Recently, there has been renewed interest in the use of coronectomy to treat mandibular third molars because the procedure presents a reduced risk of injury to the inferior alveolar nerve (Figure 1).

The coronectomy (partial odontectomy) procedure, consisting of the purposeful retention of part of a mandibular third molar root, was initially described by Ecuyer and Debien (Actual Odontostomatol [Paris] 1984). However, the procedure failed to gain widespread acceptance due to the perception that infection related to loss of pulp vitality in the retained root might occur. But no studies have confirmed or refuted the perceived risk.

To address the concern that retained residual roots could be a source of infection, Patel et al from Guys Dental Hospital, United Kingdom, reviewed histological assessments of 26 consecutive retained third molar roots removed from 21 patients as a result of symptoms after coronectomy.

To determine the status of the pulpal and periradicular tissues of the retained third molar root, the authors histologically examined the removed roots. Following approximately 840 coronectomies performed over 21 consecutive months, 21 patients (26 teeth) experienced persistent symptoms and had the retained root retrieved. The study group was made up of individuals with a mean age of 31.6 years (range, 22–70 years; 17 women, 4 men). All patients underwent surgical removal of the retained roots under local anesthesia. The causes of persistent symptoms included

- acute infection
- nonhealing socket
- erupted or partially erupted retained roots, some with root migration

In patients with partially or fully erupted roots, indications for retrieval of coronectomy roots included infection, pain and localized soft tissue tenderness.
The mean time to the retained root removal was 15 months (range, 2–54 months). In 11 of the 26 sockets, the roots were radiographically clear of the inferior alveolar nerve. All roots were removed without any complications, with the exception of one individual who developed a transient dysfunction of the nerve. Each of the 52 retrieved roots contained vital pulp, although 3 had partial necrosis limited to the coronal part of the root canal; the apical portion of the pulp possessed vital pulp that was not inflamed. There was variable hypercementosis in all roots, likely due to trauma.

**Conclusion**

This study supports the less invasive practice of coronectomy in certain cases. To limit the risk of developing an infection in retained roots, teeth chosen for coronectomy should be sound, caries-free and with no evidence of pulpal, periodontal or periapical disease. To maintain root vitality, the crown must be separated from the roots without mobilizing them within the socket. Root canal treatment of the retained root has been shown to produce a high frequency of infection, necessitating root removal.


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**Prophylactic Antibiotics Before Dental Procedures In Patients with Prosthetic Joints**

The American Dental Association Council on Scientific Affairs assembled an expert panel to develop an evidence-based clinical practice guideline on the use of prophylactic antibiotics in patients with prosthetic joints who are undergoing dental procedures. The intent of the guideline was to clarify the earlier 2012 recommendations on this issue developed by the American Academy of Orthopaedic Surgeons and the American Dental Association. The 2014 panel focused on the clinical question, “For patients with prosthetic joints, is there an association between dental procedures and PJI [prosthetic joint infection], and, therefore, should systemic antibiotics be prescribed before patients with prosthetic joint implants undergo dental procedures?”

The panel, chaired by Sollecito from the University of Pennsylvania, ascertained with moderate certainty that no association between dental procedures and the occurrence of PJI exists. Their decision was based on 2 main considerations:

- Reviewed studies showed a consistency of results: 3 of 4 studies failed to show an association between dental procedures and PJI, while the fourth implied that those undergoing dental procedures had a lower rate of PJI.
- Despite the limited number of studies, it was unlikely that additional study results would change the conclusion.

The 2014 panel recommended that, for patients with prosthetic joint implants, prophylactic antibiotics prior to dental procedures to prevent PJI are not recommended. However, the dental practitioner should take into consideration any clinical situation that might indicate potential significant medical risk of rendering dental care without antibiotic prophylaxis.

The panel also took certain non-dental factors into consideration in reaching their recommendation against antibiotic use.

1. Antibiotic resistance may occur with repeated exposure to antibiotics, leading to the development of resistant bacteria (e.g., penicillin-resistant *streptococci*).
2. Adverse drug reactions may occur from repeated use of penicillin-type drugs. Penicillin is the most common allergen related to potentially life-threatening anaphylaxis in humans; approximately 75% of fatal anaphylaxis in the United States each year results from penicillin use.

Other adverse reactions include nausea, vomiting and diarrhea. Extended use of antibiotics may be associated with infections secondary to alterations in the gastrointestines.
testinal flora, such as oral thrush. Clindamycin, cephalosporins and fluoroquinolones have been identified as potential inducers of *Clostridium difficile* infection, which results in the hospitalization of approximately 250,000 individuals and 14,000 deaths annually.

According to a 2013 study, antibiotic prophylaxis prior to dental procedures for patients with hip and knee prostheses may total >$50 million per year.

**Conclusion**

Generally, prophylactic antibiotics before dental procedures to prevent PJI are not recommended for patients with prosthetic joint implants.


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**Implant Survival Rates With Varied Bone Density**

Many studies in the dental literature have reported that implant survival rates are associated with implant site location, with implant survival rates in the maxilla—particularly the posterior maxilla—lower than those in the mandible. This discrepancy is mostly due to the difference in bone quality.

The relative proportion of cortical bone, which helps stabilize the implant, to trabecular bone, which assists in vascular supply, significantly affects implant survival. When there is well-mineralized bone with appropriate corticalization, a 99% survival rate has been reported at 15 years; in poor trabecular bone, however, survival rates of 50% to 94% have been observed.

Implant failure can be classified as early or late. Early failures are evident before osseointegration, prior to prostheses delivery or connection of the abutment; late failures occur following prostheses delivery. Early failures occur due to lack of osseointegration; late failures occur due to a loss of osseointegration, likely instigated by occlusal overload and peri-implantitis.

He et al from China Medical University designed a retrospective study to investigate the influence of local bone density on implant cumulative survival rates and to evaluate prognostic factors associated with implant failure at sites with variable bone densities. Over an 8-year period, 2,684 implants were placed in 1,377 patients. The bone into which these implants were placed was rated by density according to the Lekholm and Zarb classification of bone types 1 through 4; the implants were then divided into 4 groups (G1–G4), from high density to low density.

Implant cumulative survival rates and the reasons for failure in each group were assessed. Implant failure was determined by clinical mobility of the implants, which were subsequently removed. Bone-density grading at the implant site was assessed with imaging and surgical findings regarding bone volume, proportions of cortical and trabecular bone, and tactile sensation during drilling.

<table>
<thead>
<tr>
<th>Group</th>
<th>No. placed</th>
<th>% placed</th>
<th>No. failed</th>
<th>Survival rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>G1</td>
<td>53</td>
<td>1.97</td>
<td>0</td>
<td>100.00</td>
</tr>
<tr>
<td>G2</td>
<td>1,542</td>
<td>57.45</td>
<td>12</td>
<td>99.22</td>
</tr>
<tr>
<td>G3</td>
<td>868</td>
<td>32.34</td>
<td>20</td>
<td>97.70</td>
</tr>
<tr>
<td>G4</td>
<td>221</td>
<td>8.24</td>
<td>13</td>
<td>94.12</td>
</tr>
<tr>
<td>Total</td>
<td>2,684</td>
<td>100.00</td>
<td>45</td>
<td>98.32</td>
</tr>
</tbody>
</table>

A total of 45 implants were lost, resulting in implant cumulative survival rates for G1 through G4 illustrated in Table 1. The key reasons for failure in each group were

- failed osseointegration
- occlusal overloading
- low bone density was related to
- advanced age (>50 years)
- a posterior maxillary site

Diabetes mellitus and nonthreaded implants significantly influenced failure in the high bone-density group (G2), while advanced age, smoking, nonthreaded implants and immediate loading were risk factors for the low bone-density groups (G3 and G4).

**Conclusion**

It is difficult to achieve mechanical fixation of implants at sites with poor-quality bone (low bone density) due to the thin layer of cortical bone and high proportion of trabecular bone. This creates the potential for failure to achieve primary stability of the implant and osseointegration. The lack of primary stability could result in breaks in the bone-to-implant interface, with ingrowth of fibrous scar tissue and ultimate implant failure.

Impact of Craniofacial Growth on Osseointegrated Implants

Craniofacial growth has not been previously considered when planning dental implant cases. Daftary et al, private practitioners from California, studied the potential complications when teeth and implants coexist and subtle craniofacial growth takes place. After 20 years of following partially edentulous patients, the authors identified alterations of their patients’ remaining teeth and jaws resulting from continued craniofacial growth during adulthood. They detected a number of instances in which adult craniofacial growth may have had an impact on the relationship of implant restorations to the remaining teeth and jaw structure.

Following decades of observing single-tooth and multiple-tooth implant restorations, the authors found evidence that for certain patients there are esthetic, functional, restorative and periodontal implications to subtle continued craniofacial growth. Due to implants’ ankylosic nature, they do not move with growing jaws and faces as do teeth and tooth buds.

For this reason, implants are not recommended for growing patients. Ödman et al (Eur J Orthod 1991) demonstrated that new teeth in a growing pig erupted more coronally and buccally relative to implants as the jaws grew. As part of the same study, Thilander et al (Eur J Orthod 1992) found that implants stay in the same 3-dimensional spatial relationship as the body continues to develop around them.

Infraocclusion of implant restorations was noticed in patients who were still growing. Investigations by Ainamo et al (J Periodontal Res 1978, 1981) showed that significant alveolar growth takes place between the ages of 23 and 45 years; further growth at a slower rate continues to age 65. Adult craniofacial growth may influence the relationship of implant restorations to the remaining teeth and jaw structure in the following situations:

- Changes in occlusion, which can occur when there is continued growth in the arch where implants have been placed as well as in the opposing arch. In this scenario, the implant position and related restorations are static, whereas the teeth are prone to move in facial and occlusal directions.
- Migration of teeth resulting in opening contact when natural teeth and dental implants coexist in the same arch. An opening of contact between the implant restoration and, most commonly, the natural tooth anterior to the implant restoration has been observed. This phenomenon occurs more frequently in the mandible, and the rate increases over time.
- Changes to anterior esthetic results occurring even after the implant has been deemed stable. Discrepancies can be observed in the incisal edge length, the gingival margin height and the facial contour alignment. Extrusion and lingual tipping of the anterior teeth and maxilla can produce all 3 discrepancies simultaneously. Thinning of the labial soft tissue over the implant and abutment has also been detected. When this process occurs and the implant restoration’s cervical gingival margin changes relative to the adjacent natural tooth, corrective actions will prove difficult.

Conclusion

It is clear that the criteria for long-term implant success should be redefined. Even after osseointegration occurs and both the implant and restoration meet the criteria for short-term success, continued craniofacial growth may compromise long-term outcomes.


In the next issue:

- Prescribing nonsteroidal anti-inflammatory drugs in oral health care
- Implants with different abutment interfaces to replace maxillary single teeth
- Maxillary fixed prosthesis design based on the preoperative physical examination
- What are the odds for future extraction of asymptomatic third molars?

Do you or your staff have any questions or comments about Report on Oral Surgery? Please call or write our office. We would be happy to hear from you.