Decoronation

Decoronation: How, Why and When?

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Abstract

Decoronation is a surgical method for treating ankylosed incisors in children and adolescents. The crown and the root filling are removed, leaving the root in situ to be resorbed and covered with a mucoperiosteal flap. Early loss of a permanent tooth leads to loss of alveolar bone, especially in buccopalatal width. Decoronation preserves not only the width of the ridge but also the vertical height.

Dental trauma is most common in children between 8 and 10 years old, during the early mixed dentition, a period of incomplete root development and dynamic jaw development. The most serious injuries are intrusion and avulsion, which damage both the pulp and the periodontal ligaments (Figures 1A through C). In cases with complete root formation, extirpation of the pulp should be performed about two weeks after replantation and the root canal dressed with calcium hydroxide before permanent root filling. In cases of incomplete root formation, pulpal revascularization is possible and endodontic treatment should be postponed until signs of inflammatory root resorption are seen.

Replacement resorption or ankylosis is due to damage to the periodontal ligament and fusion of the alveolar bone and root substance, which is continuously resorbed and replaced by bone. The condition is progressive, eventually resorbing the entire root (Figures 2A and B). To date there is no means of arresting or reversing the condition.

Providing no other changes suprervene, the ankylosed tooth can be retained until the crown falls off or removed by forceps when most of the root substance has been replaced by bone. The rate of resorption seems to vary with age and skeletal growth rate of the patient.

In children and adolescents, the ankylosis is accompanied by increasing relative infraposition of the tooth (Figures 3A and B). A slight increase in infraposition has been observed even in young adults. In patients in their late teens with limited
infraposition, the incisal edge can be built up in composite. Orthodontic extrusion is not a
treatment option, as it results in intrusion of the adjacent teeth (Figures 4A through E).

If an ankylosed tooth is left in situ, infraposition will increase. Conditions may be further
complicated by tilting of the adjacent teeth with subsequent space loss. A satisfactory
outcome may be very difficult to achieve, even with prolonged orthodontic treatment
(Figure 5). The ankylosed tooth should be removed in time to prevent these adverse
effects on the outcome of orthodontic and/or prosthetic therapy.

The Decoronation Technique

Clinical experience shows that extraction of an ankylosed tooth may involve loss of
attached bone, particularly the thin buccal plate of the maxilla (Figures 6A and B). The
decoration technique was developed to prevent such bone loss. The crown of ankylosed,
infrapositioned incisors is removed, leaving the root in the alveolus, to be replaced by
bone. In most cases an ankylosed tooth is endodontically treated. An existing root filling
should be removed before the root is covered with a mucoperiosteal flap since endodontic
sealers may cause irritation, and gutta percha filling would be an obstacle to complete
bone healing.

A mucoperiosteal flap is raised and the crown is removed with a diamond bur under
continuous saline irrigation. The root filling is removed with an endodontic file. The
coronal part of the root surface is reduced to 2 mm below the marginal bone. The empty
root canal is thoroughly rinsed with saline and thereafter allowed to fill with blood. This is
very important, as the blood clot is organized from the surrounding tissues. The
mucoperiosteal flap is drawn over the alveolus and sutured with single sutures. A blood
clot forms in the gap between the labial and palatal mucosa (Figures 7A through K).

Indications for Decoronation

When ankylosis is diagnosed, the following clinical guidelines may be applied:
* In the early mixed dentition (age 7 to 10 years): Decoronation within two years,
* In the late mixed dentition (age 10 to 12 years): Individual monitoring. If patients have
  reached the pubertal growth spurt, a rapid increase in infraposition can be expected.
Decoronation is indicated at the time of infraocclusion
* In the early permanent dentition: The increase in infraposition is sometimes slow.
Decoronation might not be necessary, but annual follow-up is important.10

Replacement of the Lost Crown After Decoronation in Growing Patients

Replacement of a lost crown in young patients in the mixed dentition may be complicated.
During eruption of the canines there is an increase in transverse intercanine width, and the
lateral incisors often change position due to apical pressure. Fixation of the replacement
tooth to the adjacent teeth should therefore be postponed until the canines are fully erupted
(Figures 8A through D).

The most common option for replacing the missing incisor is a removable acrylic partial
denture, retained by Adam's or ball clasps. Poor retention during the mixed dentition is a disadvantage. It is also important to avoid interfering with eruption of teeth in the lateral segments.

An alternative therapy during the mixed dentition is a lingual arch wire soldered to bands on the second primary molars, with a denture tooth fixed to the arch wire. To avoid a midline shift, stops should be placed on both sides of the space. Occlusal stops are also necessary to avoid pressure by the prosthetic tooth on the alveolar ridge. It is preferable to use bands on the second primary molars to avoid interference with permanent molar eruption (Figures 9A and B). Thereafter, a similar appliance fixed to molar bands can be used.9

When the canines are fully erupted or when there is no risk of interference between the lateral incisor and the canine, a pontic can be bonded to the adjacent teeth. The crown removed from the ankylosed tooth may serve as a pontic, shaped with composite material and splinted to the adjacent teeth by the acid-etch technique (Figures 10A through C). As downgrowth of the mucosa over the alveolus and formation of new marginal bone over the retained root can be expected,1 it is important to leave a space between the pontic and the gingiva, rather than cover all the lost tissue (Figures 11A through D).

**Development of the Alveolar Ridge**

At the Department of Paediatric Dentistry of the Eastmaninstitutet in Stockholm, 77 teeth were decoronated during the period following publication of the first study in 19841 up to 1997. The age of the patients at the time of trauma varied between 6 and 18 years and the age at decoronation between 10 and 22 years. Radiographs were taken immediately before and after decoronation, after six months and then annually up to 14 years. In most cases, the radiographs showed normal alveolar bone. In a few cases, remnants of the root were still present at the end of the follow-up period but did not impede subsequent insertion of implants. In patients treated with decoronation before the age of 13 years, i.e., before or during pubertal growth periods, there was an increase in vertical bone level (Figures 12A through D). The buccopalatal width of the alveolar ridge was maintained into adulthood in all patients (Figures 13A and B and 14A through D).

**Summary**

Extraction of an ankylosed tooth may involve loss of attached bone. In young patients, an uncomplicated extraction also has unfavorable sequelae. Early loss of a permanent tooth leads to loss of alveolar bone, especially the buccopalatal width. These adverse effects are circumvented by the decoronation technique, which preserves not only the width but also the vertical height of the alveolar ridge. Above all, maintaining the width of the alveolar ridge allows optimal positioning of an implant and ideal esthetic shaping of the crown.

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References


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Legends

Figure 1A. Intrusion and avulsion cause damage to both the pulp and the periodontal ligaments. This figure shows intrusion of the maxillary right central incisor in the mixed
dentition in a 10-year-old girl.
Figure 1B. Avulsion of the maxillary right central incisor in an 8-year-old boy.
Figure 1C. The avulsed tooth from 1B with an open apex.

Figure 2A. Ankylosis due to damage to the periodontal ligament in both central incisors after avulsion and replantation in a young girl. Immediately after replantation at 12 years of age.
Figure 2B. After two years. Almost total resorption of the roots with replacement by bone.

Figure 3A. Progressive infraposition of an ankylosed incisor. A 12-year-old boy with his maxillary left central incisor in slight infraposition one year after diagnosis of ankylosis.
Figure 3B. Three years later, there is considerable increase in infraposition.

Figure 4A. An unsuccessful attempt to extrude an ankylosed tooth with a fixed orthodontic appliance. Fixed appliance with an extrusion force applied to the maxillary left central incisor. The tooth is in infraposition due to ankylosis.
Figure 4B. Six months later, there is intrusion of all adjacent teeth.
Figure 4C. Relapse after treatment. Despite a composite build-up, the outcome is a failure.
Figure 4D. Radiographs at the start of extrusion.
Figure 4E. Three years later. Note obliteration of the pulp of the lateral incisor due to the trauma. The resorption at the distal root surface was caused by ectopic eruption of the canine and subsequently healed.

Figure 5. Neglect of an ankylosed incisor, showing inhibited vertical growth of the alveolar ridge in the region of the ankylosed maxillary left central incisor and tilting of the adjacent teeth.

Figure 6A. Extraction of an ankylosed tooth may cause severe bone loss. Ankylosis of the maxillary left central incisor.
Figure 6B. The extracted tooth, with attached bone.

Figure 7A. The decoronation technique. The ankylosed maxillary right central incisor.
Figure 7B. A mucoperiosteal flap is raised.
Figure 7C. The crown is removed with a diamond bur under continuous saline irrigation.
Figure 7D. The crown has been removed.
Figure 7E. The root filling is removed with an endodontic file.
Figure 7F. The coronal part of the root surface is reduced to 2 mm below the marginal bone.

Figure 7G. The empty root canal is thoroughly rinsed with saline and thereafter allowed to fill with blood.
Figure 7H. The mucoperiosteal flap is drawn over the alveolus and sutured with single sutures. A blood clot forms in the gap between the labial and palatal mucosa.
Figure 7I. The removed crown is shaped as a pontic with composite material and splinted to adjacent teeth.

Figure 7J. Before decoronation.
Figure 7K. Immediately after decoronation. (Figures 7A through K from Malmgren O, Malmgren B, Goldson L 19939).
Figure 8A. Change of position of lateral incisors during eruption of the canines. A 10-year-old boy. The lateral incisors are tipped slightly mesially.

Figure 8B. Two years later, the lateral incisors have changed position and are tipped distally due to eruption of the canines.

Figure 8C. Radiograph showing eruption of the right canine during the observation period.

Figure 8D. Another such radiograph.

Figure 9A. Fixed space maintainer in the early mixed dentition.

Figure 9B. Lingual archwire is soldered to bands on the primary second molars. Note the mesial and distal stops on the prosthetic tooth and also the occlusal stop (Figures 9A and B from Malmgren O, Malmgren B, Goldson L 19939).
Figure 10A. A removed crown shaped as a pontic and bonded to the adjacent teeth. Preparation of the pontic, lingual aspect.
Figure 10B. Pontic filled with composite, lingual aspect.
Figure 10C. Bonding to adjacent teeth. Rubber dam isolation of the field is essential.

Figure 11A. Clinical follow-up after decoronation. Downgrowth of the gingiva and formation of new marginal bone over the alveolus made it necessary to shorten the pontic one year after decoronation. At the time of decoronation.
Figure 11B. After one year, the pontic has been shortened.

Figure 11C. Radiographs immediately before and after decoronation.
Figure 11D. Radiographs six months and one year later.
Figure 12A. Development of the alveolar ridge over 13 years, after decoronation in a young girl. One year after trauma, at 9 years of age. Maxillary left central incisor ankylosed and in infraposition. Note build-up of the incisal edge.

Figure 12B. Three years later, immediately before decoronation.

Figure 12C. Immediately after decoronation. The adjacent teeth have been proclined during orthodontic treatment to prepare space for a temporary prosthesis.

Figure 12D. At the age of 21, there is an increase in vertical dimension of the marginal bone.

Figure 13A. Difference in buccopalatal width of alveolar ridge after normal extraction and decoronation. An 18-year-old patient with a concave alveolar ridge following uncomplicated conventional extraction at age 12.

Figure 13B. Patient from Figures 7 and 17, 10 years after decoronation. The alveolar ridge has a favorable width for an implant.
Figure 14A. Insertion of implant as a final solution in the same patient as in Figure 7. Insertion of implant 10 years after decoronation. A few root remnants were no impediment.
Figure 14B. Final solution.

Figure 14C. Radiograph at the time of insertion of implant.
Figure 14D. Five-year follow-up.