Decoronation: A treatment option for teeth avulsed - Case report

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ABSTRACT
Dental replantation is the first treatment option after dental avulsion. However, avulsed teeth often develop root resorption or ankylosis after replantation caused by the absence of the vital periodontal ligament on the root surface and inadequate tooth storage for the first 60 minutes. Trauma patients may have associated a history of malocclusion requiring treatment. When dealing with young patients, one option is the decoronation technique, where the tooth is sectioned at the level of the neck (the crown is removed and the root is left in the sockets) with the aim of supporting the bone, avoiding bone grafting in the future for the placement of dental implants. Thus, this study aims to review the literature on the subject and report a clinical case involving dental avulsion and decoronation and orthodontic and prosthetic treatment.

Keywords: Dental avulsion, Dental replantation, Root resorption, Dental ankylosis, Decoronation.

1 INTRODUCTION

Dental trauma is an emergency that must be treated promptly and correctly to reduce suffering, costs, and time for patients (1). There are several clinical protocols that aim to preserve dental structures in situations of dental trauma. Specifically for avulsed teeth, dental replantation is considered the first choice of treatment, although its success depends on many factors and the long-term prognosis is uncertain (2,3). Conservation of the periodontal ligament is essential for successful treatment (4). When the tooth is kept in the extraoral environment for more than 60 minutes, resorption or ankylosis often occurs after replantation, due to the loss of vitality of the periodontal ligament (5,6). After replantation, the patient is submitted to a therapy that involves endodontic treatment, restorations, and clinical follow-up with radiographs (3).

Treatment with dental replantation is very sensitive and susceptible to the time exposed to the extraoral environment and to the storage mode(7,8). Therefore, cases of dental replantation after trauma should be preserved. This monitoring is used in order to evaluate the occasional occurrences of root resorption and ankylosis that may hinder the procedure(5). Root resorption is progressive and

depends on the patient's age (9) and root size (10). Ankylosis is considered a very serious sequelae that leads to infraocclusion and defects in bone tissue that are difficult to correct, which is a concern, especially in children and adolescents who are in a phase of maxillomandibular bone growth (11). In these cases, the consequence is the loss of reimplanted teeth. Thus, it is important to consider other alternatives that preserve aesthetics, chewing, speech and promote the maintenance of space.

The decoronarization process is a viable alternative to avoid tooth extraction, with the advantages of avoiding resorption of the alveolar bone and, consequently, avoiding the need for future bone grafts. Decoronarization is indicated for ankylosed and infrapositioned permanent teeth. The procedure is characterized by the section of the tooth at the cervical level, with the crown being removed and the root left in the alveoli in order to minimize bone resorption. The mucoperiosteal flap is sutured after the root is buried(11,6).

The manufacture of removable orthodontic prostheses or appliances with provisional acrylic anterior teeth is preferred for the rehabilitation of young patients who have lost anterior teeth, as implants are contraindicated in growing patients.

The objective of this study is to review the literature on the subject, as well as to report a clinical case of decoronation.

2 CASE REPORT

A 17-year-old female patient was referred by her general dentist for orthodontic treatment.

In his dental history it was reported that at the age of 12 he suffered dental trauma with avulsion of elements 11, 21,22 and 23 after a fall from a bicycle. In less than an hour after the trauma, the patient was taken to a dental office where a dental surgeon reimplanted the avulsed teeth, splinting with polycarbonate and resin wire, and suturing the macerated soft tissues was performed by a dental surgeon.

The splint was removed after one month of restraint with prescription mouthwash with 0.2% chlorhexidine digluconate every 6 hours for 2 weeks. Endodontic treatment of the avulsed teeth was performed.

Follow-up was performed every eight months with clinical examinations and periapical radiographs of the traumatized region. However, after one year of follow-up of the case, infraocclusion of element 23 was noted, suggesting its ankylosis. The decision was made to wait for tooth development, leaving to act as late as possible in relation to occlusion in case there was a need for intervention. Then, 3 years after the trauma, the beginning of cervical resorption in elements 11, 21 and 22 was radiographically observed.

Tooth preservation was maintained for another two years when the patient returned to the dental office reporting mobility of teeth 11 and 21 and was referred to the orthodontist who requested complete orthodontic documentation (Figure 1, 2, 3, 4, 5 and 6).

3 DIAGNOSIS

Facial analysis revealed a convex profile, dolichofacial pattern, absence of passive lip sealing, and exposure of 95% of the maxillary incisors (Figure 1). The lower facial third was enlarged in relation to the other facial thirds.

In the intraoral analysis, it was found that the patient had complete permanent dentition. A relationship of class I molars was verified: right and left sides, right canine in class I and left with a tendency to class II and in infraocclusion (Figures 2 and 3).

Radiographically, it was found that there was the presence of germs of elements 28, 38 and 48. Periapical radiographs showed endodontic treatment of elements 11, 21, 22 and 23, as well as advanced cervical resorption in elements 11, 21 and 22 (Figures 4, 5 and 6).

Fig 1. Initial Facial Photographs

Fig. 2 Intraoral frontal view

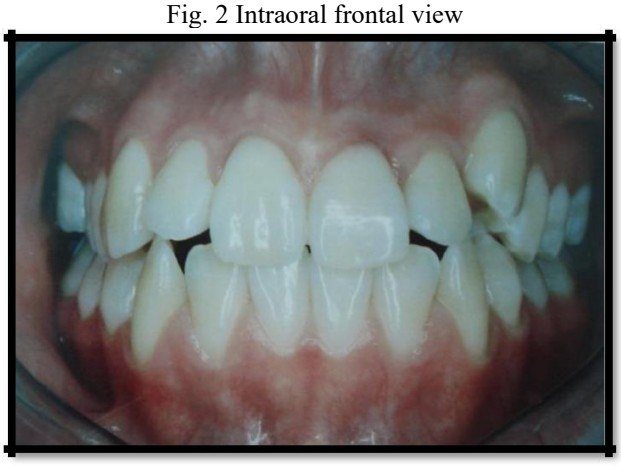

Fig 3. Right and left intraoral lateral view.

Fig. 4- Periapical radiographs of the anterior region.

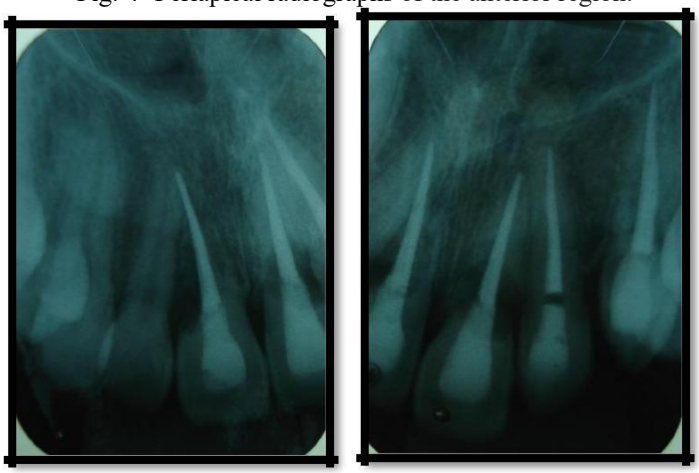

Fig. 5 - Initial panoramic radiograph.

Fig 6 - Initial lateral teleradiography.

4 DIAGNOSIS

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Cephalometrically, a Class I skeletal pattern was observed, with convex profile, with upper and lower incisors projected and proclinated (Table I and Figure 7).

Fig. 7 - Initial cephalometric tracing.

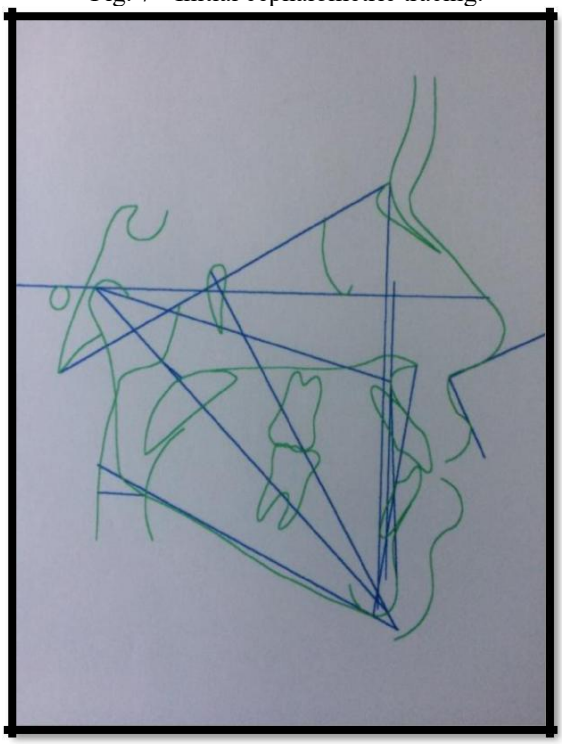

Table I – Initial cephalometric data.

	Norm	Patient's initial
SNA	82nd	81st
SNB	80th	80th
ANB	2nd	First
1.NA	22nd	33rd
1-NA	4mm	10mm
1.NB	25th	27th
1-NB	4mm	7mm
1/1	131st	120th
FMA	25th	27th
IMF	68th	65th
IMPA	87th	87th

In the analysis of models, there was a discrepancy between models with 4 mm negative in the lower arch and 3 mm negative in the upper arch.

5 TREATMENT

The proposed treatment was upper and lower fixed appliances with extraction of elements 14, 23, 34 and 44 to correct the biprotrusion, and insertion of natural provisional elements in the region of 11, 21 and 22 until the end of the orthodontic treatment with future installation of implants and dental prostheses in this region.

In order to correct the dental malocclusion presented, as well as to solve the problem of cervical resorption, the decoronarization technique was recommended in order to preserve the vestibular bone of this region for future dental implants of elements 11, 21 and 22. The patient was informed that the implants could only be performed after the end of bone growth so that there would be no damage to the aesthetics of the upper anterior prostheses in the future.

After the banding in elements 16 and 26, decoronarization was performed. Then, the crowns of the teeth were cleaned to be included in the orthodontic appliance, which was glued to the upper arch at the same appointment (.022" roth slot prescription), in order to preserve the patient's aesthetics and speech (Figure 8,9,10).

Fig.8 - Frontal intraoral view with fixed orthodontic appliances including the crowns of the patient's incisors.

Fig. 9 - Right and left lateral intraoral view, with fixed orthodontic appliances including the patient's natural incisor crowns.

Fig. 11 - Panoramic radiography 4 months after decoronarization.

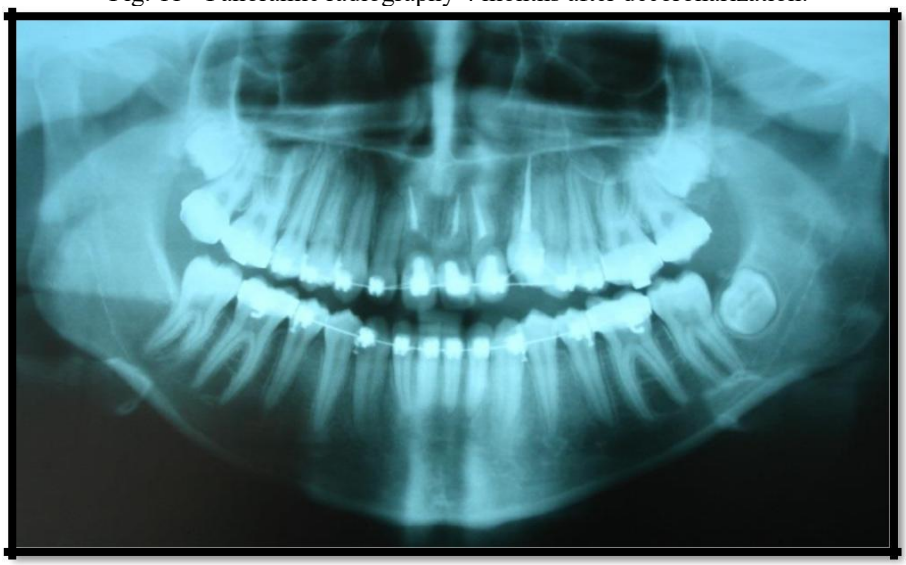

Fig. 12 - Periapical radiograph of the anterior region after decoronarization.

The treatment continued with bonding of the fixed appliance in the lower arch.

Four months after the surgical procedure and the beginning of orthodontic treatment, panoramic and periapical radiographs of the anterior region were requested (Figures 11 and 12) to preserve the tissues surrounding the tooth roots.

During the treatment, a sequence of orthodontic archwires were installed for alignment and leveling in sequence (0.014" of Niti, 0.016", 0.018", 0.020" of stainless steel) in the upper and lower arches. These arches were used for both the upper and lower arches.

The moment of tooth extraction (14, 23, 34 and 44) occurred when the 0.18' stainless steel archwire was used in order to start the retraction of the canines (13, 33 and 43) 14 days after surgery, to start the retraction of elements 13, 33 and 43, with elastic chain.

Afterwards, 0.19' x 0.25' retraction archwires were made, with a 5 mm high loop in the region between lateral incisors and canines, with the purpose of closing spaces by sliding.

Remembering that at each arch change, the natural crowns of the missing elements in the anterior region (11, 12 and 22) were tied to the arch and conjugated with 0.010" tie wire and tied with 0.10' tie wire (tietogether) so that there would be stability for these teeth during speech and chewing.

Orthodontic completion was performed with a .019' x .025' stainless steel archwire, and, as the patient presented complete bone growth, seen through overlapping lateral radiographs, it was sent to the implantologist, who installed the implants of teeth 11, 21 and 22 (Figure 13).

The patient was waited 4 months after the insertion of the implants with orthodontic appliances. Soon after, the appliance was removed, the necessary orthodontic retainers were performed (upper wraparound and lower 3-3 bar) and the patient was referred to the dental prosthesis specialist for the preparation of the definitive prosthetic dental elements (Figures 13, 14, 15, 16, 17 and 18).

The total duration of orthodontic treatment was 32 months.

Fig. 13 - Postoperative moment of implant installation of elements 11, 21 and 22.

Fig. 14 - Intraoral frontal view after the installation of the definitive crowns.

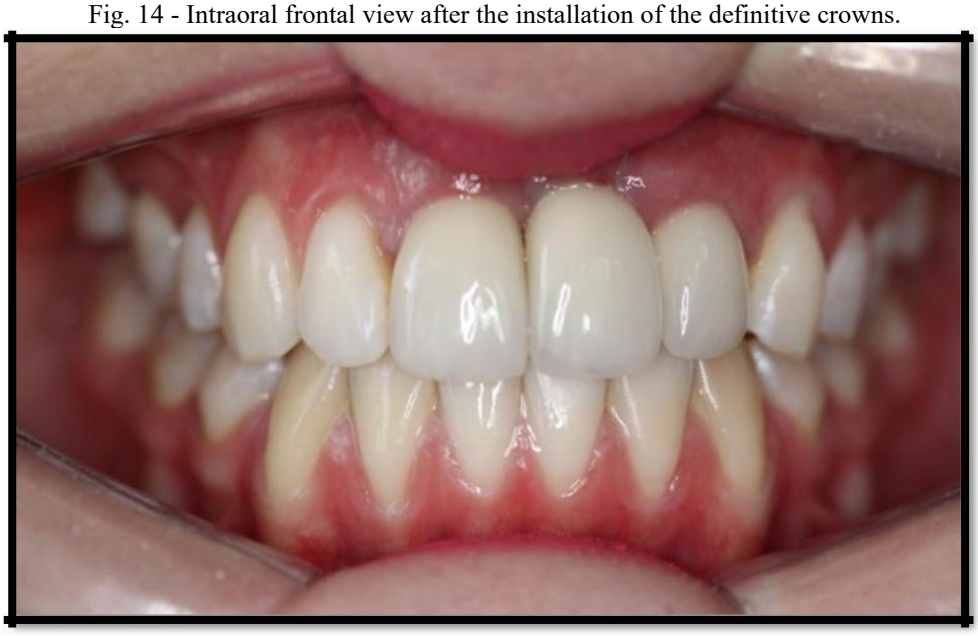

Fig. 15 - Lateral intraoral view, right and left side after orthodontic completion.

Fig. 16 – Final panorama.

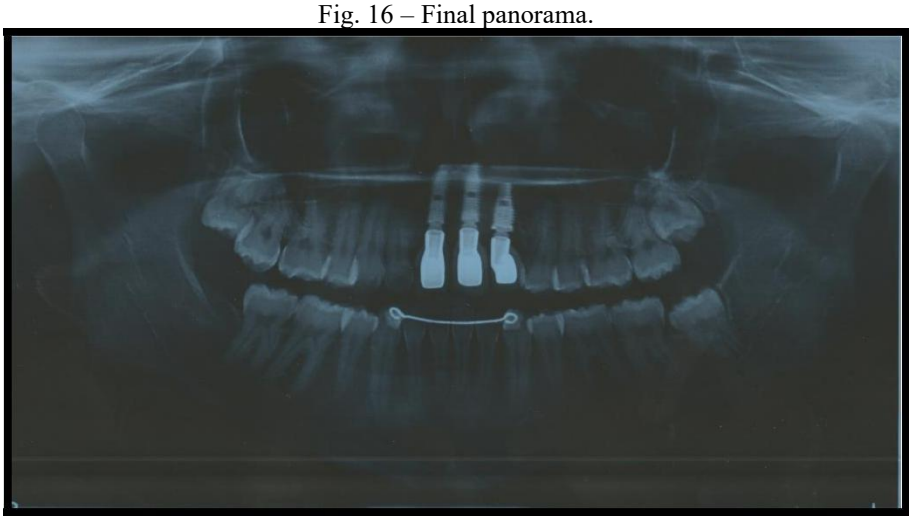

Fig 17- Final lateral teleradiography.

Fig. 18- Final cephalometric tracing.

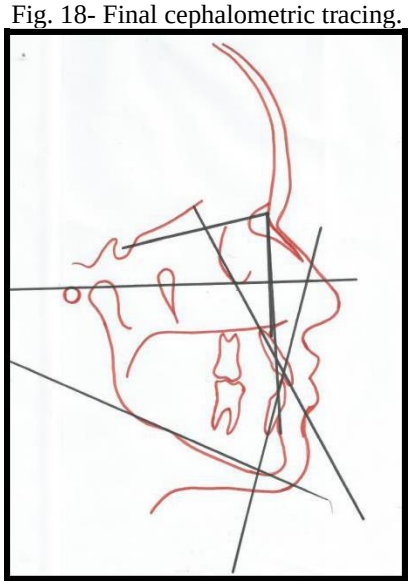

Table II – Final cephalometric data.

	Norm	Patient's Ending
SNA	82nd	82nd
SNB	80th	81st
ANB	2nd	First
1.NA	22nd	28th
1-NA	4mm	8 mm
1.NB	25th	19th
1-NB	4mm	4mm
1/1	131st	133rd
FMA	25th	27th
IMF	68th	72nd
IMPA	87th	81st

Fig. 19- a) Post-treatment frontal view b) Front view smiling post treatment c) Lateral view of post-treatment profile.

Fig. 20- Close-up view of the patient's smile after treatment.

At the end of the treatment, it was observed that the patient had an aesthetically pleasing facial profile with the presence of passive lip sealing (Figure 19 a, b and c). In the intraoral analysis, a good posterior intercuspation (molar and canine class I) and a good incisor interrelationship (overjet and overbite of 2 mm) were established (Figure 14,15).

The maxillary first premolar performed the function of the upper canine on the left side. Both arcades were well aligned and level.

The total duration of orthodontic treatment was 32 months.

The patient was very satisfied with the outcome of the treatment (Figure 19.20).

6 DISCUSSION

Dental trauma are emergencies that must be treated promptly and correctly in order to reduce suffering, costs, and time for patients (1). There are a number of clinical protocols that aim to preserve

dental structures in situations of dental trauma. Specifically for avulsed teeth, dental replantation is considered the first choice of treatment, although its success depends on many factors and the long-term prognosis is uncertain (2,3).

In the reported case, dental replantation was performed soon after tooth avulsion. When the time is less than 60 min, there is a greater probability of success in the case of dental replantation (15, 6,3). This time is almost guaranteed that the tooth will undergo ankylosis (3,17).

Element 23 ankylosis, in the case reported here, was diagnosed during follow-up, 12 months after the trauma, due to its infra-occlusal position in the arch. Andreasen (2012) suggests that preservation should be carried out over a period of 4 weeks, 3 months, 6 months, 1 year and then annually, through clinical and radiographic examinations. (18)

Another sequelae found during preservation was tooth resorption of elements 11, 21 and 22. According to Soares *et al.,* (2008), approximately 63% of the reimplanted teeth analyzed in their sample underwent root resorption, corroborating the result found. (12)

The treatment proposed for the patient was the extraction of the resorbed and ankylosed teeth, as they already had a certain degree of cervical dental resorption and could not be used during the orthodontic treatment.

Ankylosis in young patients with growth can have a negative effect on the patient's aesthetics. The recommended treatment is tooth extraction (10, 11, 13,14), but it may be accompanied by removal of part of the alveolar bone, especially when the removed elements are in the maxilla region with a thin bone board (15, 6).

In this case, the elements reabsorbed by the decoronarization technique were first removed. This is justified by the fact that these teeth are in the anterior region of the maxilla where the removal of the bone crest affects aesthetics, causes bone deformities and difficulty in achieving the ideal prosthetic treatment (3, 15)

This technique is easy to perform (19), has predictable success rates, and assists in the favorable growth of the alveolar ridge (20). It consists of the removal of part of the crown and instrumentation of the pulp duct to stimulate bleeding, and is suggested as a more conservative approach to bone preservation until implants are placed (14).

The timing of decoronarization is important and should be planned taking into account the patient's age, growth pattern and intensity(15,20). The option of performing dental transplantation and the presence of an overjet of less than 2 mm are exclusionary factors for cases where this decoronarization technique is indicated(11).

Its primary purpose is to maintain marginal bone in young growing patients, and by preserving the root in the alveolar bone, it helps stimulate vertical bone growth (6). Thus, the bone is maintained

by the presence of the root for the placement of future implants, and in this case the need for larger bone grafts was avoided. In this case, no bone graft was performed.

The emotional and psychological impact on the behavior of children and adolescents after dental trauma changes their quality of life, demanding aesthetic and functional rehabilitation in order to ensure the patient's reintegration into their normal life. (21) In the present case, the crowns of the resorbed teeth were included in the orthodontic appliance, in order to preserve the patient's aesthetics and speech.

Temporary rehabilitation was performed during the transitional period that the patient would be without teeth, it can also be performed with removable retainers and with artificial teeth, which would make use difficult. (22) However, temporary rehabilitation is more easily tolerated and better preserves aesthetics when teeth with the same shape, color, size, and alignment are used as neighboring teeth(11,16), justifying the use of natural crowns suspended by orthodontic appliances.

The treatment of anterior tooth avulsion in young, growing patients is a challenge for the dentist, as its treatment must be performed in an interdisciplinary manner because it requires prosthetic and orthodontic treatment, and subsequent implant placement(22).

According to Malmgren et al.2001, the *waiting time for orthodontic treatment in patients who have suffered moderate or severe trauma (dislocation, extrusion, intrusion, avulsion) is one year*(18). In this case, we report a patient in whom the sequelae of avulsion appeared after a few years of trauma, which justifies the need to preserve dental trauma during childhood and adolescence.

Decoronarization was efficient for the maintenance of the bone ridge during bone growth, however, there was a need for a graft so that there was an adequate and sufficient ridge to support the implant. There would probably have been greater bone loss if the roots of the teeth had not been kept in the anterior region of the bony ridge of the upper arch.

7 CONCLUSION

According to the clinical case presented, it was found that it is possible to perform orthodontic treatment with rehabilitative functions where there is a need for the interaction of several specialties such as general practice, endodontics, implantology, dental prosthesis and orthodontics for the case to be successful. Decoronarization proved to be an appropriate technique for the case. However, the choice of the best treatment for each case should be a reflection of adequate clinical evaluation and scientific knowledge of what can be done to solve each specific case.

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