DO POSTERIOR TEETH SUPRA-ERUPT WHEN OPPOSITE RESECTED SEGMENTS HAVE NOT BEEN PROSTHETICALLY RESTORED?

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Introduction: The aim of this study was to assess the rate and timing of possible supra-eruption of posterior teeth opposing resected segments in a select maxillofacial group of postsurgical patients.

Methodology: Twenty patients were included. 16 underwent simultaneous segmental mandibular resections and iliac bone graft reconstructions. The remaining 4 had partial maxillary resections with primary closure of the defect. No patient received any prosthetic restoration. Clinical photographs and radiographs at the last follow-up examinations were compared by superimposition to those obtained initially (mean 6.9 years).

Results: The results of this longitudinal retrospective study showed that not even slight supra-eruption had occurred in any of the 16 patients.

Conclusion: These findings are discussed with regard to their possible cause and prosthodontic implications.

Keywords: super-eruption, supra-eruption, occlusion, unopposed molars, resected segments.
situations. In a questionnaire study of 200 Swedish dentists presented with a drawing of an SDA in the mandible in a virtual case, 85% of them suggested that marked SE of the maxillary molars would occur, whereas 13% believed in minor changes.10 In a large sample of patients with SDA and extreme SDA, Sarita et al. found that SE of unopposed teeth was absent or mild in 12%, severe in 32% and to the opposing residual ridge (severe SE) in 56% of the subjects.11 However, the authors did not provide data with regard to the pattern of posterior tooth loss, though alluding to gradual tooth loss in their study. The aim of the present study was to assess the rate and timing of possible SE of unopposed posterior teeth in a select group of postsurgical patients.

Methodology
Subjects
The study group included consecutive patients who were hospitalized in the Department of Oral and Maxillofacial Surgery, Beilinson Campus, Rabin Medical Center, Israel, during the 1990-2009 period. Medical data such as clinical photographs, radiographs, type of surgical procedures and histopathological findings, were gleaned from hospital records. The inclusion criteria were: (1) surgical resection of a tumor in a posterior region of one of the jaws limited to bone and attached soft tissues; (2) immediate mandibular reconstruction of non-continuity defects or alternatively, primary surgical closure of a maxillary defect; (3) no adjuvant therapy such as radiation therapy or chemotherapy; (4) no signs of temporomandibular disorders; (5) sound dentition with minimal restorations; (6) normal occlusion with good intercuspation; (7) no postoperative prosthodontic treatment and (8) keeping long-term follow-up visits.

Diagnostic evaluation
The complete evaluation of each patient was made at the preoperative stage. Frontal and lateral views of the face of the patient was photographed using a Nikon SLR regular end digital camera with 1:1 macro lens (105/2.8 Nikon macro lens focusing at 1.2 meters). Intraoral photographs of the dentition in maximal intercuspation and semi-open position were taken at a distance of 30 cm with 22 lens aperture with the same camera. Other imaging modalities such as CT, MRI, ultrasonography or angiography were rarely indicated for a complete evaluation of the individual patient and have not been used in this study. Initial and follow up orthopantomographic radiographs were obtained for all cases.

Surgical procedures
In the mandible, under general anesthesia via using a naso-endotracheal intubation, segmental

Table 1: Mandibular Reconstruction Cases

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Age (yrs)</th>
<th>M/F</th>
<th>Diagnosis</th>
<th>Resection Site Location</th>
<th>Distal Tooth</th>
<th>Follow up (yrs)</th>
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<tbody>
<tr>
<td>1</td>
<td>S.L.</td>
<td>7</td>
<td>M</td>
<td>Ameloblastic fibroodontoma</td>
<td>RT mand</td>
<td></td>
<td>13</td>
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<td>2</td>
<td>S.D.</td>
<td>10</td>
<td>M</td>
<td>Ameloblastic fibroodontoma</td>
<td>RT mand</td>
<td></td>
<td>13</td>
</tr>
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<td>3</td>
<td>S.S.</td>
<td>10</td>
<td>M</td>
<td>Ossifying fibroma</td>
<td>RT mand</td>
<td></td>
<td>7</td>
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<tr>
<td>4</td>
<td>C.E.</td>
<td>20</td>
<td>M</td>
<td>Blast injury</td>
<td>LT mand</td>
<td></td>
<td>11</td>
</tr>
<tr>
<td>5</td>
<td>Y.A.</td>
<td>20</td>
<td>F</td>
<td>Ameloblastoma</td>
<td>RT mand + condyle</td>
<td></td>
<td>14</td>
</tr>
<tr>
<td>6</td>
<td>K.Y.</td>
<td>20</td>
<td>M</td>
<td>Odontogenic keratocyst</td>
<td>RT mand</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>7</td>
<td>C.Y.</td>
<td>22</td>
<td>F</td>
<td>Ameloblastoma</td>
<td>LT mand</td>
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<td>3.5</td>
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<tr>
<td>8</td>
<td>A.G.</td>
<td>26</td>
<td>M</td>
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<td>RT mand</td>
<td></td>
<td>12</td>
</tr>
<tr>
<td>9</td>
<td>S.H.T.</td>
<td>30</td>
<td>F</td>
<td>Giant cell tumor</td>
<td>RT mand</td>
<td></td>
<td>10</td>
</tr>
<tr>
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<td>G.E.</td>
<td>32</td>
<td>M</td>
<td>Ameloblastoma</td>
<td>LT mand</td>
<td></td>
<td>2.2</td>
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<tr>
<td>11</td>
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<td>F</td>
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<td>LT mand</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>12</td>
<td>D.S.</td>
<td>38</td>
<td>F</td>
<td>Ameloblastoma</td>
<td>RT mand + condyle</td>
<td></td>
<td>13</td>
</tr>
<tr>
<td>13</td>
<td>R.A.</td>
<td>40</td>
<td>F</td>
<td>Aneurismal bone cyst</td>
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<td></td>
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<td>14</td>
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<td>F</td>
<td>Ameloblastoma</td>
<td>LT mand</td>
<td></td>
<td>2.3</td>
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<td>15</td>
<td>S.O.</td>
<td>59</td>
<td>F</td>
<td>Mucoepidermoid carcinoma</td>
<td>LT mand</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>16</td>
<td>R.Y.</td>
<td>61</td>
<td>M</td>
<td>Giant cell tumor</td>
<td>LT mand</td>
<td></td>
<td>7</td>
</tr>
</tbody>
</table>

Table 2: Maxillary Reconstruction Cases

<table>
<thead>
<tr>
<th>No.</th>
<th>Name</th>
<th>Age (yrs)</th>
<th>M/F</th>
<th>Diagnosis</th>
<th>Resection Site Location</th>
<th>Distal Tooth</th>
<th>Follow up (yrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>B.A.</td>
<td>11</td>
<td>F</td>
<td>Ameloblastic fibroodontoma</td>
<td>RT max</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>2</td>
<td>C.M.</td>
<td>14</td>
<td>F</td>
<td>Ameloblastic fibroodontoma</td>
<td>LT max</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>K.Y.</td>
<td>16</td>
<td>M</td>
<td>Sialodentogenic cyst</td>
<td>RT max</td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>M.M.</td>
<td>16</td>
<td>F</td>
<td>Odontogenic myxoma</td>
<td>LT max</td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>
resection of the lesion was carried out by the combined intra and extraoral approach (modified Risdon or submandibular approach). Intraoral wounds were closed by watertight locking and interrupted sutures. Mandibular fragments were positioned by maxillo-mandibular fixation in maximal intercuspation, secured by Eric arch bars. Mandibular continuity was restored by using titanium reconstruction plates (DePuy Synthes Companies, West Chester, PA 19380, USA; Stryker Global Headquarters, Kalamazoo, MI 49002, USA). Full body or hollow screws were used to secure the fixation of mandibular stumps.12,13 Cortico-cancellous particulate bone was harvested from the anterior iliac crest14 supported by a crib-form allogenic split rib.15 Soft tissues were closed by layers. In the maxilla, using oro-endotracheal intubation for general anesthesia, the lesion was resected in toto. Primary surgical closure of soft tissues was carried out, either by exploiting the buccal pad of fat or by a palatal rotated mucoperiosteal flap or a combination of both was used to facilitate closure. In the vast majority of patients, healing was uneventful, albeit in few patients healing was prolonged but complete; healing was spontaneous with the help of (or using) antiseptic irrigations (0.2% chlorhexidine gluconate).

Recall and documentation
Postoperatively, patients were placed on a regular recall schedule namely, once every 3 months for the first year and thereafter once a year. Complete evaluation was made at the preoperative diagnostic stage. Clinical photographs and radiographs at the last recall visit were compared to those obtained initially. Photographed slides were scanned by Umax Power Lock II scanner and some of the older slides were copied by Nikon - E 28 Slide Copying Adapter. Radiographs were scanned and superimposed on PC graphic program and the degree of supra eruption of the unopposed segments evaluated.

Results
Twenty patients who were found to fulfill the inclusion criteria were included in the study, namely sixteen with mandibular involvement (Tab. 1) and 4 patients with maxillary involvement. (Tab. 2). The age of the patients ranged from 7 to 61 (mean 29.4) in the mandibular group and from 11 to 61 (14.2) in the maxillary group. In most patients ameloblastoma or its variants appeared as a primary tumor of the jaws. In contrast as a primary soft tissue pathosis, patients afflicted by squamous cell carcinoma could not be enrolled in this study. The results of this study showed that not even slight SE had occurred in any patient. This is seen in examples of cases in Fig. 1-5. The condition of the temporomandibular joints was not evaluated.

Discussion
The results of this long term retrospective study were unexpected. Super eruption had not occurred apparently even slightly in any single patient regardless of the age of the patient, the location and extent of the surgical resection and the follow up period. These results are in contrast with those obtained by Sarita et al.11 However, in their study tooth loss was gradual, whereas in our study loss of teeth occurred in a single surgical procedure. As a result, the tongue could immediately fill the intraoral space created. It is conjectured that the lateral aspect of the dorsum of the tongue came into contact with the occlusal surface of the posterior teeth and prevented their subsequent eruption. Stabilization of the mandible during swallowing that is normally affected by the occlusal intercuspal contact is affected by
Figure 4. Ameloblastoma. Treated by hemi mandibulectomy and restored with split rib and reconstruction plates

Figure 5. Twenty two years post operative. No supra-eruption of the unopposed maxillary teeth opposite the resected segment

closure onto the interposed tongue. Moreover, it seems that the ventral surface of the tongue can also function in this manner preventing super eruption of mandibular teeth. It is noteworthy that super eruption did not occur in patients were the surgical reduction extended beyond the definition of the SDA to include premolars, canines and even the incisor teeth. These situations may be considered as unilateral ultra-shortened dental arches. Even in patients who underwent partial glossectomies, the remaining tongue appeared to preserve oral function and hinder super eruption. However, prosthetically augmenting the palate for lowering the occlusal plane and thus enabling the remaining tongue to keep the bolus over the dorsal surface, is still advocated in some patients. Further lowering the occlusal plane may bring it below the maximum ability of the buccinators contraction. To summarize, within the limits of this study, restoration of the posterior jaw defects merely for prevention of future super eruption appears unjustified. Thus the time-old principle by DeVan “Our objective should be the perpetual preservation of what remains rather than the meticulous restoration of what is missing.” is still valid.

Conclusion

Posterior teeth opposing unrestored resected segments of the maxilla or mandible did not supra-erupt over long periods of time. It is speculated that the interposition of the tongue to brace the mandible on swallowing prevents the unopposed molars and premolars from supra-erupting.

Bibliography


He graduated from the Hadassah Dental School Jerusalem (DMD). He got his advanced Education at Sloane Kettering USA specializing in Maxillofacial Prosthodontics and Prosthodontics. He is Head of the IDF Dental Prosthetic unit. He is also Chief Consultant in Maxillofacial Prosthodontics and Temporomandibular Disorders at the Beilinson Hospital Petach Tikva. He is Head of the Prosthodontics and Prosthodontic graduate program IDF. He is also Honorary member of the International College of Prosthodontists.

Questions

A “shortened dental arch” is defined as:
- a. An arch from canine to canine;
- b. An arch missing molar teeth;
- c. The presence of two bilateral pairs of occlusal contacts (premolar occlusion);
- d. The presence of 10 teeth per arch contacting each other.

Immediate bony reconstruction of a posterior segmental mandibular resection, without replacement of the lost teeth, leads to:
- a. Supra-eruption of the unopposed molars;
- b. No supra-eruption of the unopposed molars;
- c. Earlier loss of remaining teeth due to increased wear;
- d. Bilateral increase of the curve of Spee.

Which is not a possible adverse outcome of a shortened dental arch?
- a. Bruxism;
- b. Increased wear of the remaining anterior teeth;
- c. Interdental spacing in the premolar area;
- d. Temporo-mandibular-joint overload.

After ablative surgery with immediate bony reconstruction, supra-eruption of unopposed teeth is avoided because of:
- a. Old age;
- b. Follow-up visits;
- c. Tongue interposition;
- d. Absence of any tooth filling.