to the mucolabial reflection was suggested by Ellinger (11). The results indicated an average distance of 20 mm from the maxillary tooth incisal edge to the upper reflection, and 16.33 mm from the lower reflection to the mandibular tooth incisal edge.

Fayz et al .(12) reported that the mean distance between the depth of the mucolabial reflection in the maxillae and mandible was 34.2mm in the right incisor region and 34.06mm in left incisor segment. The measurements were made on impression from 25 dentulous patients with the teeth in centric occlusion. According to this study, the mean distances from the depth of the mucolabial reflection to the incisal edge of the anterior teeth were 21.24and 21.28 mm for maxillary right and left central incisor and 16.54 and 16.78 mm for mandibular right and left central incisors.

The aim of the present study was to determine the relation of the mucolabial reflection to the maxillary and mandibular central incisors.

Materials and methods

The sample was selected from college of dentistry, University of Baghdad. A total of 45 Iraqi undergraduate students (25 females and 20 males), the age range between (18-25) years were selected. They had all of their anterior teeth, without marked caries, restoration or artificial crowns. All had a posterior occlusal stop, and those who had undergone orthodontic treatment were excluded.

Each subject was seated on a dental chair, and impression of the maxillary and mandibular teeth were made with perforated trays using alginate impression material. The material was mixed according to the manufacturer’s directions (one scoop of powder to one measure of water cylinder). A small quantity of the mixed material was applied on the mucolabial reflection of the upper and lower lip from the right to the left canine region, before the main bulk in the tray was inserted into the mouth in order to achieve more accurate reproduction of the mucolabial reflections. After the material had set, it was removed and inspected to be certain that no defect exist, especially at the mucolabial reflections.

The impression was poured immediately to avoid dimensional changes. A dental stone was used, and the casts were allowed to set, after setting of the casts, they were trimmed and washed. The following measurements were then made on the casts by using a divider, and Boley gauge to the nearest 0.1 mm (Fig 1,2,3).

1- The distance from the middle of the upper central incisor edge to the height of the mucolabial reflection of the upper lip.
2- The distance from the middle of the lower central incisor edge to the depth of the mucolabial reflection of the lower lip.
3- The maxillary and mandibular casts were closed in centric occlusion, and the distance from the height of the
The validity of mucolabial reflection in determining
mucolabial reflection of the upper lip to the depth of the mucolabial
reflection of the lower lip at the middle of the central incisors were
measured. A divider measured all the distances, the pointed ends of the divider was
punched on a cardboard, then measured with Boley gauge. (Fig. 4)
The mean values for the measurements were calculated, and used for statistical
analysis.

Results
Mean standard deviation and ranges were calculated. Table 1 shows
that the range of distance from the center of incisal edge of the maxillary
central incisors to the mucolabial reflection in female was from “17.4
mm-25.4 mm”, while in male from “18.4 mm-32.1 mm”. In addition
(Table 1) and (Fig. 5) show that the mean distance for female was "21.1
mm" while for male as" 21.8 mm". Also Table 1 show the range of
distance from the center of incisal edge of the mandibular central incisor to the
mucolabial reflection in female was from “12.9 mm-22.6 mm” and in male
from “14.2 mm-20.3 mm”. The mean
distance for female was "16.6 mm" and
for male "16.9 mm" as shown in (Table
1) and (Fig. 5).

The range of distance from the
depth of the maxillary to the
mucolabial reflection in female was from “28.8 mm-44.5 mm”
and for male from “30.6 mm-42.2 mm”
as shown in (Table 2). The mean
distance for females was "34.9 mm"
and for male "35.6 mm" (Table 2) and
(Fig. 5). Measurements of the total
sample were also calculated as shown in (Table 1 and 2).
The data of the male and female
was subjected to statistical t-test (Table
3). No significant sex related
difference was noted in any of the
measurements (P>0.05).

Discussion
The mucolabial reflection is a
useful reference because it approximates the border of the denture.
It can be used as a guide in the anteroposterior positioning of the
anterior teeth and in determining the vertical distance of the teeth from the
vestibules.
In the present study, the mean
distances of the maxillary mucolabial
fold to the incisal edge of the maxillary
central incisors was "21.5 mm" and the
mean distance of the mandibular mucolabial reflection to the incisal
dge of the mandibular central was
"16.7 mm". The mean distance from
the maxillary to the mandibular mucolabial reflection in the region of the
central incisor was "35.3 mm" .This comes in agreements with the
finding of Fayz et al (12) who reported
that the mean distance from the depth of the mucolabial reflection to the to
the incisal edge of the maxillary and
mandibular central incisors was "21.2
mm and 16.5" mm respectively.
The mean distance between the
depth of the mucolabial reflection in
the maxilla and mandible was "34.2
mm" in the maxillary central incisor
region. According to Ellinger (11), the
distance from the depth of the vestibule
to the incisal edge of central incisors is
"20 mm" in the maxilla and "16.33"
mm in the mandible. The results of the
present study also agree with the
findings of Ellinger. However, a
significant difference can be seen with
McGrane’s (10) Findings, who
reported that the average distance
between the maxillary and mandibular
labial fold adjacent to the labial freni
was "40 mm". He also found that the
distance from the incisal edge of the

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maxillary central incisors to the labial vestibule adjacent to the maxillary labial frenum was "22 mm", the corresponding distance for the mandibular central incisors was "18 mm". The difference between McGrane’s findings and this study may be because the vertical overlaps of the anterior teeth were not measured in McGrane’s study and the impression materials and tray were different.

The findings of this study could help for initial establishment of OVD at approximately "35.5 mm" from the mucolabial reflection in the region of the maxillary and mandibular central incisors. Also the result of this study may help in preliminary arrangements of the maxillary and mandibular central incisors. The distance from the border of the denture to the edge of the maxillary central incisors would be approximately "21.5 mm". The mandibular central incisors would be set at "16.5 mm" from the mandibular denture border to the incisal edge.

This would be a tentative determination of OVD made and tooth position. However the final determination of OVD and correct tooth position must be at the try-in appointment when esthetics, phonetics and other factors are evaluated for each patient.

### References


### Table 1 Distance from the center of the incisal edge for the maxillary and mandibular central incisors to the depth of the mucolabial reflection.

<table>
<thead>
<tr>
<th>Tooth No.</th>
<th>Mean (mm)</th>
<th>Std. Deviation</th>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Central</td>
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<td>2.18</td>
<td>17.4</td>
<td>25.4</td>
</tr>
<tr>
<td>Mand. Central</td>
<td>16.66</td>
<td>2.14</td>
<td>12.9</td>
<td>22.6</td>
</tr>
<tr>
<td><strong>Male</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Mand. Central</td>
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<td>1.57</td>
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<td>20.3</td>
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<tr>
<td><strong>Total</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
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<td>Mand. Central</td>
<td>16.78</td>
<td>1.85</td>
<td>12.9</td>
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Table 2 distances from the depth of the maxillary to the mandibular reflection with casts in centric occlusion.

<table>
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<th></th>
<th>Mean (mm)</th>
<th>Std. Deviation</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
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<tr>
<td>Female</td>
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<td>3.88</td>
<td>28.8</td>
<td>44.5</td>
</tr>
<tr>
<td>Male</td>
<td>35.63</td>
<td>3.01</td>
<td>30.6</td>
<td>42.2</td>
</tr>
<tr>
<td>Total</td>
<td>35.31</td>
<td>3.44</td>
<td>23.8</td>
<td>44.5</td>
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Table 3 T-test between males and females measurements

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<th>P value</th>
<th>Sig.</th>
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<td>Max. CI/Max. R</td>
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<td>0.037</td>
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<td>Max. R/Mand. R</td>
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<td>34.97</td>
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<td>0.748</td>
<td>N.S.</td>
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</table>

Max.CI: Maxillary central incisors
Mand. CI: Mandibular central incisors
Max. R: Maxillary mucolabial reflection
Mand. R: Mandibular mucolabial reflection

Figure 5: Mean distance from the incisal edge of the maxillary and mandibular central incisor to the depth of the mucolabial reflection and between the depth of the maxillary and mandibular mucolabial reflection

A: Maxillary central incisor to the maxillary mucolabial reflection
B: Mandibular central incisor to the mandibular mucolabial reflection
C: Maxillary to mandibular mucolabial reflection
Figure 1: Distance from the center of the incisal edge for the maxillary central incisors to the depth of the mucolabial reflection.

Figure 2: Distance from the center of the incisal edge for the mandibular central incisors to the depth of the mucolabial reflection.

Figure 3: Distance from the depth of the maxillary to the mandibular reflection.

Figure 4: The pointed ends of the divider was punched on a cardboard, then measured with Boley gauge.
Salivary C-peptide, a useful biochemical marker for insulin-dependent diabetes mellitus

Dr. Natheer H. Al-Rawi B.D.S, M.Sc, PhD Assistant Professor *

Abstract: Insulin-dependent diabetes mellitus (IDDM) is characterized by complete destruction of β-cells, this result in little or no production of insulin & /or C-peptide which is a portion of insulin & is released in amounts equal to the insulin. C-peptide level can indicate how much insulin is being produced by the pancreas.

Patients & Materials: Fifty six diabetic patients were enrolled in this study (15 IDDM & 41 NIDDM). C-peptide levels in serum & saliva were estimated using Radio-immuno assay (RIA) method, with measuring serum FBS in both groups.

Results: The serum & salivary levels of C-peptide as well as serum FBS levels were markedly higher in NIDDM than in IDDM with a significant negative correlation between salivary C-peptide & FBS in IDDM group.

Conclusion: Salivary C-peptide level estimation can be used as an adjunct to serum FBS to measure the amount of insulin produced by β-cells, as well as to measure the response of insulin therapy in IDDM.

Keywords: C-peptide, IDDM, Saliva

Introduction

Diabetes Mellitus is a chronic systemic metabolic disorder, characterized by increased level of glucose in the blood & abnormality in lipid & protein metabolism. Two basic types of diabetes mellitus (DM) have been described: Type 1 (Insulin-dependent diabetes mellitus IDDM) & Type 2 (Non-Insulin-dependent diabetes mellitus NIDDM). IDDM is most frequently found in young patients before 40 years of age. They always require insulin treatment, whereas NIDDM is usually diagnosed after age 45 & does no require insulin supplementation. IDDM is characterized by complete destruction of β-cells, this result in little or no production of insulin as well as C-peptide. C-peptide is a portion of insulin; it is released in amounts equal to insulin, so the level of C-peptide in blood can indicate how much insulin is being produced by the pancreas.

Saliva is a fluid which show some changes correlated with some diseases. Such alteration could be in its flow rate or in its composition as seen in diabetes mellitus. The aim of this study is to estimate the level of C-peptide in serum & saliva & to determine the validity of using this test as a bio-marker for differentiating between the types of diabetes (IDDM & NIDDM) for the newly diagnosed cases.

Patients & Materials

The sample is consisted of 55 diabetic patients attended Al-Kadhemiyyah Teaching Hospital. They were divided into two groups according to the type of diabetes the patients have. The first group is composed of 15 IDDM of both sexes & the second group is composed of 41 NIDDM of both sexes.

Blood & saliva were collected at least 8 hours after last meal, 5ml
venous blood was collected from each patient, centrifuged at 2000 rpm. The supernatant was collected by micropipette & stored frozen in polyethylene tube until time of assessment. At the same time 3-5 ml of unstimulated saliva was collected after instructing patients to wash & rinse their mouth by tab water to insure the removal of any food debris & asked to collect saliva in sterile polyethylene tubes by ordinary spitting method. The collected saliva was immediately cold centrifuged at 2000 rpm & the supernatant was drawn for biochemical investigation.

FBS was performed for each patient using the routine method & C-peptide was assessed using RIA & the values measured in gamma counter.

The difference between two groups was measured using student t-test with 0.01 level of significance & Pearson correlation between two groups at 0.05 level of significance.

Results

The first group (IDDM) is composed of 15 patient (7 males & 8 females) with mean age (10.28 ±2.6 years). The mean value of serum FBS plus serum & salivary C-peptide is shown in table (1).

The second group (NIDDM) is composed of 41 patient (20 males & 21 females) with mean age (41.65 ±13.5 years). The mean value of serum FBS plus serum & salivary C-peptide as shown in table (1).

The serum levels of FBS as well as the serum & salivary levels of C-peptide are markedly higher in NIDDM group than in IDDM group with a highly significant statistical difference (p <0.001) and the serum levels of C-peptide is slightly higher in NIDDM group than in IDDM group, but it does not reach the level of significance (p>0.05) as shown in table (2).

A non significant correlation between serum C-peptide & FBS was found in both IDDM & NIDDM group, whereas a significant negative correlation (p<0.05) between salivary C-peptide & FBS was found in IDDM group but not in NIDDM group, a non significant correlation was found between serum C-peptide & salivary C-peptide in both IDDM & NIDDM group as shown in table (3).

Discussion

C-peptide levels may be ordered if we have newly diagnosed diabetes, as part of an evaluation of "residual β-cells function. The level of C-peptide in the blood can indicate how much insulin is being produced by the pancreas (6). Hsieh, et.al. (1985) proposed that a person whose pancreas is unable to produce any insulin (IDDM) usually has a decreased level of C-peptide as well as insulin & a person with NIDDM has normal or increased levels of C-peptide.

The results of the present investigation showed a marked elevation of C-peptide & FBS in NIDDM group which is three times higher than that of IDDM group. A positive correlation between serum FBS & serum C-peptide was found but it does not reach a significant level.

The decrease in the level of C-peptide in IDDM group which is about normal value may be due to the use of manmade (synthetic) insulin which does not contain C-peptide, or may be due to inappropriate use of insulin which also lead to lower the C-peptide levels (7). The longer half-life of C-peptide than insulin render it to persist longer in peripheral circulation (8). For this reason, plasma as well as salivary C-peptide values can measure insulin secretion more reliably than the insulin
itself & also to evaluate the response of treatment \(^{(6)}\).

The significant negative correlation between FBS & salivary C-peptide means that the function of β-cells in insulin production is so affected to a level that makes an increase in levels of FBS & a decrease in C-peptide levels.

Serum & salivary C-peptide values were increased with the presence of hyperglycemia as seen in NIDDM group, this could be due to the retention of this biomolecule in the serum & saliva & partly due to improper filtration of C-peptide by kidney which is the major excretory site of it \(^{(4)}\).

Up to our knowledge, this is the first study that used saliva as an easy collected fluid to measure C-peptide levels in diabetic patients.

From the results of the present investigation it can be concluded that salivary C-peptide levels estimation can be used as an adjunct to FBS for evaluation of β-cell activity in the pancreas as well as to monitor insulin therapy in IDDM patients. The test is simple & the sample can be easily collected without the need of venepuncture.

### References


### Table (1): Mean values of FBS & C-peptide in IDDM & NIDDM group

<table>
<thead>
<tr>
<th>Group</th>
<th>FBS (mg/dl)</th>
<th>Serum C-peptide (umol/L)</th>
<th>Salivary C-peptide (umol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDDM</td>
<td>91.07± 6.82</td>
<td>0.628 ± 0.6</td>
<td>0.147 ± 0.3</td>
</tr>
<tr>
<td>NIDDM</td>
<td>184± 84.5</td>
<td>1.84 ± 1.35</td>
<td>0.336± 0.6</td>
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</table>

### Table (2): Differences between FBS & C-peptide in IDDM & NIDDM group using t-test

<table>
<thead>
<tr>
<th>Group</th>
<th>FBS (mg/dl)</th>
<th>Serum C-peptide (umol/L)</th>
<th>Salivary C-peptide (umol/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IDDM</td>
<td>91.07± 6.82</td>
<td>0.628 ± 0.6</td>
<td>0.147 ± 0.3</td>
</tr>
<tr>
<td>NIDDM</td>
<td>184± 84.5</td>
<td>1.84 ± 1.35</td>
<td>0.336± 0.6</td>
</tr>
<tr>
<td>IDDM vs. NIDDM</td>
<td>7.32E^-09 **</td>
<td>0.08</td>
<td>7.32E^-09 **</td>
</tr>
</tbody>
</table>

*Non Significant ** Significant at 0.001 level

### Table (3) Correlation between serum & salivary C-peptide & FBS

<table>
<thead>
<tr>
<th>Group</th>
<th>Serum C-peptide vs.FBS</th>
<th>Salivary C-peptide vs. FBS</th>
<th>Serum C-peptide vs. Salivary C-peptide</th>
</tr>
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<tbody>
<tr>
<td>IDDM</td>
<td>0.33</td>
<td>0.04 -</td>
<td>0.422</td>
</tr>
<tr>
<td>NIDDM</td>
<td>-0.12</td>
<td>0.17</td>
<td>-0.19</td>
</tr>
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</table>

* Significant at 0.05 level
Hyoid bone position in relation to Mandibular rotation

DR. Nagham H. Al-Sahaf B.D.S., M.Sc.*

Abstract

Aims: This retrospective cephalometric study was designed to evaluate and correlate the hyoid bone position and angulations in two groups of subjects exhibiting vertical and horizontal mandibular rotation.

Material & method: Each group consisted of 50 subjects (25 males and 25 females) with skeletal class I pattern. Cephalometric data were obtained and four measurements were used to locate the hyoid bone in 3 aspects 1. Vertical, 2. Horizontal and 3. Angular. Thirteen angular and linear measurements were used to evaluate mandibular rotation and facial morphology.

Result: There were statistically significant differences in vertical position, horizontal distances and angulations of hyoid bone measurements between the vertical and horizontal group subject (P<0.05). These measurements were significantly correlated with mandibular rotation angles.

Conclusion: In vertical mandibular rotation group subjects, the hyoid bone showed to be more inferior and posterior position with downward inclination. While in horizontal mandibular rotation group subjects, the hyoid bone was more superior and anterior position with relatively upward angulations.

Keywords: Hyoid bone, Mandibular rotation.

Introduction

Changes in hyoid bone position are related to changes in mandibular position and that the hyoid bone adapts to anteroposterior changes in head position. Studies of hyoid relationships to the facial skeleton and the cervical column have indicated, that the hyo - cervical relationship is more stable than the relationship of the hyoid to the skull and mandible, but Licciardello et al reported a highly significant decrease of a distance between mandibular, vertebral column and hyoid bone in skeletal class III subjects treated with chin cup and dilaire mask therapy. Other studies have shown that changes in hyoid bone position are coordinated in both upward and downward rotation of the mandibular position and changes in head and cervical posture when provided longitudinal studies of denture wearers.

The hyoid bone is a unique structure in man in that, unlike all other bones of the head and neck, it has no bony articulation but provides attachment for muscles, ligaments and fascia of the pharynx, mandible and cranium. Brodi considered that the hyoid bone is an important part of postural apparatus of the head and jaws. While Licciardello et al concluded in their study that the function of the hyoid bone could point out as an (organ of respiration), since the variation of its position, as a sign of new muscular equilibrium, should help

* Ass. Prof. Orthodontic department, College of Dentistry, University of Baghdad
to maintain the patency of the upper airway. Hyoid bone developed from the second and third branchial arches. The posterior portion of the tongue also develops from these two arches. The variation in position of the tongue in the mouth is a major factor in changing the shape and position of dental arches. Wick wire and Behl felt et al have shown, however, that the tongue can adapt to a new situations as reflected in a downward and backward positions of the hyoid bone.

Ismail and Haralabakis studied the position of the hyoid bone in relation to the skeletal classification in open bite patients and concluded that the hyoid bone was positioned differently according the skeletal class. Abdul Rahman studied the hyoid bone position in different skeletal classes among Iraqi population using cephalometric measurements described by Sassounis archial method of analysis in 1955. The result concluded that the position of hyoid bone varies considerably in skeletal classes and is affected by the posterior vertical facial height rather than the anterior vertical facial height.

The position of the hyoid bone relation to the cranial base and mandible has been of interest especially as an indicator of tongue posture and function. Milne et al said that the tongue, hyoid and the mandible appear to work as an integrated unit. Hoffman and Hoffman believed that hyoid bone was important in tongue position in that most of the extrinsic muscles of tongue are attached to it and it also helps to maintain the pharyngeal airway which is essential to life, Behl felt and Battagel confirm this finding.

Studies of alterations in mandibular morphology and position in relation to hyoid bone position have been reported by Graber and McNamara subsequent to orthopedic chin - cup therapy. These studies have indicated that is a distal or clockwise facial rotation with the mandible moving relatively posteriorly and inferiorly. Hyoid position also tended to move slightly posteriorly but was primarily displaced in an inferior direction. Licciardello et al reported a similar result when he evaluated the changes in hyoid bone position after skeletal class III therapy with chin cup and delaire face mask treatment.

Gonzalez and Galindo concluded that the position of the hyoid bone is very important in the position of the head in which that the anteroposterior position of the hyoid bone presented with posterior position of the head, vertical growth, posterior rotation of the mandible when they were applied the hyoid triangle and cervical vertebrae analysis to a sample of 51 patients with hemifacial microsomia.

Tallgren and solow concluded that in the older age groups the mandibular inclination, the anterior facial heights and the sagittal jaw relation were, on average larger than in the young age group, the mean vertical distance from the hyoid bone to the upper face, the mandible and the cervical column were greater in the older age groups. While the position of the hyoid in relation to the cervical column showed less variability than the hyoid relation ship to the maxilla and the mandible, also the study indicated that a large hyo-mandibular distance is associated with a large mandibular inclination. Kaduk et al compared in his retrospective cephalometric long term study, the hyoid bone position in cleft lip and palate patients with orthodontic patient with no cleft. The result concluded that with increasing age of the patients, the skull growth pattern changed from vertical to horizontal growth, hyoid
bone position differed significantly and was found to be more caudal and anterior.

The position and inclination of the hyoid bone in relation to the mandibular rotation does not seem to have been studied systematically. The purpose of the present study was to:

1- Investigate the relationships of hyoid bone position and inclination with mandibular rotation in Iraqi adult sample (by location of the hyoid bone in three different aspects: vertical, horizontal and angular).

2- Correlate the hyoid position with both vertical and horizontal rotation of the mandible.

**Material and Methods**

176 cephalometric radiographs of pre-treated Iraqi individuals aged 18 - 25 years with skeletal class I were traced and analyzed according to the ANB angle\(^29\). Records were taken from the files supplied with each radiograph in Orthodontic Department in Dentistry College, Baghdad University. Subject with gross facial asymmetry, facial abnormality, under orthodontic treatment, or any poor quality of radiograph was excluded.

Then the previous sample were divided into two groups according to the posterior facial height and anterior facial height ratio (PFH / AFH ratio)\(^30, 31\), subjects in which the ratio (PFH / AFH) is under 62 % was expressed as a vertical growth pattern (Group V). Subjects in whom the ratio (PFH / AFH) is Greater than 65 % was expressed as horizontal vector (group Z). So that the final sample size of the two groups was comprised of 100 subjects, each group was consisted of 50 subjects (25 males and 25 females).

Cephalometric measurements

Four cephalometric measurements were used to evaluate the position of the hyoid bone, and thirteen measurements to evaluate the mandibular rotation and facial morphology.

A. **Hyoid bone measurement**

Figure (1): according to stepovich\(^32\)

1- SL line: it is a vertical distance from (S) point to the intersection of the hyoid plane (HG) at the point (L).

2- SLG (angle of hyoid bone) it is formed by the line connecting (S) point and the registrations point (L) on the hyoid bone with the hyoid plane (HG). (L) Point is a registration point at which a perpendicular from SN at S intersects the hyoid plane.

3- LH: it is a horizontal distance from the registration point (L) to a point H on the hyoid bone to locate the hyoid bone anteriorly. If point L was to the left of point H, a positive figure was recorded; if it was to the right a negative figure was recorded.

4- d : it is a horizontal distance from the most anterior point of hyoid bone (H) to the most anterior point of Atlas vertebra: to locate the posterior position of the hyoid bone\(^33\).

B. **Measurements of mandibular rotation**\(^34, 35\)

Figure (1)

1- Saddle ( NS Ar ), 2- Articular ( S ArGo ), 3- Gonial angle ( ArGoMe ), 4- Upper gonial angle (NGOAr), 5- Lower gonial angle (NGOMe), 6- SNMeGO (This angle gives the inclination of the...
mandible relative to the cranial base), and 7- Y-axis (NSGn : the anterior or posterior rotation of the mandible is characterized by closing or opening of this angle).

C. **Linear measurements** 29, 36 vertical facial dimensions were recorded.

1- AFH: represents the anterior facial Height it measured vertically from N point to Me point.

2- PFH: represents the posterior facial height it measured vertically from S point to point Go.

3- LFH: represents the Lower facial height it measured vertically from ANS point to Me point.

D. **Facial angles** 34, 37 SNA, SNB, and ANB to determine the skeletal pattern of the selected sample.

Angular measurements were made with an accuracy of 0.5 degrees, and linear measurements were made with an accuracy of 0.5 mm.

**Statistical analysis**

Two weeks after the first measurements, 20 radiographs were selected randomly, and their hyoid bone dimensions with all other cephalometric measurements used in the study were measured by the same investigator. A paired t test was applied to the first and second measurements, and no significant differences were found between the first and the second radiographic readings at (5%) probability level.

The data were statistically analyzed using SPSS version 14 with simple descriptive statistics (mean, standard deviation, upper and lower limits). t-test was applied to detect the statistically significant difference in the mean values of different measurements between the two examined groups (vertical and horizontal) and between genders.

Pearson correlation coefficient was done to detect the significance of the hyoid bone measurements and other cephalometric measurements in vertical and horizontal groups.

**Results**

**Hyoid bone position**

Table (1) showed the descriptive statistics of the measurement of the hyoid bone in both vertical and horizontal groups with the t-test. It is found that the vertical distance of the hyoid bone position (SL) is significantly larger at the level of 0.05 in vertical group than that in horizontal (110.24, 103.42 respectively) that means the hyoid is displayed more inferiority in vertical group.

Angle of hyoid bone inclination also demonstrated in this table represented by SLG angle in which it becomes closed in vertical group while it opens in horizontal group (61.18, 68.4 respectively) this difference was significant at a level of 0.05. This means that hyoid bone was relatively inclined more downward in vertical group than in horizontal.

An Anteroposterior change in position of the hyoid bone was indicated by two measurements. In vertical group, the anterior position of the hyoid bone represented by the LH distance showed a significant decrease than that in horizontal group at a level of 0.05 (2.17, 8.43 respectively) which means that the L point is moving more forward indicating a relatively posterior displacement of the hyoid bone.

The posterior position of the hyoid bone represented by (d) distance shows significant difference at the level of
0.05 between vertical and horizontal group subjects, though this distance was smaller in the former group than in the latter (25.21, 33.027 respectively).

Although the mean values of the hyoid bone measurements were higher in male sample than that in females, but these were statistically not significant at 0.05 levels. Therefore, the comparison of hyoid bone measurements between genders was disregarded and considered with a total sample.

**Angular and linear measurements**

The descriptive statistics of all angler and linear measurements in both vertical and horizontal groups are shown in table (2) with the t-test.

The mandibular rotation angles (NSAr, SArGo, ArGoMe, NGOMe, SNMeGo and y-axis) were higher in vertical growth pattern group than that in horizontal group. These differences were statistically significant at the level of 0.05. NSAr and NGOAr showed no significant differences between the two examined groups.

Angles of sagittal jaw relation ship were significantly smaller in vertical group than that in horizontal group although the difference between two angles were statistically not significant between vertical and horizontal groups (ANB: 2.1, 2.2 respectively) indicated more retruded facial pattern in vertical group subjects since they exhibited smaller values of SNA, SNB angles (78.57, 76.41 respectively).

The mean values of the vertical linear measurement between the vertical and the horizontal group were displayed in this table. It showed that the AFH and LFH were higher in vertical group than that in horizontal, while in horizontal group the PFH was higher than that in vertical group (87.26, 77.08 respectively). These differences were statistically significant at a level of 0.05.

**Correlations**

Pearson correlation analysis of hyoid bone position in relation to other variables among vertical and horizontal group subjects were displayed in table (3) and (4) respectively.

The vertical distance of the hyoid bone (SL) was positively and significantly correlated, in vertical group subjects; with all mandibular rotation angles (except the NGOAr angle). A similar correlation of SL vertical distance has been found in horizontal group subjects but with y-axis only.

Further more, the (SL) distance in both groups has highest significant correlation with facial heights (AFH, LFH and PFH) at the level of 0.01 in both vertical and horizontal groups.

The angle of hyoid bone position (SLG) in the two examined groups has no significant correlation with all variables except with the anterior position of the hyoid bone (LH) in which it shows strong and significant correlation at a level of 0.01. This correlation indicates that a smaller angle of hyoid bone is associated with relatively posterior position of it and vice versa.

The anteroposterior position of the hyoid bone which is represented by the horizontal distance (LH) anteriorly and (d) distance posteriorly showed that the (LH) distance has a strong and significant correlation with AFH and LFH in vertical group and with LFH only in horizontal group subjects. The posterior distance (d) has significant correlation with SArGo and NGOMe angles in vertical group, while it has no significant correlation with all variables in horizontal group subjects.

**Discussion**

The significant differences in the position and angulations of hyoid bone
were found in vertical group and horizontal group subjects who possessed skeletal class I jaw relationship can be summarized as follows: In subjects who exhibited vertical growth pattern, the displacement of the hyoid bone was inferiorly with a downward angulations of it (since it shows higher value of SL vertical distance and small value of SLG angle) (table1), this is associated by the movement of the L point more anteriorly giving an indication of posterior position of the hyoid bone. This come in agreement with Tallgren and Solow\textsuperscript{27} who stated that, on the average, a large distance from the hyoid bone to the mandible is seen in subjects with a large inclination of the mandible. The significant differences of the posterior distance of the hyoid position between vertical and horizontal groups represented by the \((d)\) distance may agreed with Licciardello et al\textsuperscript{10} who found that an inferior hyoid bone position is associated with a decrease of a distance between mandibular, vertebral column and hyoid bone. While it comes in contrary of the findings of Takag et al\textsuperscript{1}, Fromm\textsuperscript{2}, and Bibby and Preston\textsuperscript{8} who studied the hyoid relationships to facial skeleton and the cervical column and indicated that the hyo-cervical relation ship is more stable than the relation of the hyoid to the skull and mandible, also Graber\textsuperscript{3} considered that the measurements from the vertebral column to hyoid bone as unreliable measurements and was disregarded. Kumar\textsuperscript{9} confirm these findings.

Angles of mandibular rotation show their highest values in vertical group subjects (table 2) indicated a back ward rotation of the mandible which comes in accordance with Tallgren and Sollow\textsuperscript{27} and Adamidis\textsuperscript{33} who stated that the hyoid position is coordinated with facial structure. Also, the significant correlation of the vertical position of the hyoid bone with mandibular rotation angles, AFH and LFH (Table 4) confirm this findings as indicated by Tallgren and Solow\textsuperscript{27} who reported that there are certain connection of a back ward mandibular rotation with an increased in facial heights. Also, the reduced SNA, ANB mean values indicated more retruded facial morphology which comes in coordination with a back ward rotation of the mandible.

All these give an indication that in vertical group subjects, the hyoid bone is positioned more posterior-inferiorly which is associated with back ward rotation of the facial complex and the mandible. This come in agreement with Graber\textsuperscript{3, 24, 25} who indicated that the posterior inferior, (i.e. clock wise) rotation of facial complex particularly the mandible is followed by the similar pattern of the hyoid bone apparatus. This can be explained on the bases that as the mandible is moved posteriorly relative to other craniofacial structures, the tongue and the hyoid bone are literally “carried” with it. Also Graber\textsuperscript{3} claimed that with increased posterior movement of the mandible there is an increased movement of the hyoid bone in an inferior direction.

On the other hand, subjects who exhibited horizontal growth pattern, the vertical distant of the hyoid bone (SL) was reduced (table 1) with more back ward movement of the (L) point (indicating a more anterior position of the point H of the hyoid bone), and the (SLG) angle is relatively larger than that in vertical growth pattern gives and indication of a more superio-anterior position of the hyoid bone with an upward inclination. This comes in accordance with the findings of Stepovich\textsuperscript{32}. Further more the angles of mandibular rotation were reduced in this group (Table 2) with an increased mean value of SNA, SNB.
angles in that of the vertical group. Also the AFH and LFH show their lowest values and the PFH showed its highest value in this group gives an indication of more forward rotation of the mandible as come in agreement with Tallgren and Sollow\textsuperscript{27}. Also, the significant correlation of the mandibular inclination angle (Y-axis) and the LFH with the vertical position of the hyoid bone (table 3) supports this connection of the forward mandibular rotation and the decrease in facial heights as agreed by Tallgren and Sollow\textsuperscript{27} who indicated that backward mandibular rotation is connected with an increase in facial heights.

**Conclusion**

For the vertical and horizontal growth subjects the hyoid bone position was studied in three different aspects; (1) vertical, (2) angular and (3) anteroposterior. The result was concluded as follows;

1- The vertical, angular and anteroposterior position of the hyoid bone is significantly different in vertical group than that in horizontal group subjects.

2- In both groups (vertical and horizontal) the vertical position of the hyoid bone (SL) distance was the only hyoid measurements that correlated significantly with mandibular rotation angles rather than other hyoid bone measurements.

3- The hyoid bone position is coordinated with mandibular rotation:

In vertical group pattern, Subjects possessed backward rotation of the facial complex and particularly the mandible, the position of the hyoid bone is posterior inferiorly with downward angulations.

In horizontal group subjects, the position of the hyoid bone is antero superiorly with relatively upward inclination, which is associated with forward rotation of the mandible Figure (2).

**References**


5- Adamidis IP, and Spyropoulos, MN: the effect of lymphadenid hypertrophy on the position of the tongue, the mandible and the hyoid bone. Europ. J. Orth.1983


20- Abdul-Rahman BR: The relationship of the hyoid bone to different skeletal patterns a thesis submitted to the college of dentistry, Baghdad University; 1994.
30- Graber TM, Rakosi T, Petrovic AG: Dentofacial orthopedic with functional appliance. Mosby Comp. 1985
Table (1) Hyoid bone measurements in vertical and horizontal group subjects with t-test

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S: significant at 0.05 levels
Table (2) Descriptive statistics of all measurements for Vertical and Horizontal group subjects with t-test

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S: significant at 0.05 level  NS: not significant

Table (3) Correlations between Hyoid bone measurements and other variables in Vertical group subjects

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<th>d</th>
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</tr>
<tr>
<td>SL</td>
<td>1</td>
<td>.073</td>
<td>.318(**)</td>
<td>.092</td>
</tr>
<tr>
<td>SLG</td>
<td>.073</td>
<td>1</td>
<td>.277(**)</td>
<td>.087</td>
</tr>
<tr>
<td>LH</td>
<td>100(**)</td>
<td>.277(**)</td>
<td>1</td>
<td>-.235(*)</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level. ** Correlation is significant at the 0.01 level.
Table (4) Correlations between hyoid bone measurements and other variables in Horizontal group subjects

<table>
<thead>
<tr>
<th>Variable</th>
<th>SL</th>
<th>SLG</th>
<th>LH</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA</td>
<td>-.158</td>
<td>-.092</td>
<td>-.062</td>
<td>.081</td>
</tr>
<tr>
<td>SNB</td>
<td>-.144</td>
<td>.031</td>
<td>-.007</td>
<td>-.015</td>
</tr>
<tr>
<td>ANB</td>
<td>-.046</td>
<td>-.180</td>
<td>-.084</td>
<td>.143</td>
</tr>
<tr>
<td>NSAr</td>
<td>.023</td>
<td>.079</td>
<td>-.134</td>
<td>-.001</td>
</tr>
<tr>
<td>SArGo</td>
<td>.268</td>
<td>-.188</td>
<td>-.019</td>
<td>.013</td>
</tr>
<tr>
<td>ArGoMe</td>
<td>-.114</td>
<td>.166</td>
<td>.160</td>
<td>.072</td>
</tr>
<tr>
<td>NGoAr</td>
<td>-.109</td>
<td>.212</td>
<td>.156</td>
<td>.022</td>
</tr>
<tr>
<td>NGoMe</td>
<td>.227</td>
<td>.049</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>SNMGo</td>
<td>.213</td>
<td>.065</td>
<td>.043</td>
<td>.111</td>
</tr>
<tr>
<td>Yaxis</td>
<td>.536(**)</td>
<td>.044</td>
<td>.026</td>
<td>.105</td>
</tr>
<tr>
<td>PFH</td>
<td>.712(**)</td>
<td>-.026</td>
<td>.118</td>
<td>-.010</td>
</tr>
<tr>
<td>AFH</td>
<td>.924(**)</td>
<td>.104</td>
<td>.178</td>
<td>.036</td>
</tr>
<tr>
<td>LFH</td>
<td>.775(**)</td>
<td>.211</td>
<td>.281(*)</td>
<td>.069</td>
</tr>
<tr>
<td>SL</td>
<td>1</td>
<td>.223</td>
<td>.257</td>
<td>.042</td>
</tr>
<tr>
<td>SLG</td>
<td>.223</td>
<td>1</td>
<td>.460(**)</td>
<td>.266</td>
</tr>
<tr>
<td>LH</td>
<td>.257</td>
<td>.460(**)</td>
<td>1</td>
<td>-.163</td>
</tr>
<tr>
<td>d</td>
<td>.042</td>
<td>.266</td>
<td>-.163</td>
<td>1</td>
</tr>
</tbody>
</table>

** Correlation is significant at the 0.01 level.
* Correlation is significant at the 0.05 level.

Figure (2) illustrates the hyoid bone position in vertical and horizontal mandibular rotation group subjects according to the result of the present study.
Longitudinal study of dental caries experience and pattern among a group of children in Baghdad

Dr. Wesal A. Al-Obaidi  B.D.S., M.Sc. *

Abstract

The most dramatic increase in dental decay is thought to have occurred during the last part of the 19th and the beginning of the 20th centuries. The aim of this study was to investigate the caries experience and pattern in primary and permanent teeth in a longitudinal study. Dental caries of 166 kindergarten children of 4-5 years old was recorded. Only 122 of the children were re-examined when their ages became 10-11. The third examination of 118 children was done when their ages became 13-14. Dental caries registration was done following the criteria of WHO (1987). Dental prevalence was increased by age reaching 94.9 percent at 13-14 years old. No sex differences were observed among the three examinations except in DMFT. The DMFT incidence after 6 years was 4.3 and after 3 years was 1.8, while DMFS incidence was 6.4 and 2.2 respectively. The D/d component was the highest mean value. Although dental caries was significantly higher in posterior than in anterior teeth, there were no jaw differences. Occlusal and proximal surfaces were the predominate surfaces affected among permanent and primary teeth respectively. Coinciding with the incline in caries experience observed among children, changes in the distribution and progression rate of the disease have been found.

Keywords: Dental caries experience, pattern, longitudinal study.

Introduction:

Dental caries is a wide world oral health problem. It starts early in life and advances with age due to its irreversibility and accumulative nature (1). Fourth year of life was described as a critical year (2), while the FDI considered the five year old as a target group (3), in which the key-risk teeth (first molars) are erupted and they had a higher risk of developing oral diseases (3, 4). The highest priority key-risk age group is 11 to 14 year olds, from the age the second molars start to erupt in girls until they are fully erupted in boys (4). The risk and pattern of dental caries in primary and permanent teeth vary greatly according to the patient’s chronologic age, type of tooth and surface (4, 5). Caries-preventive measures must be integrated and based on predicted risk from age groups down to the individual tooth surfaces (4).

Many Iraqi cross-sectional studies were directed to estimate caries experiences (6, 7, 8, 9, 10, 11) and pattern (12, 13), but there is only one Iraqi longitudinal study (14) investigated caries increment in primary teeth in one year interval. In some cases, cross-sectional studies had less validity (15), beside a fewer knowledge about this subject in a longitudinal point of view, this longitudinal study was conducted to estimate the dental caries incidence and pattern among primary, mixed and permanent dentitions.

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Materials and methods

The sample consisted of 166 kindergarten children of 4-5 years who were randomly selected. Dental caries examination was done in their class rooms following the basic methods of the WHO \(^{(16)}\) using mouth mirrors and caries explorers. After 6 years, 122 children were re-examined when their ages became 10-11 years. The third examination of 118 children was done after three years when the children ages became 13 -14 years. The others were missed during the last two examinations. The data obtained was statistically analyzed using Student's t-test at a level of significance 0.05.

Results

Table 1 illustrates the percentages of caries free children (dmfs and/or DMFS). Caries experience in relation to gender is revealed in Table 2. Statistically, no gender differences were observed among the three examinations (P>0.05) except for DMFT in the second and third examinations. Dental caries increases with age in permanent teeth and decreases in primary teeth. The reduction in mean dmfs between the first and the second examinations was 4.9, while the incidence of DMFS between the first and the second was 3, and between the second and the third examinations were 2.2.

Table 3 demonstrates DMF/dmf components. It was found that D/d component was the highest mean value. Posterior teeth caries experience was significantly higher than that of anterior teeth. While, statistically, no significant difference was found in caries experience between the upper and lower jaws (P>0.05) (Table 4). Figure 1 illustrates the caries experience in relation to tooth surface. Occlusal surface of permanent teeth was the predominate surface affected by dental caries, while, approximal surface was the predominate surface among the primary teeth. Buccal and lingual surfaces caries experiences were higher in permanent than in primary dentition.

Table (1): Caries free children (dmfs and/or DMFS)

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Index</th>
<th>No.</th>
<th>Caries Free No.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-5</td>
<td>dmfs</td>
<td>166</td>
<td>32</td>
<td>19.3</td>
</tr>
<tr>
<td></td>
<td>DMFS</td>
<td>60</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>166</td>
<td>32</td>
<td>19.3</td>
</tr>
<tr>
<td>10-11</td>
<td>dmfs</td>
<td>30</td>
<td>8</td>
<td>26.7</td>
</tr>
<tr>
<td></td>
<td>DMFS</td>
<td>122</td>
<td>14</td>
<td>11.5</td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>122</td>
<td>12</td>
<td>9.8</td>
</tr>
<tr>
<td>13-14</td>
<td>DMFS</td>
<td>118</td>
<td>6</td>
<td>5.1</td>
</tr>
</tbody>
</table>
Table (2): Caries experience by gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>No.</th>
<th>4-5 dmft Mean±SE</th>
<th>10-11 DMFT Mean±SE</th>
<th>13-14 dmft Mean±SE</th>
<th>13-14 DMFT Mean±SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>72</td>
<td>5.5 0.43</td>
<td>22</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Females</td>
<td>94</td>
<td>5.0 0.48</td>
<td>38</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Both</td>
<td>166</td>
<td>5.2 0.32</td>
<td>60</td>
<td>0</td>
<td>30</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gender</th>
<th>No.</th>
<th>4-5 dmfs Mean±SD</th>
<th>10-11 DMFS Mean±SD</th>
<th>13-14 dmfs Mean±SD</th>
<th>13-14 DMFS Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>72</td>
<td>7.8 0.78</td>
<td>22</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td>Females</td>
<td>94</td>
<td>7.9 0.93</td>
<td>38</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Both</td>
<td>166</td>
<td>7.9 0.62</td>
<td>60</td>
<td>0</td>
<td>30</td>
</tr>
</tbody>
</table>

* P<0.05  \( t = 2.03 \)  d.f = 120
** P<0.05  \( t = 2.55 \)  d.f = 116

Table (3): DMF/dmf components

<table>
<thead>
<tr>
<th>Ages</th>
<th>4-5</th>
<th>10-11</th>
<th>13-14</th>
<th>Comp.</th>
<th>4-5</th>
<th>10-11</th>
<th>13-14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comp.</td>
<td>Mean±SE</td>
<td>Mean±SE</td>
<td>Mean±SE</td>
<td>Mean±SE</td>
<td>Mean±SE</td>
<td>Mean±SE</td>
<td>Mean±SE</td>
</tr>
<tr>
<td>dt</td>
<td>4.90 0.31</td>
<td>1.43 0.25</td>
<td>-</td>
<td>ds</td>
<td>6.80 0.52</td>
<td>2.37 0.40</td>
<td>-</td>
</tr>
<tr>
<td>mt</td>
<td>0.20 0.03</td>
<td>0.25 0.10</td>
<td>-</td>
<td>ms</td>
<td>0.97 0.15</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>ft</td>
<td>0.009 0.03</td>
<td>0.25 0.10</td>
<td>-</td>
<td>fs</td>
<td>0.10 0.04</td>
<td>0.62 0.28</td>
<td>-</td>
</tr>
<tr>
<td>DT</td>
<td>0</td>
<td>3.93 0.25</td>
<td>5.59 0.30</td>
<td>DS</td>
<td>0</td>
<td>5.45 0.38</td>
<td>7.50 0.49</td>
</tr>
<tr>
<td>MT</td>
<td>0</td>
<td>0.009 0.03</td>
<td>0.13 0.03</td>
<td>MS</td>
<td>0</td>
<td>0.49 0.15</td>
<td>0.65 0.17</td>
</tr>
<tr>
<td>FT</td>
<td>0</td>
<td>0.311 0.07</td>
<td>0.34 0.09</td>
<td>FS</td>
<td>0</td>
<td>0.42 0.11</td>
<td>0.47 0.13</td>
</tr>
</tbody>
</table>

* P<0.0001  \( t = 4.7 \)  d.f = 330
** P<0.0001  \( t = 7.4 \)  d.f = 58
\( ^* \) P<0.0001  \( t = 14.6 \)  d.f = 242
\( ^^* \) P<0.0001  \( t = 14.8 \)  d.f = 234

Table (4): Caries experience DMFS/dmfs in relation to the jaw and segment.

<table>
<thead>
<tr>
<th>Ages</th>
<th>Index</th>
<th>No.</th>
<th>Anterior Mean±SE</th>
<th>Posterior Mean±SE</th>
<th>Upper Mean±SE</th>
<th>Lower Mean±SE</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-5 dmfs</td>
<td>166</td>
<td>2.8 0.34</td>
<td>5.3 0.40*</td>
<td>4.1 0.37</td>
<td>3.9 0.36</td>
<td></td>
</tr>
<tr>
<td>10-11 dmfs</td>
<td>30</td>
<td>0 0</td>
<td>3.2 0.43**</td>
<td>1.6 0.34</td>
<td>1.5 0.31</td>
<td></td>
</tr>
<tr>
<td>13-14 DMFS</td>
<td>122</td>
<td>0.3 0.14</td>
<td>5.9 0.35*</td>
<td>2.9 0.24</td>
<td>3.3 0.21</td>
<td></td>
</tr>
</tbody>
</table>

\( ^* \) t = 4.7  P<0.0001  \( d.f = 330 \)
\( ^^* \) t = 7.4  P<0.0001  \( d.f = 58 \)

Figure (1): Caries experience (DMF/dmf) in relation to tooth surface
Discussion

The data revealed that the percentage of children with caries free primary teeth was higher than that for permanent teeth except for the first examination. Dental caries increased with age for permanent dentition which may be attributed to the accumulative nature of the disease \(^1\), and decreased with age for primary teeth which may be due to the teeth exfoliation. This finding is in agreement with many cross-sectional studies \(^6, 7, 9, 13, 17\), the latter demonstrated that caries experience for primary teeth declined after an inclination up to the age of 8. Thirty-seven percent of the children who were caries-free in primary dentition remained so in the mixed dentition, which was much lower than that reported by Greenwell et al \(^18\).

After about 5 years of teeth eruption for both dentitions, the higher caries experience in primary than in permanent teeth may be related to the complete eruption of primary teeth full set and the morphological differences between the two dentitions \(^5\). This result agrees with Mortimer study \(^19\) that attributed it to the thinner thickness of primary teeth enamel than that found in permanent teeth and when caries lesions were present, extensive cavitation and involvement of decay were usually found, besides, the prenatal enamel was less mineralized than postnatal one. Although, males had a significantly higher mean DMFT than females at the second and third examinations, gender differences in relation to caries experience among the three examinations were not significant. This result is in accordance with other previous studies \(^7, 9\).

The mean DMFT increased from 0 to 4.3 after 6 years which means almost four carious teeth incidences and from 4.3 to 6.1 after the latter three years, which means almost two carious teeth incidences. While incidence of DMFS caries experience was 6.4 and 2.2 carious surface after six and three years respectively. That means approximately one carious surface per year. The caries increment averaged 2.2 DMFS over the three years was near to that reported by Burt et al \(^20\). The reductions in dmft and dmfs were 3.5 carious teeth and 4.1 carious surfaces after 6 years. The highest d/D component mean value is in agreement with many studies \(^8, 11, 12, 13\) which indicates the negligible dental treatment. The FT component was higher than MT, while vise versa regarding primary teeth, which may be due to the lesser dental care concerning primary teeth.

Dental caries in posterior teeth was significantly higher than that in anterior teeth for both dentitions. This finding is in accordance with some studies \(^8, 12, 13\). The differences in the morphology of pits and fissures in posterior teeth may explain this result \(^5\). Dental caries experience in anterior segment was more in primary than in permanent teeth. This result agrees with other studies \(^11, 12, 13\), which may be attributed to the occurrence of rampant type of caries as early as in the first year of life affecting the labial and palatal surfaces of the incisors. Besides, the incisal papilla is situated close to the mesiolongual aspects of those teeth, which gives rise to increased accumulation of plaque \(^5\). Although statistically there were no jaw differences in caries experience, dental caries in the upper jaw of primary teeth was higher than that for the lower jaw. This result is in agreement with El-Samarrai study \(^8\) and may be due to that the most commonly attacked primary teeth were the molars and upper anterior teeth, while the lower anterior teeth seldom
show sign of dental caries (5, 8, 21). The opposite picture regarding permanent teeth, which may be attributed to the early eruption of the lower teeth (5).

Occlusal surface of permanent teeth was the most affected by dental caries, while the proximal surface of primary teeth was the most affected. This result is in agreement with some studies (13, 22) and in disagreement with Grindfjord et al (23) and may be due to the fact that in the primary teeth less pronounced fissure systems are found than in the permanent teeth. Also, the high frequency of spacing in the molar areas in the primary teeth of young preschool children reduces the number of proximal caries. With increasing age, proximal contacts are established which may give rise to an increase of proximal caries in primary teeth at the age of 5 to 6 (5). Kidd and Pitts (24) showed that at least half of the proximal lesions in primary molars of children aged 3-7 years would not be detected without radiograph. Children developed 1.5, 0.3, 0.2 and 0.26 new lesions for occlusal, proximal, buccal and lingual permanent teeth surfaces respectively during the last three years. The difference in the means of surfaces with caries was largest for pit and fissure surfaces. This agrees with Li et al study (25). The increase in the proximal caries among permanent teeth by age was more than smooth surface caries because the latter is self cleansing. In addition, the proximal surfaces of the newly erupted posterior teeth are most caries susceptible during the first 11 to 14 years (4). Such variations in surface "susceptibility" reflect variations in the intra-oral environment, and do not reflect any known variations in composition of the tooth surfaces (15).

It is important to motivate and encourage individuals to assume responsibility for their own oral health. A preventive program should be tailored and integrated to reflect trends in the pattern of dental caries in our country.

References


