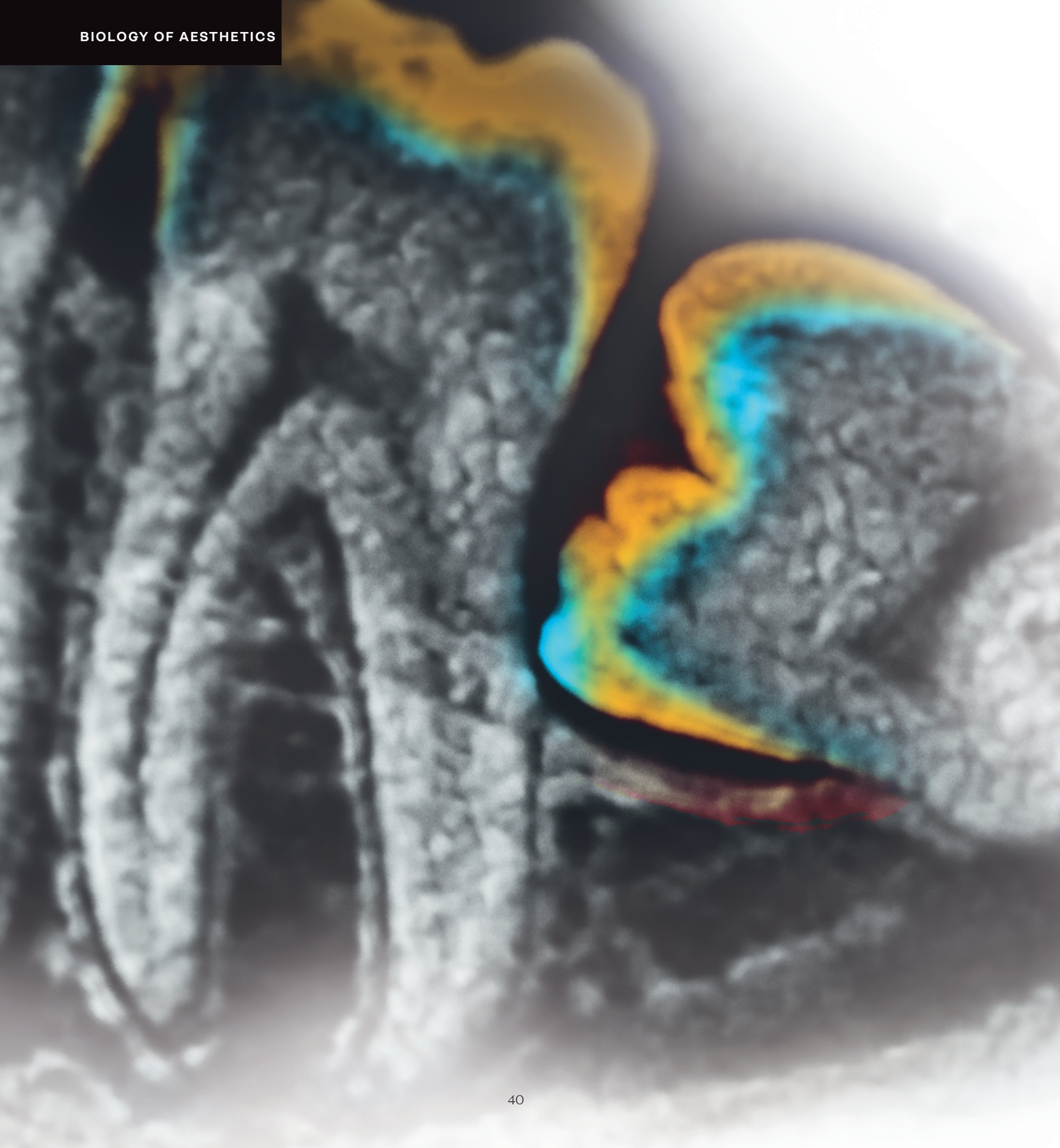

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Decoronation without and with implants: What it is and when it is used

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ABSTRACT:

Introduction: Decoronation is a therapeutic technique for use in ankylosed teeth after dental trauma, which naturally develop into tooth loss by replacement resorption, in order to avoid post-surgical sequelae. This technique can, however, also be indicated for many other clinical situations.

Description: Teeth in the process of developing alveolodental ankylosis and tooth resorption by replacement should be considered normal bone, in a full continuous and physiological process of remodeling. As a result, osseointegrated implants can successfully be applied, if necessary, as osseointegration will occur. For successful decoronation, the absence of contamination is essential, which represents its contraindication.

Final considerations: The location, angulation, and position for implant placement after decoronation must be determined by clinical convenience. This must not change the normal planning for implant placement or the criteria for choosing the type and brand of dental implant to be used.

Keywords:
Decoronation. Osseointegration. Dental implants. Alveolodental ankylosis. Replacement resorption of the teeth.

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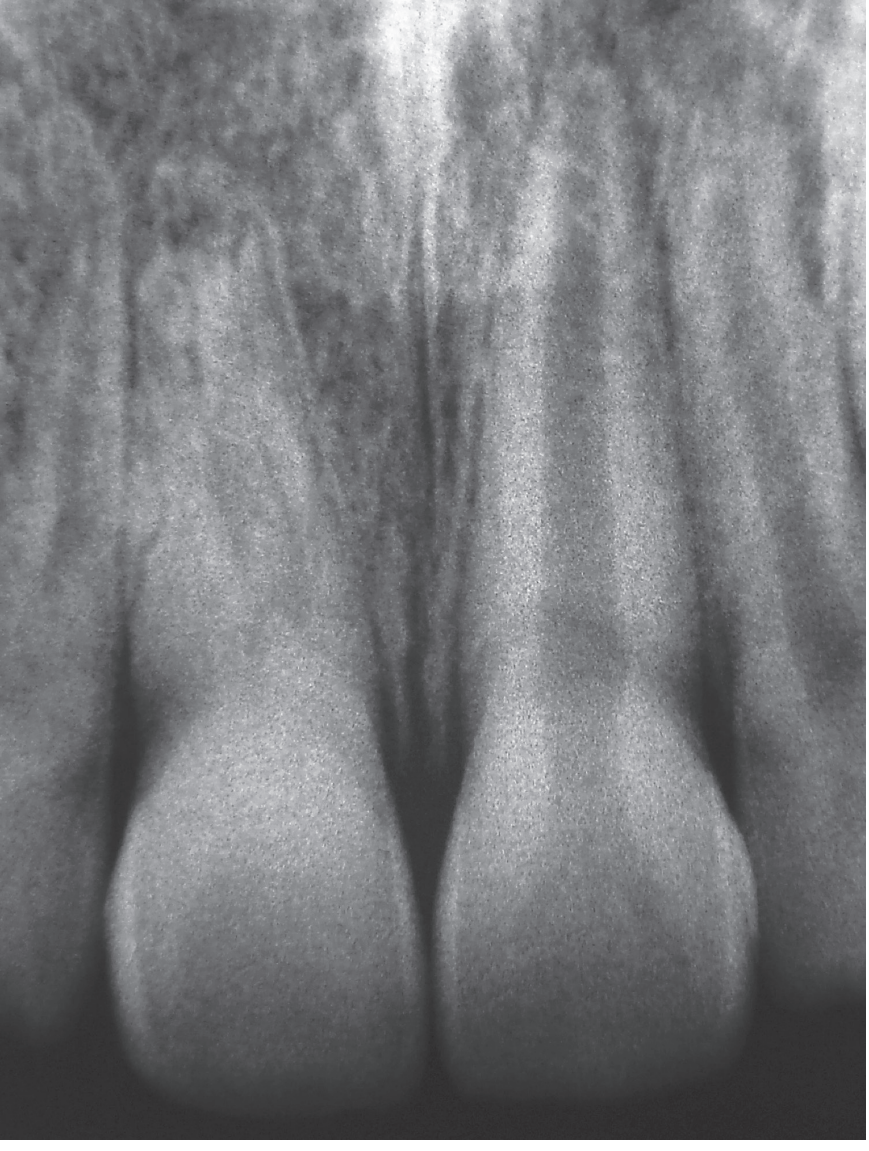
Decoronation is the most contemporary and efficient treatment for restoring function and esthetics in cases of teeth with alveolodental ankylosis and tooth loss by replacement resorption[1,2] (Fig 1). To this date, unfortunately, there is no way to reverse or delay the development of this condition, as has previously been reported.[1-5]

Decoronation is a therapeutic technique, described in 1984, for the management of ankylosed teeth after dental trauma, which naturally develop into tooth loss by replacement resorption.[6] When referring to traumatized teeth, these are included in all conditions ranging from teeth subjected to concussion through to those that have been reimplanted and transplanted.

WHY DOES ALVEOLODENTAL ANKYLOSIS OCCUR?

For alveolodental ankylosis to occur and the bone to unite with the tooth, it is necessary to destroy the epithelial cell network of Malassez, formed by islets and cords of cells known as epithelial rests of Malassez, whose three-dimensional conformation in the periodontal ligament resembles a basketball hoop.[7]

The epithelial rests of Malassez continuously secrete the mediator EGF, or Epithelial Growth Factor, which diffuses throughout the ligament and



↑ **Figure 1:** Typical case of alveolodental ankylosis and loss of tooth #11 by replacement resorption, indicated for the decoronation procedure, followed by the placement of an osseointegrated implant.

is found on bone cells with specific receptors[7,8] that induce resorption on the surface of the periodontal ligament adjacent to the alveolar bone.

On the root surface, EGF does not act on cementoblasts, which do not have specific EFG receptors and other mediators of bone resorption and, therefore, do not promote external tooth resorption under normal conditions.

The epithelial rests of Malassez are only eliminated or become necrotic due to dental trauma, in isolated points of the periodontal ligament and, occasionally, in larger segments. When bone cells find cementum and dentin, they do not distinguish them from trabeculae and cortical bone, and continue with their saga of bone remodeling, to adapt the bone to the immediate and necessary functional requirements or demands.[9]

In normal teeth without ankylosis, bone remodeling does not involve the teeth: 1) due to the protection offered by the epithelial rests of Malassez and the EFG released; and 2) by covering the roots with cementoblasts, without specific surface receptors that would allow them to interact or "listen" to the mediators that command bone remodeling.

The Epithelial Rests of Malassez is the "Guardian of Periodontal Space", and cementoblasts are the "Protectors of the Root Surface". Once these two protective structures are eliminated by dental trauma, the bone will include the teeth in the bone remodeling process and will intrude into the root structure. Orthodontic treatment and occlusal trauma do not eliminate the Epithelial Rests of Malassez.

Radiographs will reveal the presence of ankylosis only if 20% or more of the root surface affected comes into contact with the bone.[1,7] If there is less than 20%, alveolodental ankylosis will not yet generate imaging signs. Alveolodental ankylosis and replacement resorption can be diagnosed on well-obtained and properly interpreted CT images.

WHY PERFORM THE DECORATION?

Extraction of ankylosed teeth and replacement resorption of the teeth promote a much higher level of post-surgical alveolar bone loss than the extraction of teeth with preserved periodontal ligament.[2,10]

This greater bone loss makes it difficult to restore the esthetics and function in the region, due to the sequelae arising from the loss of vertical and/or horizontal volume of the alveolar process. Correction of these sequelae usually requires soft and hard tissue grafts and, in these cases, surgical procedures and materials require an extended waiting time and additional costs.[11,12]

Decoronation was developed as a more suitable treatment than extraction of ankylosed teeth and those with replacement resorption, to circumvent undesirable effects.[6] Decoronation is coronectomy of the ankylosed tooth with replacement resorption performed 2 mm below the level of the cementoenamel junction (Fig 2). The tooth affected will tend to disappear in a period of 1 to 10 years after the procedure.[13]

DECORATION: RELEVANT TECHNICAL ASPECTS

Extraction of ankylosed teeth leads to bone loss of the bone united and fused to the root, more particularly to the thin buccal cortical of the maxilla. Decoronation was developed by Malmgren et al.,[6] in 1984, to overcome this undesirable effect. In incisors, the crown of the ankylosed tooth that is usually infrapositioned, is removed, leaving the root in the alveoli, and this will be replaced by bone (Fig 2).

In the majority of cases, ankylosed teeth with replacement resorption are have been endodontically treated. If obturation of the canal has been performed, it must be removed before the root is covered with a mucoperiosteal flap over the opening of the alveolus, as some endodontic

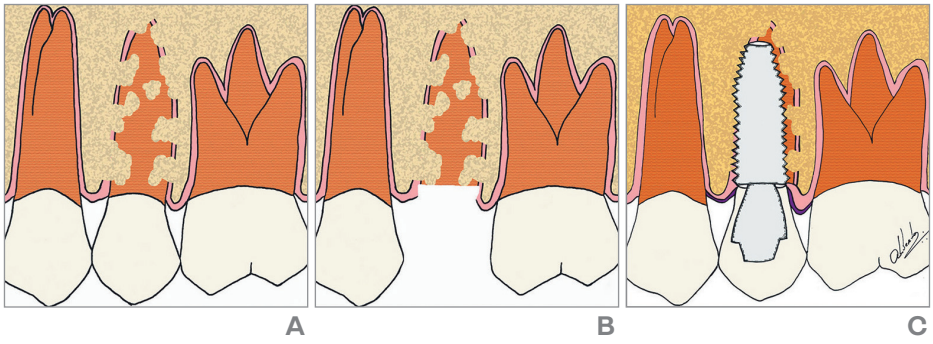


Figure 2: Schematic diagram of a premolar decoronation (**A**); with tooth loss by replacement resorption (**B**); followed by placement of an osseointegrated implant with immediate loading (**C**).

".....taking periodontal care of the gingiva is essential for improved esthetic and functional results."

obturators such as gutta-percha can cause aggression and can induce a foreign body type of granuloma that would be an obstacle to complete bone and mucosal repair.

A mucoperiosteal flap is made to cover the crown that was removed with a diamond bur under continuous irrigation. The filling material is removed with an endodontic instrument that is more appropriate for this purpose. The coronal part of the root is then reduced to a point 2 mm below the marginal bone.

The entrance of the canal from which the filling was removed is irrigated with saline solution and filled with blood. This is very important, because the clot helps to repair the surrounding tissues. The flap that covers the opening of the alveolus must be sutured in such a way, so that it closes the access to the oral environment, in order to avoid secondary contamination of the area as far as possible.

In cases of teeth with vital pulp, the pulp must be sectioned with sharp curettes, in the same way as it is done in pulpotomies, and its surface covered with clot to promote local repair. In general, irregular cemento-dentinal tissue is formed, and will cover the exposed part of the pulp.

If the case has been indicated and/or has the option for implant placement right after decoronation, it is not necessary to worry about obtaining a mucoperiosteal flap to close the opening of the alveolus. There will be a choice of the area where the implant will be placed and the rotary instrument to prepare the cavity for it.

At this time, the set of root remnant and the bone to receive the implant should be considered the only bone. There will be a difference between the root remnant and the bone, in terms of resistance to the action of the instrument, which must be skilfully overcome, because cracks or small displacements may occur, which can be ignored and the implant can be fixed with the provisional crown able to receive immediate loading, according to the usual criteria for placing an implant. If it is not possible for the implant to receive immediate loading, it will be submerged, to await osseointegration, within the usual and expected standards for an area with bone without a tooth.

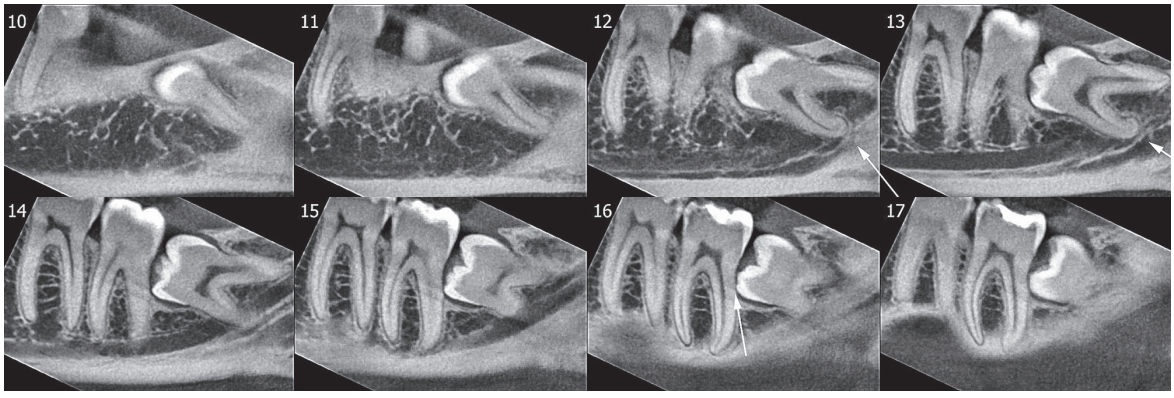
To enhance the decoronation technique followed by implant placement, with or without immediate loading, taking periodontal care of the gingiva is essential for improved esthetic and functional results.

THE CONCEPTUAL EVOLUTION OF DECORONATION AS A THERAPEUTIC TECHNIQUE WITHOUT DENTAL IMPLANT PLACEMENT

Decoronation was developed at a time when dental implants were not yet a clinical option. The aim was exclusively to prevent ankylosed tooth extractions from leaving post-surgical sequelae that would make it difficult to perform prosthetically restoration. At the time, pontics and other older rehabilitation devices were still being used.

After this initial concept, decoronation was extended to similar procedures, also represented by coronectomies of selected teeth (Fig 3). There is a list of indications for decoronation without implants:

- Teeth with alveolodental ankylosis and replacement resorption.
- Very severe lacerations, almost axial, in teeth to be extracted.
- Teeth indicated for extraction, which had roots that were very close to each other or that structurally involved the inferior alveolar nerve.
- Accentuated hypercementosis in teeth indicated for extraction.
- Teeth with roots that are very close or located within the maxillary sinus.
- Unerupted teeth in close proximity and resorption of neighboring teeth, but their total extraction could leave important post-surgical sequelae in the region (Fig 3). This can occur with normal teeth such as unerupted canines, partially erupted third molars, and supernumerary teeth.
- Surgical removal of teeth that would make the alveolar process even more



↑ **Figure 3:** Indication for decoronation of tooth #38, with incipient external inflammatory resorption in the distal part of tooth #37, due to the relationship with the pericoronal follicular tissues, due to the extremely close relationship of its roots with the mandibular canal and the inferior alveolar nerve.

"Placing dental implants in sites with tooth loss by replacement resorption has no biologic or clinical bad consequences for osseointegration, and so they osseointegrate normally"

atrophic and irregular and would make it difficult to establish the prognosis of prostheses and implants. In this case, the roots are purposely submerged to preserve the height and width of the alveolar process. Curiously enough, this process was also called "buried roots", and it was more frequent, especially when only the mandibular incisors remained in the arch.

THE DESTINATION OF ROOTS WITHOUT ANKYLOSIS THAT HAVE BEEN BURIED IN BONE, IN DECORONATION WITHOUT IMPLANTS

In cases of ankylosed teeth with replacement resorption, in a few months or a few years, the region will habitually have trabecular bone that should be considered normal from a surgical, implant and orthodontic point of view. On the bone, the oral mucosa will appear to be normal.

Relative to the roots of non-ankylosed teeth that have now been buried:

- They can repair themselves with fibrous tissue in the area of the cut and remain there for long years or a lifetime, without causing problems per se.
- On the live and cut pulp, there will be formation of fibrous tissue or the formation of irregular dentin tissue, as occurs in cases of pulpotomies.[8,9]
- The surgical decoronation procedure is a dental trauma and, in general, in a few months or years, the roots become ankylosed with tooth loss by replacement resorption and disappear completely after being buried for a few years.
- Very rarely, will aseptic necrotic pulp and its necrotic material induce a discrete periapical lesion, identified in routine and control examinations. In general, this pulp had been infected or improperly manipulated at the time of the surgical procedure.

THE CONCEPTUAL DEVELOPMENT OF DECORONATION WITH DENTAL IMPLANTS: HOW DID THIS OCCUR?

Decoronation has not been extensively explored, and the majority of clinicians are not aware of this possibility either with or without the placement of osseointegrated implants.[13]

The immediate placement of implants after decoronation favors maintenance of the bone and soft tissue volume, in the vertical and horizontal directions, favoring the adequate restoration of esthetics and function. The same occurs if implants are placed late[14-20] at the time of decoration. This procedure that favors aesthetics and function should be emphasized when decoronation is performed without the placement of implants[19-24] and, even more so, when immediate or late implants are placed.

Alveolodental ankylosis makes the bone come into contact with and includes the tooth in the context of the bone in such a way that it could be said that the bone cells tended to recognize an ankylosed tooth as a mineralized part of the bone and included it in their physiology.

In constant process of remodeling and reformatting, the bone and ankylosed tooth will be resorbed and, in their place, new trabeculae and medullary spaces will be formed. In a few years, there will no longer be signs of dentin, cementum, and enamel at the site, as they will have been resorbed and replaced by bone.

Inevitably, it must be considered that an ankylosed tooth is bone, because sooner or later it will all be replaced by the bony parts. Hence this tooth resorption that occurs subsequently to an ankylosis is termed tooth loss by replacement resorption.

In the same way as osseointegrated implants are inert and are considered by bone as being part of it, when inserted into the context of bone, bone also does this with ankylosed teeth. Placing dental implants in sites with tooth loss by replacement resorption has no biologic or clinical bad consequences for osseointegration, and so they osseointegrate normally.

As remodeling and reformatting takes place, dentin and cement will gradually be replaced by bone and, at the osseointegration interface, there will not even be any traces of them. The pulp and its components are incorporated and undergo gradual metaplasia into bone marrow tissue.

ESSENTIAL CONDITION FOR SUCCESSFUL DECORATION IS THERE A CONTRAINDICATION?

For successful decoration procedures with or without implants, the absence of microbial contamination on the region is essential. Inflammatory pain and purulent processes, such as pulpitis, abscesses and osteomyelites, depend on the interaction of bacteria with neutrophils that will inevitably reach the site, and precede the repair.

If neutrophils encounter no bacteria within the first 24-48 hours, they migrate or undergo apoptosis at the site and give way to the peri-implant bone repair process known as osseointegration. The purulent exudate results exclusively from the interaction between staphylococcal and streptococcal bacteria with neutrophil-type leukocytes.[9]

When cutting the crown of a healthy tooth in a location free from bacteria, it tends to repair itself as it does in pulpotomies and biopulpectomies. Pain and purulent exudate only occur when bacteria are present. If the pulp is alive and the environment is free of bacteria, the prognosis is very good. If endodontic treatment has been performed without contamination, the filling material can be removed before placing the implant or during the surgical procedure for its placement.

Therefore, decoronation, with or without implants, is contraindicated if the teeth are contaminated with dentin caries in dentin pulp necrosis, fistulas, infected canals, chronic periapical lesions, and active periodontal disease with presence of calculi, and teeth with pericoronitis and old unconsolidated root fractures. As a foundation stone of the concept and clinical application of decoration, the site where it is performed must be free of microbial life!

FINAL CONSIDERATIONS

1. Decoronation is a therapeutic technique, described in 1984, for ankylosed teeth after dental trauma that naturally develop into tooth loss by replacement resorption.[6]
2. Not all indications for decoronation are followed by placement of osseointegrated implants. Other situations described can be resolved with decoronation, without implants, avoiding sequelae and undesirable post-surgical consequences.
3. Placement of osseointegrated implants in decoronated areas is a technological development of this form of treatment, which was initially planned for maintaining the volume of areas that would be surgically operated and would have undesirable sequelae, which would make it more difficult to perform the esthetic and functional rehabilitation.
4. Decoronation should not be performed at sites where there is microbial contamination, which is a contraindication for the procedure.
5. The technical procedures for the placement of osseointegrated implants after decoronation are subtly adaptable and overcome with technical mastery by the professional, which can rapidly be achieved.

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