FREQUENCY OF OVERERUPTION IN UNOPPOSED POSTERIOR TEETH

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ABSTRACT

The objective of the study was to determine the frequency and extent of over eruption in unopposed posterior teeth. The study was conducted in the Department of Prosthodontics, Lahore Medical & Dental College, Lahore. Fifty sites of unopposed posterior teeth were included in the study. Broadrick flag technique was used for the generation of broadrick occlusal curve. The measurement of over eruption of the unopposed posterior tooth was measured from the generated curve to the tip of most occlusally projecting cusp by a vernier caliper. Forty seven (90%) of the subjects and sixty teeth (83.3%) out of seventy two had some degree of over eruption. It was concluded that unopposed posterior teeth lead to over eruption of antagonists with clinical and statistical significance (83.3%).

Key words: Dentition, Occlusal patterns, Spee curve

INTRODUCTION

With changing times oral health awareness has significantly improved dental status¹ this is evident as the decrease in edentulism with more people retaining their natural teeth until old age² but increasing partial edentulism has its own set of problems. Majorly, tooth loss may lead to supra occlusion of opposing teeth³ which may compromise and complicate the prosthodontics treatment plan.

There is no evidence that eruption ceases on contact with an antagonist⁴ but it continues to erupt, compensate and adapt.⁴,⁵ Many studies have confirmed this notion⁶ of continuous tooth eruption without concomitant coronal movement of alveolar bone in teeth which had no antagonists. These manifest themselves as active eruption or passive eruption.⁷

Even the loss of occlusal contacts due to caries can lead to the collapse of the setup with detrimental consequences to the stability and integrity of the interarch tooth alignment.⁸

Moreover, tipping⁹, tilting and physiological drifting¹⁰ may adversely affect the relative crown-root alignment⁷,⁹ resulting in unfavorable occlusal forces which may lead to periodontal breakdown or occlusal trauma.¹¹ In younger age group, the undesirable tooth movements are more profound due to greater potential for growth.¹² Majority of them occur in the early post extraction periods.¹³ Loss of periodontal support may superimpose later as reinforced by Ainamo and Ainamo in 1978.¹⁴

Understanding the effects of these types of movements is vital in the management of restorative and prosthodontic care. Occlusal plane orientation is a key to harmonious occlusion. This study will be an attempt to provide a guide to the extent of over eruption. This study may help in understanding the possible conse-

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sequences of over eruption, decision making process and planning of future tooth replacement.

**METHODOLOGY**

Fifty cases of unopposed posterior teeth visiting the out patient department of Prosthodontics, Lahore Medical and Dental College were selected on the basis of inclusion and exclusion criteria. 18 to 55 years old patients having two or more unopposed posterior teeth with the loss of antagonist at least 6 months backs were included. Periodontally compromised dentition was not included in the study. Patients who have had any previous prosthodontics treatment or orthognathic reconstructive surgery, or patients having congenital or acquired defects were likewise excluded. Verbal consent was taken. Patient’s demographic data was noted. The patients were informed of the risks/benefits of the techniques employed and materials used.

Impressions were made with irreversible hydrocolloid impression material (Chromo gel - Chromatic Alginate by Zhermack Spa) manipulated according to the manufacturer’s instructions. In case of any error, the impressions were repeated. After disinfection casts were poured immediately with dental stone type IV to avoid syneresis and imbibitions.

The maxillary cast was oriented by means of an arbitrary face bow transfer (Whip mix) on a semi adjustable articulator (Whip mix 3040) modified for employing Broadrick Flag technique.\(^{15,16}\)

Vinyl polysiloxane bite registration material (fast setting) was employed for recording centric relation position which was located by bimanual manipulation of the mandible as described by Long and modified by Dawson.\(^{17}\) An anterior jig\(^{18}\) was also constructed to deprogram any muscle engrams, if present. The anterior jig or deprogrammer was directly fabricated in the mouth using auto polymerizing acrylic resin. The deprogrammer was retained in the mouth for 15 minutes to deprogram the habitual occlusion. Dawson’s bimanual manipulation was carried out consecutively while the anterior jig was in place. The registration if perforated was discarded.

Broadrick flag was constructed by 4 x 4 inch hard card board piece 3mm thick. The card board was covered with blank white sheet to create a double sided flag. The flag was attached to the upper member of the articulator by two custom made clear acrylic blocks into which the flag snugly fitted. Silicone matrices were constructed to conform to the condylar element of the articulator. A hole was drilled into it to locate the center for the posterior survey point required for generation of Broadrick occlusal curve.

Using the Broadrick flag method described by Lynch and McConnell\(^{19}\), the ideal occlusal plane was created using a graphite lead in a bow compass. It was adjusted to the radius selected. In class 1 incisal relationships 4 inch radius, class 2 relationships 3.75 inches and class 3 incisal relationships 5 inch arc was used respectively. The center point of the bow compass was positioned on the anterior survey point (ASP) which was located on the midpoint of the distoincisal edge of the mandibular canine scribing an arc of about 3 inches on the flag. Posterior survey point (PSP) was already located by the silicone putty matrices and another arc was drawn which intersected the first arc. The point of the compass adjusted to the same radius was now placed at the intersection of the arcs. The graphite marker was swept over the buccal surfaces of the unopposed posterior teeth marking the Broadrick occlusal curve on the teeth.

Vernier caliper was employed to measure the projection of the unopposed tooth from the Broadrick occlusal curve in vertical direction. Measurements were taken to two decimal points. Three readings were taken at the mesiobuccal, center and distobuccal aspect of the tooth. Readings were recorded on the proforma and mean calculated.

Data was entered to SPSS (version 11.0) for analysis. The variables under study were age, sex, unopposed site, extent of over eruption. Numerical variable (age, extent of over eruption) were calculated as mean and standard deviation. Qualitative variables (sex, unopposed sites) were calculated as frequency and percentages.

**RESULTS**

Fifty two subjects with unopposed posterior teeth were selected. The age of these patients ranged between 18-55 years of age. Twenty three were male and twenty nine were female subjects. Seventy two unopposed teeth were measured for over eruption. Forty
TABLE 1: DISTRIBUTION OF TOOTH TYPES IN TEETH WITH OVER ERUPTION AND IN TEETH WITHOUT OVER ERUPTION

\[(n=72)\]

<table>
<thead>
<tr>
<th>Tooth type</th>
<th>1st premolar</th>
<th>2nd premolar</th>
<th>1st molar</th>
<th>2nd</th>
<th>Total</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teeth with over eruption</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mx Rt</td>
<td>0</td>
<td>3</td>
<td>15</td>
<td>6</td>
<td>42</td>
<td>58.33</td>
</tr>
<tr>
<td>Lt</td>
<td>0</td>
<td>4</td>
<td>11</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mn Rt</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>0</td>
<td>18</td>
<td>25.00</td>
</tr>
<tr>
<td>Lt</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teeth without over eruption</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mx Rt</td>
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<td>0</td>
<td>1</td>
<td>1</td>
<td>5</td>
<td>6.94</td>
</tr>
<tr>
<td>Lt</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mn Rt</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>7</td>
<td>9.72</td>
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<tr>
<td>Lt</td>
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<td>1</td>
<td>2</td>
<td>0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>15</td>
<td>39</td>
<td>16</td>
<td>72</td>
<td></td>
</tr>
<tr>
<td>percentage</td>
<td>2.77</td>
<td>16.67</td>
<td>54.17</td>
<td>22.22</td>
<td>100</td>
<td></td>
</tr>
</tbody>
</table>

Key:
- n = number
- Mx = maxillary
- Mn = mandibular
- Rt = right
- Lt = left

Out of 72 total teeth, the extraction period of the antagonist of 23 teeth, 3 percent was between 8-20 months, of 36 teeth was between 21-60 months, 50 percent, of 11 teeth was between 61-100 months, 15.3 percent and of 1 tooth each was between 101-140 months and 141-180 months, 1.4 percent.

Seven (65.28%) teeth were present in the maxillary arch out of which twenty six were in the right and twenty one in the left maxillary quadrant. Twenty five (34.72%) teeth were present in the mandibular arch out of which nine were in the right and sixteen in the left mandibular quadrant. Forty seven (90%) of the subjects and sixty teeth (83.3%) out of seventy two had some degree of over eruption. Mean over eruption recorded was 2.26 mm with standard deviation of 0.94. The smallest recorded reading was 0.32 mm and the highest recorded reading was 4.38 mm.

DISCUSSION

One of the major influences of posterior tooth loss is supra eruption of the antagonist. In this study, the edentulous period was kept small as most of the over eruption occurs in the early post extraction period. Provisional restorations in fixed prosthodontics substantiate this concept.
The fifty two subjects observed had one or more unopposed sites. Third molars were excluded since their period of remaining unopposed could not be ascertained with accuracy. Periodontally compromised dentitions were excluded since they may super impose the initial positional changes leading to greater over eruption. Unopposed tooth in this study was defined as being completely unopposed with at least two antagonists missing. This was based on the fact that one tooth to two tooth contact is seen in normal healthy individuals.

This study had some limitations. The rate of over eruption and its susceptibility in different age groups could not be ascertained which can only be done by a longitudinal study. Convenience sampling was employed. Few patients of posterior tooth loss may have been missed. Age may affect the measurements of over eruption. Increasing age may lead to periodontal involvement, gingival recession and increased tooth wear. Relative tooth wear of adjacent teeth may have over estimated over eruption in some teeth.

Over eruption were measured in a vertical direction only. Studies have shown that the distal aspect of an over erupted tooth is most affected due to tipping. This problem was overcome by measuring three reference points on the tooth (mesiobuccal, centre and disto buccal). Another aspect which may have been over looked is the normal buccal inclination of the maxillary teeth leading to greater over eruption of its mesiopalatal cusp. Thus, over eruption may have been under estimated over eruption in some teeth.

Majority of teeth which were found to be unopposed in this study comprised of first molars (54.17%). These results are consistent with other studies on patterns of tooth loss. Similarly, more maxillary teeth were unopposed (65.28%) implicating that missing teeth were common in mandibular arch as evident by other studies done both in and outside Pakistan.

The frequency of over eruption was as high as 90% in at least one of their unopposed teeth. 83.3% teeth showed some degree of over eruption. Majority had moderate to slightly severe degrees of over eruption. The results showed that over eruption is likely to be encountered in most of the patients. The results are clinically significant in regard to the amount of tooth reduction needed, the degree of complexity that may be anticipated and the actual possibility of treating such cases without extractions.

Another significant finding was lesser number of teeth with severe degrees of over eruption. This may be attributed to deleterious consequences of over eruption to the tooth itself like root exposure, sensitivity, mobility and traumatic bite leading to tooth loss. The findings of this study implicate that unopposed sites should be monitored regularly. Preventive measures should be considered as described by Solnit like temporary acrylic removable prosthesis or adhesive cantilever prosthesis.

These results are consistent with other studies which also demonstrated high frequencies of over eruption in their samples. The reproduction of the natural occlusal curve (curve of Spee) is widely varied in different studies. Smith in 1996 reported over eruption to be statistically significant. He drew a straight line between two points on the cusp tips of the teeth adjacent to the extraction site. This flattens the natural occlusal curve and may produce a false impression of supra eruption. Killiardi combined the subject’s occlusal plane and the marginal ridges of the teeth adjacent to edentulous space by a straight line, in this case molars unopposed for 10 years. The study displayed that 82% of the teeth had some degree of over eruption. Measurements were not made beyond 2mm so severe degrees of over eruption may have been ignored in this study. Shugars also used the same methodology showing over eruption between 0.1-1.0 mm ranges.

Craddock et al demonstrated 83% over eruption in unopposed teeth which had less than 20% contact with the antagonist. Commonly encountered values were between 1 to 2.5mm. Only one tooth showed over eruption of 5.39mm. The outcome of the present study is consistent with these results and comparable as they employed a fairly accurate method to measure over eruption. Computer software was utilized using Orthlieb’s method to generate the curve. In 2005, Yamouka et al measured over eruption through orthopantomographs. Their results showed 42.92% of over eruption which is far below the frequencies found in the present as well as other studies. The difference may be due to improper measurement technique. The radiographs were not standardized and exact measurements were not taken.
Two recent studies (2007) by Craddock et al have been done to determine the frequency of over eruption. The second study displayed quite a high frequency of over eruption (90%). They generated a spline curve produced by the maximum concavities of the gingival margins. The reason behind different results of this study may be due to flattening of the curve in this method.

The present study employed Broadrick Flag technique to generate the occlusal curve. It helps fairly accurate location of the cusp tips and demonstrates the degree of tooth reduction or porcelain addition to be employed. It has also been supported as a scientific instrument and a useful tool in prosthodontics and restorative dentistry. The orientation of the posterior survey point, which is located on the distal molar tooth, may not always be suitable. A study done by Craddock et al concluded that tipping of the posterior determinant has little effect on the size curve radius. In the present study, this problem was over come by utilizing Needle’s approach for all subjects. He suggested the use of anterior point on the condylar element as the PSP. Lynch and McConnell also advocated the same approach. Flattening of the curve is possible in this method as well due to different skeletal patterns in individuals. The radii of different values were employed for the three skeletal patterns to avoid discrepancy in the generated occlusal curve.

The results of this study showed a high frequency of over eruption. This may be attributed to a number of factors. The correlation of lower education level, socio-economic status and lack of dental health awareness with delayed presentation and increased tooth mortality stands true for Pakistan. Moreover, lack of access to dental care services was the most significant factor as cited by Sonia et al. The ignorance regarding preventive and therapeutic measures contributes to a negative attitude towards dental treatment.

Priorities regarding dental health care and needs should be altered according to the local environment. Dental health awareness programs need to be initiated at community level.

Health care providers and community workers need to be integrated in the dental health care system by creating awareness regarding prevalence, consequences, preventive measures and management of oral diseases including tooth loss.

CONCLUSIONS

Within the limitations of this study, the conclusion is that unopposed posterior teeth lead to over eruption of antagonists with clinical and statistical significance (83.3%). Over eruption is likely to be encountered in most of the patients.

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Frequency of over eruption in unopposed posterior teeth


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