Circummandibular Wires for Treatment of Dentoalveolar Fractures Adjacent to Edentulous Areas: A Report of Two Cases

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Abstract

In general, dentoalveolar fractures are a common injury seen in emergency departments, dental offices, and oral and maxillofacial surgery practices. These injuries can be the result of direct trauma or indirect trauma. Direct trauma more often causes trauma to the maxillary dentition due to the exposure of the maxillary anterior teeth. Indirect trauma is usually the result of forced occlusion secondary to a blow to the chin or from a whiplash injury. Falls are the most common mechanism of injury seen in the pediatric group. In adolescents, many of these fractures are sustained during sporting activities. However, the use of mouth guards and other protective equipment has decreased this number. Most adult injuries are caused by motor vehicle accidents, contact sports, falls, bicycles, interpersonal violence, medical/dental mishaps, and industrial accidents. Early intervention to reduce and stabilize the fracture is required to establish a bony union and ensure correct function. Most dentoalveolar fractures have bilateral stable adjacent dentition and are treated with a closed technique utilizing an acid-etch/resin splint followed by splint removal at 4 weeks. Other inferior stabilization treatments used are arch bars and other wiring techniques. It is widely accepted that semirigid stabilization techniques, such as an acid-etch/resin splint or wiring procedures, are adequate to treat dentoalveolar fractures. This is in contrast to the treatment of mandible fractures where AO principles of rigid fixation are often followed. Fractures that are unable to be reduced sometimes necessitate an open reduction followed by internal fixation, sometimes using a secondary splint for mobile teeth. In those rare cases when there are not stable adjacent teeth bilaterally other modalities must be considered. In the present report, two cases are presented where circummandibular wires were used to treat fractured mandibular dentoalveolar segments adjacent to edentulous areas.

Keywords
- trauma
- dentoalveolar
- mandible
- fracture

In general, dentoalveolar fractures are a common injury seen in emergency departments, dental offices, and oral and maxillofacial surgery practices. These injuries can be the result of direct trauma or indirect trauma. Direct trauma more often causes trauma to the maxillary dentition due to the exposure of the maxillary anterior teeth. Indirect trauma is usually the result of forced occlusion secondary to a blow to the chin or from a whiplash injury.[1] Falls are the most common mechanism of injury seen in the pediatric group.[2] In adolescents, many of these fractures are sustained during sporting activities.[3] However, the use of mouth guards and other protective equipment has decreased this number.[4]

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Fig. 1 Clinical view of lingually displaced dentoalveolar fracture.



Fig. 3 Panoramic radiograph demonstrating a dentoalveolar fracture of the mandible with no dentition distal to the right side of the fracture.

Most adult injuries are caused by motor vehicle accidents, contact sports, falls, bicycles, interpersonal violence, medical/dental mishaps, and industrial accidents.[5–8] Early intervention to reduce and stabilize the fracture are required to establish a bony union and ensure correct function.[9–11] Most dentoalveolar fractures have bilateral stable adjacent dentition and are treated with a closed technique utilizing an acid-etch/resin splint followed by splint removal at 4 weeks.[12] Other inferior stabilization treatments used are arch bars and other wiring techniques.[13,14] It is widely accepted that semi-rigid stabilization techniques, such as an acid-etch/resin splint or wiring procedures, are adequate to treat dentoalveolar fractures. This is in contrast to the treatment of mandible fractures where AO principles of rigid fixation are often followed. Fractures that are unable to be reduced sometimes necessitate an open reduction followed by internal fixation, sometimes using a secondary splint for mobile teeth.[15]

In those rare cases when there are not stable adjacent teeth bilaterally other modalities must be considered. In the present report, two cases are presented where circummandibular wires were used to treat fractured mandibular dentoalveolar segments adjacent to edentulous areas.

Case Reports

Case 1

A 62-year-old healthy man fell from a moving truck and struck his face against a pipe. The patient presented to the emergency department complaining of jaw pain. He reported no significant past medical history and denied alcohol, tobacco, or illicit drug use. On examination, the patient showed a lingually displaced dentoalveolar segment from teeth #25 to 29 (lower right central incisor to lower right second premolar) (►**Fig. 1**). Teeth #22 to 24 (lower left canine to lower left central incisor) were the only other remaining teeth in the mandible, which were stable. A cat scan of the facial bones without contrast and panoramic radiograph showed a dentoalveolar fracture along teeth #25 to 29 (►**Figs. 2** and **3**). Because there was an edentulous space distal to the fracture conventional acid-etch/resin splint, arch bars or other dental wiring techniques were not possible. An open technique was not considered due to the likelihood of damage to the dental roots with internal miniplate fixation. The treatment plan for this injury was a closed reduction followed by placement of circummandibular wires. In the operating room, the fractured segment was manually reduced to establish the normal

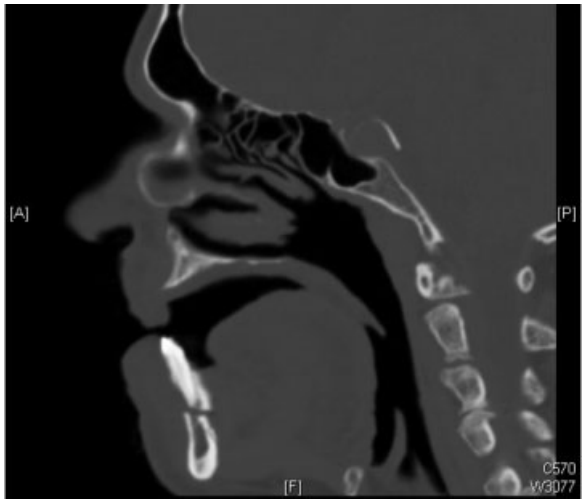


Fig. 2 Computed tomography scan of the facial bones in sagittal view demonstrating a dentoalveolar fracture of the mandible.



Fig. 4 Clinical view after reduction and stabilization of the fracture using circummandibular wires and a bridal wire.

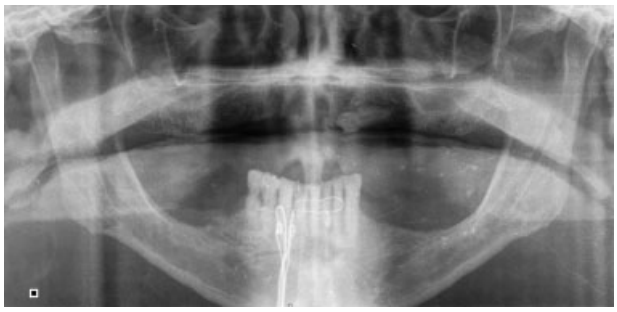


Fig. 5 Postoperative panoramic radiograph demonstrating good reduction of the fracture.

arch form. The maxillary arch was edentulous and a denture was not available to use the patient's occlusion to confirm the reduction and provide stability during fire fixation. Using an awl two 22-guage stainless steel wires were placed in a circummandibular fashion. The wires were then passed interproximally and secured. A final 24-guage bridle wire was placed between the fractured and stable segments and secured (►**Fig. 4**). A postoperative panoramic radiograph showed intact hardware and good reduction of the fracture (►**Fig. 5**). The patient was discharged on antibiotics and instructed to have a soft diet. The patient was seen in the office at 1 week and 2 months postoperatively. At the two-month visit, the fractured segment was found to be stable. A panoramic radiograph was performed which showed a union at the fracture site (►**Fig. 6**). The wires were removed under local anesthesia. On examination, there was excellent stability of the segment. The patient was discharged from care and instructed to follow-up as needed.

Case 2

An 88-year-old female, status postsyncopal episode, complained of loose teeth. On examination, the patient was found to have a mobile segment of the anterior mandible from teeth #21 to 28 (lower left first premolar to lower right first premolar). Tooth #28 (lower right first premolar) had severe mobility. A panoramic radiograph and cat scan of the facial bones without contrast showed a dentoalveolar fracture including all teeth of the mandible, #21 to 28, as well as left condylar head and right subcondylar fractures



Fig. 6 Panoramic radiograph 2 months after surgery before removal of wires, demonstrating a bony union at the fracture site.

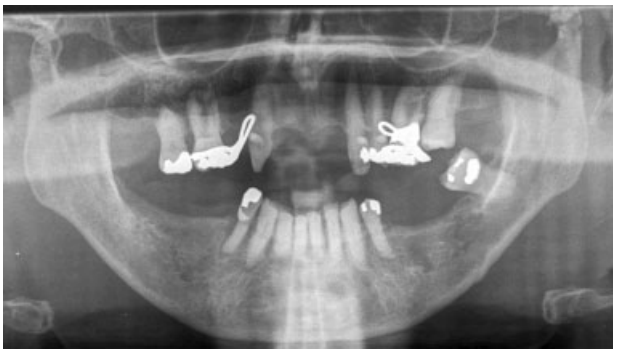


Fig. 7 Panoramic radiograph of the mandible demonstrating a dentoalveolar fracture of the entire tooth bearing segment of the mandible, as well as left condylar head and right subcondylar fractures.

(►**Figs. 7** and **8**). The lack of stable dentition precluded the use of a dental splint for stabilization of the fracture. There were no available removable partial dentures for either arch. In the operating room, the fracture was manually reduced and 24-guage stainless steel wires were placed in a circummandibular fashion. Tooth #28 was severely mobile and extracted. There was mild mobility of tooth # 24 (lower left central incisor) after the fracture was stabilized, this was splinted to the adjacent tooth with a 24-guage wire. After the fractured segment was stabilized, the occlusion was stable and reproducible, so no consideration was given to performing open reduction and internal fixation of the condyle fracture(s). The patient was instructed to be on a soft diet for the following 4 weeks to minimize stress on the fractured segment, as well as for treatment of the subcondylar/condylar fractures. The postoperative panoramic radiograph showed the fracture was well reduced (►**Fig. 9**). The patient was seen in the office at 6 weeks

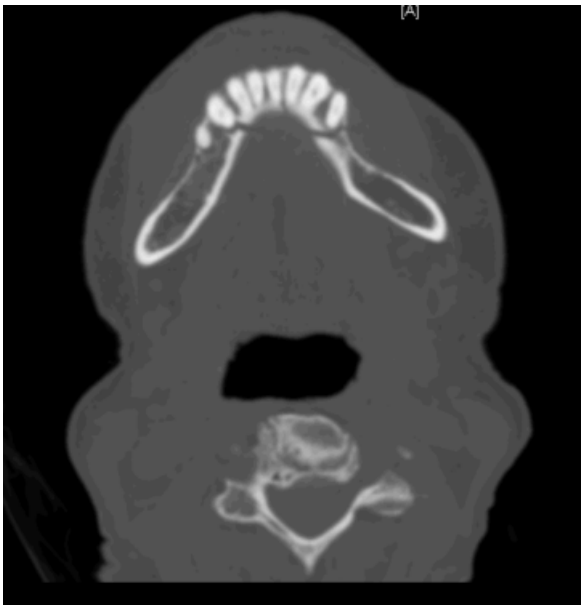


Fig. 8 Computed tomography scan of the facial bones demonstrating a dentoalveolar fracture involving all stable teeth of the mandible.

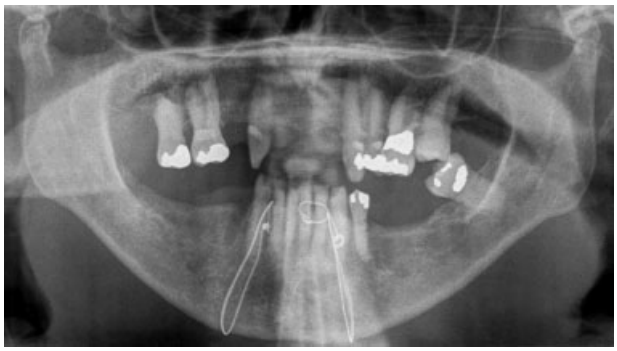


Fig. 9 Immediate postoperative panoramic radiograph after extraction of tooth #28, reduction of fracture, stabilization with circummandibular wires, and splinting of tooth # 24.



Fig. 10 Postoperative panoramic radiograph at 6 weeks, demonstrating a bony union along the fracture site.

postoperatively and the fractured segment was stable. The occlusion was also stable and reproducible. A panoramic radiograph showed a well-reduced and -healed segment (►**Fig. 10**). The patient was planned for removal of the wires under local anesthesia; however, she was lost to follow-up.

Discussion

Circummandibular wires have been used in oral and maxillofacial surgery for more than a hundred years. Gilmer's lectures in 1901 credit G. V. Black with first using circummandibular wires for edentulous mandible fractures. This technique involved placing 16- or 18-guage silver wires circumferentially around the mandible over a vulcanite splint.[16] Thoma mentioned the use of direct circumferential wiring, without the use of a splint, for edentulous or dentulous alveolar fractures.[17] Obwegeser used mandibular circumferential stabilization of stents over split-thickness skin grafts in his combined buccal and lingual vestibuloplasty procedure.[18] However, all of these techniques are used less frequently with the predictability and easy application of plating techniques as well as the use of dental implants making preprosthetic surgery more seldom.

A contemporary application of circummandibular wires is still mentioned with respect to treating pediatric mandible fractures. This can be in the direct application of wires along sagittal fractures or for stabilization of a lingual splint.[19]

Most dentoalveolar fractures are currently treated with an acid etch/wire splint. However, when there is inadequate adjacent dentition to stabilize the fracture the surgeon must decide on another modality. The technique described in this series has some advantages over an open technique with internal fixation. First, there is no risk of damaging the dental roots, such as during drilling and screw placement. Second, there is no subperiosteal reflection of a buccal flap, providing a better blood supply to the fractured site. In addition, the cost of a few pieces of stainless-steel wire is negligible compared with titanium miniplates and screws. Some disadvantages may include postoperative discomfort of the wires in the mandibular vestibule as well as the need to remove the wires after the fracture is healed. There is also a risk of submental scar formation as well as damage to structures at the floor of the mouth. However, these can be minimized with proper technique.

The two cases also exhibit how only semirigid stabilization principles need to be followed when treating dentoalveolar fractures, regardless of the size of the mandible. This is in contrast to the treatment of mandible fractures where rigid fixation is often used, especially in the case of hypoplastic/atrophic mandible fractures where the hardware must bear the entire load across the fracture, as recommended by the AO.[20–22]

In this article, the author presents two cases of mandibular dentoalveolar fractures adjacent to edentulous areas that were successfully treated with circummandibular wires. The use of this classic technique can be considered an option for treatment of this rare type of injury.

Competing Interests
None.

Please State Any Sources of Funding for Your Research
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