

# Dental reimplantation in dentoalveolar fracture: Description of a case

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## Summary

**Introduction:** Dentoalveolar fractures are injuries that affect the dental organs, bone and supporting tissue of the dental organ (periodontium), caused by accidental blows in sports, falls, etc. Although they do not compromise people's lives, they affect occlusion, masticatory function, and the psychology of the individual is also affected by the loss of teeth. The term avulsion refers to the total dislocation that involves the displacement of the tooth, out of the socket. Dental reimplantation is the procedure that consists of inserting the tooth that has been displaced, in its own place in the socket. The incidence of trauma in permanent teeth has been reported between 7 and 19%. Dental avulsion represents 5.6% of injuries to permanent teeth, being the maxillary central incisors the most frequently affected.

**Objective:** To present the "Araña Garza-Lain" semi-rigid intermaxillary fixation technique, used to keep the teeth displaced and avulsed within the socket.

**Main data of the case:** A 19-year-old female patient was presented to the Oral and Maxillofacial Surgery service with a history of frontal blow by car accident. Intraorally presented a dentoalveolar fracture, with displacement of the dental organs 1.2, 1.1, 2.1, 2.2, 2.3, 4.2, 4.1, 3.1, 3.2 and avulsion of 1.3. Semi-rigid intermaxillary fixation with ligature wire was performed using the "Araña Garza-Lain" technique and subsequent treatment of root canals of affected dental organs.

**Conclusion:** Because the time factor is vital for the preservation of dental organs, it is important and necessary to carry out immediate treatment with instruments that are available to keep the dental organs in their intraoral position.

**Keywords:** dental reimplantation, avulsion, semi-rigid intermaxillary fixation technique "araña garza-lain", dentoalveolar fracture

## Intraduction

Dental avulsion can be caused by traumas, accidents or sports practice, among others. Carrying out a treatment in time for the replacement of the teeth (reduction) and the preservation of the remaining tissues of the periodontal ligament to have a good evolution and success are very important. Therefore, a case is presented where, with simple wiring and inventiveness, the removal of the tooth from the socket was avoided, thanks to the "Araña Garza-Lain" wiring. It should be taken in consideration that in Mexico the Traumatology hospitals do not have the instruments or dental material for the treatment of this type of injuries, therefore this technique was developed to be able to provide the proper treatment to the patients with these types of injuries. Endodontics were performed after a month and a half, because the dental organ was left under observation; and since there was no alteration, it was performed at the end of the intermaxillary fixation period.

The incidence of trauma in permanent dental organs has been reported between 7 and 19%. Dental avulsion accounts for 5.6% of the permanent dental organs traumatized. Where the maxillary central incisors are the most frequent and the damage is observed in children between 7 and 9 years of age.<sup>1-5</sup>

Endodontic treatment of avulsed teeth will depend on the degree of root development and the time it remains outside the socket.<sup>6-8</sup> If loss of vitality is detected, open or closed apex the cameral and root pulp is removed, the canal cleaned and filled with calcium hydroxide. This drug will benefit evolution, given its osteogenic potential, alkaline pH and also because it is bactericidal, when the tooth has a closed apex and the time outside the mouth is greater than 2 hours. Endodontics can be performed both intra- and extra-orally with special attention not to manually or chemically damage the root surface.<sup>5,6,9-12</sup>

The contraindications to perform dental reimplantation according to Rosenblatt et al, 2010 are:

- 1) Have a deep or extensive cavity.
- 2) Presence of advanced periodontal disease.
- 3) Large comminution or multiple alveolar fractures.
- 4) Serious systemic diseases.
- 5) Treatment with immunosuppressants.
- 6) Prolonged time outside the oral environment of the avulsed tooth as well as the fact that it is immature.<sup>12</sup>

Donaldson and Kinironsen et al. concluded that contamination, coronal damage, and tooth preservation are three determining factors in the early onset of resorption in reimplanted teeth.<sup>13</sup>

Some authors report that after reimplantation, a clot forms between the 2 areas of the sectioned periodontal ligament. Two weeks later, the resorption process begins along the root surface, and may evolve to a new repair with cement, leading to superficial resorption or inflammatory resorption processes as well as ankyloses.<sup>14</sup>

Chaple AM et al. refer in their report that they performed the endodontic treatment 8 days after the tooth was reimplanted. Giovanni G et al. mention that endodontic treatment should be carried out 2 weeks after reimplantation. A traumatic dislocation that displaces the tooth outside the socket is called avulsion. Likewise, dental reimplantation is defined as the procedure that consists of inserting a tooth that has been accidentally or intentionally displaced, in its own socket. Dental avulsions account for 1% to 16% of all traumatic tooth injuries. For adequate reinsertion and fixation of the tooth in the socket, it is necessary to preserve the cells of the periodontal ligament present in the root. This is achieved by re-implanting the tooth as soon as possible, manipulating only the crown of the tooth and if this is not possible, taking the previously avulsed tooth to an environment that favors its preservation such as Hank's solution among other substances used successfully for the same purpose. It has been shown that the cells of the periodontal membrane do not survive after 18 minutes exposed to a dry environment, with half dying at 30 minutes and the majority at 120 minutes. The tooth socket itself is the best means of transport and the prognosis will improve if the tooth is reimplanted immediately, not exceeding 18 minutes. Also, the tooth can be transported, without wrapping, in the vestibule of the patient's mouth (saliva). In this medium it can be kept for up to 2 hours. Some studies have shown that fresh pasteurized skim milk was better than saliva, water, contact lens solution, and Gatorade. Milk has physiological osmolarity, a balanced Ph, is sterile, provides nutrients to fibroblasts of periodontal ligament, which makes it unlikely that the reimplanted avulsed tooth will present ankylosis in the future.

In avulsed teeth that have spent 60 minutes or more outside the socket, the periodontal supporting cells die. In these cases, no attempt is made to preserve the fibers of the periodontal ligament, and canals can be treated extraorally, but it must be done as aseptically as possible. Once the tooth is reimplanted, it is splinted in a semi-rigid way for 7-14 days, after that time, it is advisable to administer antibiotics. Reimplantation of avulsed teeth is only indicated in anterior teeth of children or young people. The advantages are that the patient keeps the tooth in position, in addition to the aesthetic value. The tooth is taken holding the crown of the tooth firmly with a sterile forceps, 2 or 3 mm of the apex is cut with a diamond disc in order to cause the least possible damage to the root tissue and to be precise in the cut. Right away, coronary access is made, holding the root with a gauze soaked in sterile serum, emptying and preparing the canal, proceeding to seal the Gutta Percha of the apex with a heated instrument. Intraorally, the region is anesthetized, clots that limit vision of the operative field are removed, the tooth is inserted into the socket, and the bands are fixed. At 2 months the splint is removed. If the tooth is not firm, the splint is placed for another month. The success rate is very high in reimplantations performed in the first 30 minutes after avulsion. Extra alveolar periods that exceed 2 hours usually lead to intense root resorption. However, the prognosis is reserved.<sup>15-19</sup>

If the cells of the periodontal ligament remain attached to the root

of the avulsed tooth and it is kept hydrated and the reimplantation is carried out in the first hour, the chances of success are high. On the contrary, if the avulsed tooth has remained more than an hour out of a suitable liquid medium, it has a poor long-term prognosis. Within the period of evolution, root resorption of inflammatory origin or by replacement and dental ankylosis may occur. In a dental reimplantation, the evolution towards ankylosis is very frequent, being the time that the tooth has remained in a dry environment the most important factor that could lead to create such ankylosis. Some authors propose that at the first signs of ankylosis the tooth should be repositioned and covered with Emdogain®, in order to stop the ankylosis progress.<sup>20</sup>

If the respective tooth has an integral root but has clotted blood with dirt, it should be washed under running water. Once the tooth is free of foreign bodies, it is repositioned in the socket, respecting the periodontal tissue during its manipulation.

Ruiz de Gopegui Fernandez et al. report that reimplantation of an avulsed tooth in a period of 60 minutes can achieve a success rate greater than 90% of cases, while an extraoral time of more than 120 minutes reduces the possibility of success up to 90% of cases. At 3 or 4 weeks, the cameral or root pulp is removed and the canal is filled with calcium hydroxide. If the apex is open and the extraoral time is longer than 2 hours, the pulp tissue is removed and filled with calcium hydroxide. When the tooth has its apex partially closed and the extraoral time is less than 2 hours, between 7 and 10 days after avulsion, the cameral and root pulp is removed to later fill the canal with pure calcium hydroxide, keeping it between 10 days and from 6 to 12 months to prevent root resorption. Gutta Percha and root canal sealant filling is performed after removal of calcium hydroxide. If the tooth has a closed apex and an extraoral time of more than 2 hours, endodontics can be performed both intraorally and extraorally.<sup>21</sup>

The purpose of this article is to present the "Araña Garza-Lain" semi-rigid intermaxillary fixation technique, used to keep the teeth displaced and one of them avulsed, within the socket. This technique adds a cap of wire to the Essig wiring technique, so it can be considered a modification of the same. It was given the name "Araña" (Spider in Spanish for the resemblance of the mentioned cap to this animal) and "Garza-Lain" after the surnames of the two maxillofacial surgeons who created this technique, one of them being coauthor of this article.

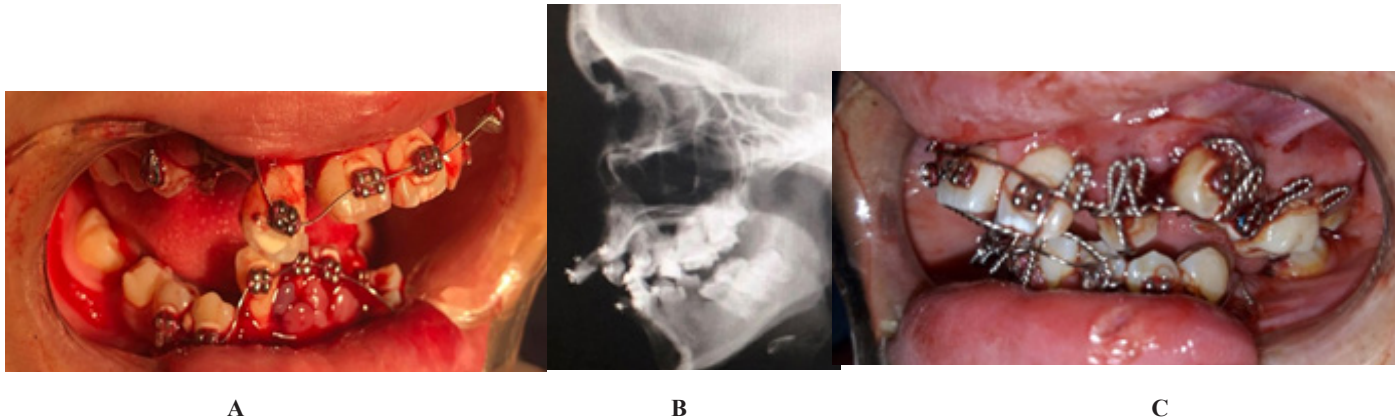
There are multiple techniques for intermaxillary fixation, which can be carried out through the use of wires or the combination of these, with malleable stainless-steel bars. Within the wires are the techniques of Essig, Oliver Ivy, Risdon, Stout and Obwegesser. Hippocrates was the first to use wire in mandibular fractures. The technique involves placing a single wire around the tooth adjacent to the fracture by twisting the wire clockwise. In the technique discussed previously, a wire is cut into equal halves approximately 8 cm, long enough to handle the operative field freely. Once both halves are cut, they are twisted in the shape of an "X" in such a way that the intersections, that is, the base of the "X" will be placed in the incisal third of the teeth with avulsion or displacement, making possible the stability and immobility of the tooth, just like the case that is presented in this article.

## Description of the clinical case

A 19-year-old female patient attends Christus Muguerza South Hospital in Monterrey, Mexico, with a history of frontal trauma from a car accident. In the extraoral examination, scoriations were observed

in facial soft tissues, intraorally there was a tear in the gingival mucosa, already coagulated blood, dentoalveolar fracture, with dental displacement in the upper maxilla of the dental organs 1.2, 1.1, 2.1,

2.2, 2.3, and in the mandible the dental organs, 4.2, 4.1, 3.1, 3.2, and avulsion of 1.3 (Figure 1A, 1B).

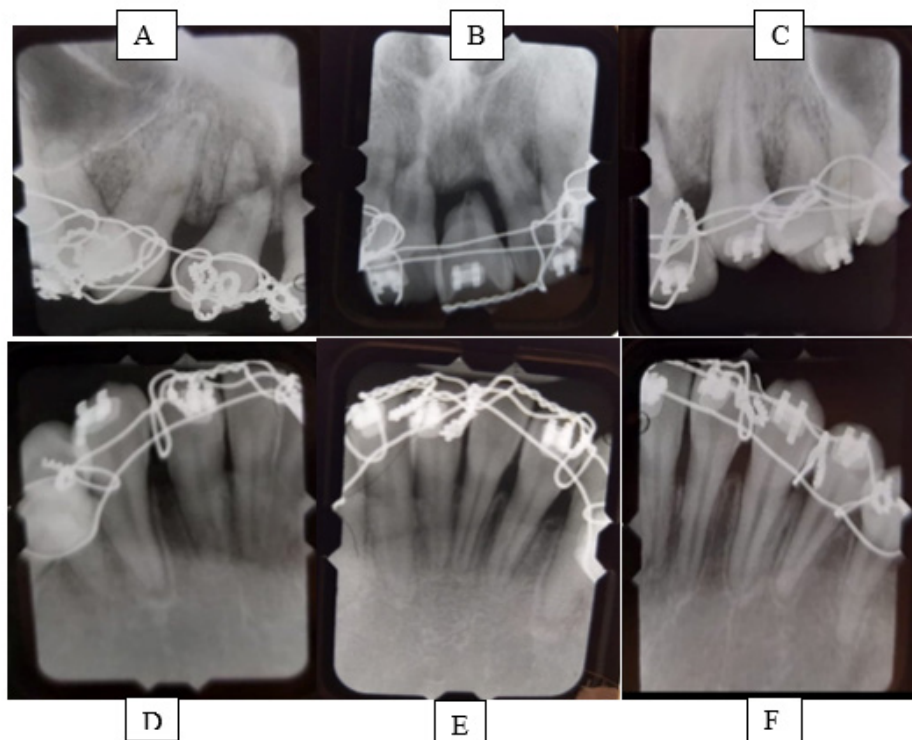


**Figure 1** A) Dentoalveolar fracture of teeth in the anterior sector of the upper and lower jaw due to a road accident, causing gingival lacerations, dental displacements and avulsion of the upper right canine; B) Lateral skull X-ray exposes dental displacement and irregularities of the alveolar process in the anterior maxillary sector; C) The “Araña Garza-Lain” wiring can be seen in the upper centrals, used to keep the affected teeth within the socket.

Under surgical protocol and local anesthesia, using lidocaine with 2% epinephrine, we proceeded to block the maxilla with the anterior dental technique at the level of each dental organ of the anterior sector to be handled, the middle dental, posterior dental and the anterior, middle and posterior palatal techniques. The mandible was anesthetized with a supraperiosteal technique in the anterior incisors, in addition both dental and mental nerves were blocked. It began with semi-rigid intermaxillary fixation with Dentaureum®. 20mm and 50-inch ligation wires. Essig wiring was placed as the main wire and a “Garza-Lain Spider” shape was placed in the incisal portion as secondary wiring;

with the purpose of keeping the avulsed dental organ fixed within the socket and providing stability to the other affected teeth (Figure 1C). The patient was left with antibiotic and anti-inflammatory drug therapy.

After immobilization by wires, the patient was referred to endodontic treatment due to the fact that the innervation and circulation of the teeth could be compromised due to the trauma; in order to prevent pulp necrosis and induce ankylosis of the teeth. Currently, with 7 months of evolution, the teeth remain stable, root resorption only occurs in the dental organ 2.1 (Figure 2B).



**Figure 2** A); Transverse root fracture in apical 1/3 of 1.2. B); Root resorption of tooth 2.1. C); There is no presence of alterations. D); Inflamed periodontal ligament in 4.3. E); Loss of alveolar bone below the amelocementary union corresponding to tooth 3.2. F); No alterations

## Discussion

In this particular case, the care of the patient was immediate due to the fact that she presented displacement of the dental organs 1.2, 1.1, 2.1, 2.2, 2.3 in the maxilla, and in the mandible corresponding to 4.2, 4.1, 3.1, 3.2. The patient also presented orthodontic appliances that decreased the mobility or avulsion of the teeth, with the exception of 1.3 that it did come out of the socket. The orthodontic wires were cut because they were bent and did not allow us to maneuver during reduction.

The wiring of Essig and “Araña Garza-Lain” was carried out both individually and twice for the reduction and fixation of the teeth in the alveoli and they were fixed for 6 weeks with intermaxillary ligaments to later perform the endodontics. We acted in this way based on the resources that we had available and secondly, based on the following statements by these different authors.

Autotransplantation maintains the dental space, remodels the alveolar bone and favors bone growth, so they can functionally and aesthetically obtain a predictable result). The favorable evolution of this case is contradicted by the literature that describes an unfavorable prognosis for reimplantations after 2 hours after the tooth is avulsed. The regenerative capacity of the periodontium in each individual is important.<sup>22,23,17</sup>

Keeping the avulsed tooth out of the mouth in a moist environment is of utmost importance. Ruiz De Gopegui Fernandez et al. Suggest keeping the tooth in milk; Do not spend more than 15 minutes dry, as it is a cause of failure. At 60 minutes you can have a success rate greater than 90% of cases, while an extraoral time greater than 120 minutes. Von Arx T, Trope M et al. suggest splinting as the basic technique for the prevention of resorption, the splint must have non-rigid elements that allow physiological movements, of short duration (7 to 10 days) until the mobility of the tooth is stabilized. Since a tooth with an open apex reimplanted early has the possibility of revascularizing the dental pulp.<sup>24,25,17</sup> Jordam F et al suggest keeping the splint for a minimum period of 7 days and a maximum of 14 days, allowing a certain degree of mobility to avoid ankyloses.<sup>26</sup>

In this case, since it was a dentoalveolar fracture, a period of 6 weeks was awaited, which is how long it takes for the bone to heal, it was not only dental avulsion but also dentoalveolar fracture, therefore the intermaxillary fixation.

## Conclusion

Generally, health institutions in Mexico do not have dental material for dentoalveolar fractures (resins and orthodontic wire). With inventiveness and creativity, immobilization was performed with .20 mm and 50-inch ligating wire. Because the time factor is vital for the preservation of the dental organs, it is important and necessary to carry out the immediate treatment with instruments that are available to keep the teeth in position inside the mouth, such as the use of ligature wires for the reduction and fixation of the dentoalveolar fracture, stabilizing and maintaining the teeth in proper position.

In this case, the permanence of the teeth in the mouth is quite promising, despite the strong impact received. So far, the only tooth that is at risk is the one with root resorption.

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## Conflicts of interest

The authors declare no conflicts of interest.

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