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RESEARCH ARTICLE

A NOVEL TECHNIQUE OF CIRCUMMANDIBULAR WIRING IN ASSOCIATION WITH LAG SCREW FIXATION FOR MANDIBULAR FRACTURES – CASE REPORT

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ABSTRACT

Mandibular fractures associated with dentoalveolar fractures presents as a management delima for achieving proper reduction and fixation. Occlusion serves as the key guide for proper reduction of mandibular fracture. When associated with dentoalveolar fracture three dimensional spatial alligment to achieve proper reduction is tiersome. Various treatment modalities are available for proper reduction and fixation of mandibular fractures, but among them the methods that minimises the need for periosteal stripping and reduces the period of IMF is the most acceptable treatment modality. Here we are discussing a case of symphysis fracture along with dentoalveolar fracture, manged with lagscrew fixation and circum mandibular wiring using acrylic splints.

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INTRODUCTION

Mandibular fractures are common injuriesseen 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 (Karl Maloney, 2015). Indirect trauma is usually the result of forced occlusion secondary to a blow to the chin or from a whiplash injury (Powers, 1997). 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. In this article we present a novel technique of lag screw fixation and circum mandibular wiring to treat mandibular symphysis fracture with associated dentoalveolar fracture. Even though mandibular and dentoalveolar fractures may be treated by various techniques including the standard principles of open reduction and internal fixation with either plates and screws or lag screws, early intervention to reduce and stabilize the fracture is required to ensure complete bony union and correct function. Most dentoalveolar fractures have bilateral stable adjacent dentition so that it can be treated with a closed technique utilizing an acid-etch/resin splint followed by splint removal at 4 weeks (Abubaker, 2009). Other inferior stabilization treatments used are arch bars and other wiring techniques. This is in contrast to the treatment of mandible fractures where AO principles of rigid fixation are often followed. In some rare fracture patterns of anteriormandible along with dentoalveolar fractures, that are difficult tomakeitstable, other modalities must be considered. It madeus to look for an ovel technique of circum mandibular wiring in association with lag screw fixation.

Objective

Purpose of this article is to discuss a minimal invasive technique for management of dentoalveolarfractures and anterior mandible fractures with several advantages over conventional methods.

Case Report

A 43-year-old female patient with history of alleged fall from bike. On examination, the patient was found to have a mobile dentoalveolarsegment of the anterior mandible from teeth 33 to 43 (lower left canine to lower right canine). Tooth #11, 12 and 21, 22 (upper central and lateral incisors) had grade 2 mobility due to root fracture, which was later treated by post and core followed by crown placement. Crown of tooth #22 was already lost during the incident. A panoramic radiograph and IOPA of

anterior mandibular segment showed a dentoalveolar fracture including #33 to 43, as well as left parasymphysis fracture not involving inferior border of the mandible, left condylar head and right subcondylar fractures (Figs. 1 and 2). There were no available removable partial dentures for either arch, so that an anterior mandibular occlusal splint was fabricated for stabilization of the fracture (Fig. 3). In the operating room, the fracture was manually reduced .Lag screw fixation was done to stabilize left parasymphysis fracture and circummandibular wiring with 26-guage stainless steel wires to stabilize anterior mandibular dentoalveolar fracture segments .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 .The patient was reviewed weekly for first month and twice weekly in second month postoperatively and the fractured segment was stable. The occlusion was also stable and reproducible. A panoramic radiograph showed a well-reduced and healed segment. Thecircummandibular wiring was removed under local anesthesia after two months and made sure that fracture segments and occlusion were stable.

Fig. 1.

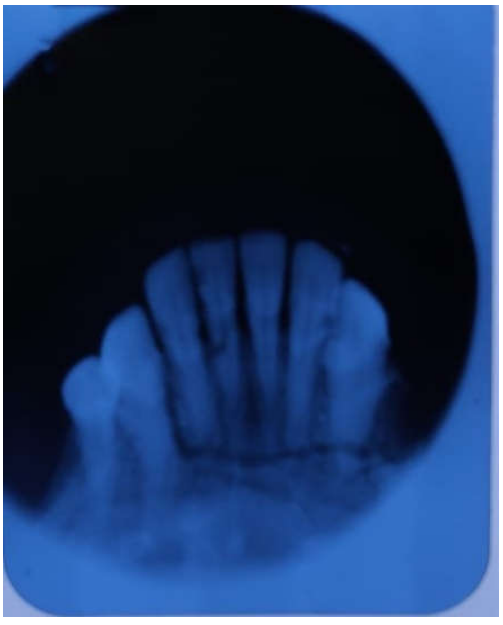

Fig. 2.

Fig. 3.

Technique

In our case we initially selected the mandibular symphysis fracture to treat using a lag screw prior to circummandibular wiring .Application of this technique relies on a tension band principle. Tension band can be achieved by arch bar fixation and pre-morbid occlusion was restored with intermaxillary fixation. A 1 cm soft tissue incision was made at the lower labial vestibule in relation to fracture site. A minimum amount of periosteal stripping was performed to drill the cortex. The point and angulation of drill should be taken into consideration while drilling the cortex. Point of drill should be equidistant from fracture line so that the threaded part of the screw engages both cortex and produces static interfragmentary compression and satisfactory fixation of the fracture. Angulation and depth must be in such ways that drill should not breach the lingual cortex beyond its limit. A guiding hole using a drill was created just 2 mm below the apices of anterior teeth, and a 20 mm lag screw was placed (Fig 4).Digital pressure was applied for counter force while placing the lag screw. Theintermaxillary fixationwas released and occlusion checked.

Fig. 4.

Secondarily anterior oocclusal splint covering the occlusal thirds of mandibular anterior toothwas fixed over mandibular anterior tooth using zinc polycarboxylate cement prior to circummandibular wiring. A vertical groove on the buccal aspect and two horizontal holes on the occlusal aspect of acrylic splint was already made in the canine region bilaterally to prevent the slippage of wire. A double wire was passed circum mandibularly instead of single strand of wire to provide more stability to splint. In this way instead of passing three circum mandibular wires, two wires can suffice preventing additional puncture site in midline. Lower border of the mandible is palpated in the canine region . Instead of bone awl, intravenous catheter stent isinserted percutaneously and exited intraorally on the lingualside taking careto stay as close as possible to the lingual surface of the mandible to avoid damage to submandibulargland. Then the 26 gauge SS wire is passed through the lumen of IV catheter and held intraorally (Fig 5).

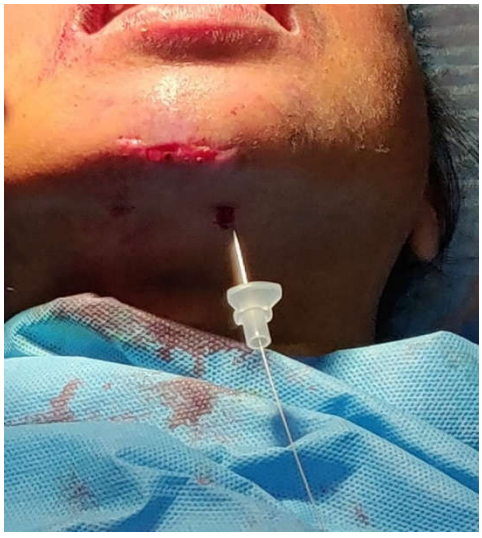

Fig. 5.

Now the IV CS is traced back following the lower border of the mandible with bevelfacing the bone. IVCS is then directed upwards along the buccal surface of the mandible to pierce through the buccal sulcus and the wireiscuto the desired length. The two ends of the wire are adjusted and pre-adjusted acrylicsplintisseated in place. Then the lingual and buccal wires are held together and twisted in the region of canine grooves, cut and finished inwards. Post operative orthopantomograph and mandible occlusal radiograph was taken to confirm the position of lag screws (Fig 6). On post operative follow up, no patient complained of malocclusion and sensory disturbance and intraoral scarring was minimal (Fig 7).

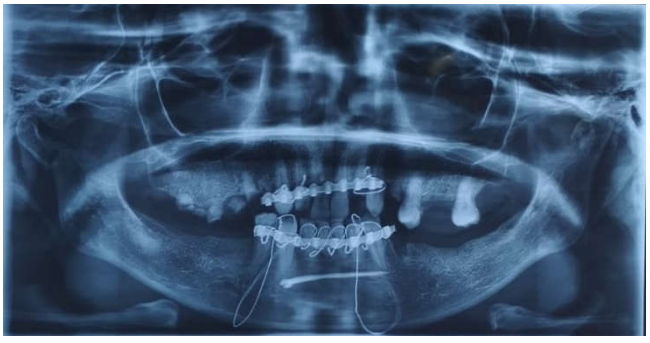

Fig. 6.

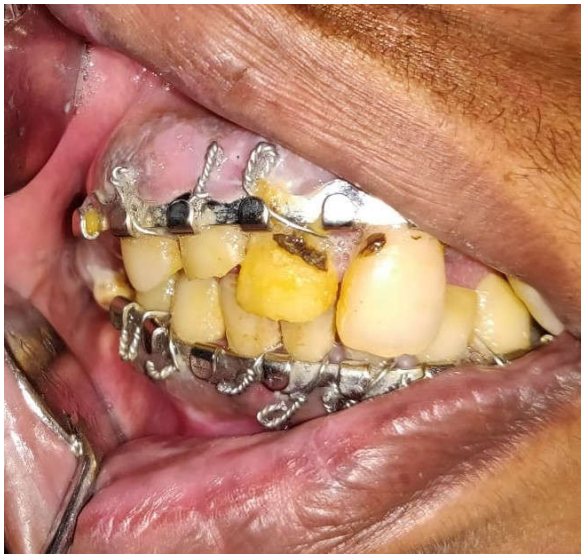

Fig. 7.

DISCUSSION

In this case we used a novel technique for fractures reduction and fixation. Firstly lag screw fixation with minimal soft tissue incision and minimal periosteal stripping. Secondly minimally invasive circummandibular wiring technique using IV cannula stents. And finally combined technique of lag screw fixation and circummandibular wiring to treat a rare fracture pattern with combination of dentoalveolar and mandibular symphysis fracture . Although lag screw osteosynthesis of anterior mandibular fractures is a sensitive,predictable, and relatively inexpensive method for internal fixation of indicated fractures, a small single incision in our technique has potential advantages over the traditional methods (Tiwana, 2007). It includes decrease chances of injury to mental nerve, maintenance of vascular supply of bone fragments, fewer amounts of implant material, decreased operative time., decreased morbidity, early improvement in functional rehabilitation due to the less traumatic procedure, less postoperative scarring and swelling, improved dental hygiene, and faster recovery. Ellis and Ghalifound lag screw fixation of anterior mandibular fractures to be an extremely simple and successful means of rigidly securing bone segments (Ellis, 1991). Technical complications with this technique are breakage of the drill bit and lingual cortex breach. Drill bit breakage usually occurs due to forceful drilling and change in angulation ones it is in the cortex (Sanjay Jadwani, 2011).

Lingual cortex breach occurs because of over drilling the cortices and wrong direction. Circummandibular wires have been used in oral and maxillofacial surgery for more than a hundred years. According to Gilmer's lectures, circummandibular wiring was first used by G. V. Black in 1901 to treat edentulous mandible fractures using 16- or 18-guage silver wires (Gilmer, 1901). Thoma mentioned the use of direct circumferential wiring, without the use of a splint, for edentulous or dentulous alveolar fractures (Thoma, 1958). 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, especially during drilling and screw placement. Second, there is minimal

subperiosteal reflection of a buccal flap(only for lag screw fixation), providing a better blood supply to the fractured site. Thirdly, a traumatic technique of circummandibular wiring with an IV cannulastent, so that no submental scar formation as well as no damage to structures at the floor of the mouth. Fourthly, circummandibular wiring remain close to bone to avoid damage to submandibular duct and other structures, and easy to take care of puncture wound. In addition, the cost ofstainless-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.

Conclusion

Fixation of anterior mandible and dentoalveolar fractures using this technique can achieve good stability and appropriate compression. The technique is simple and easily performed, reducing trauma to vital structures, reduce the surgical time, reduce the chances of infection due to less exposure and promote the healing process by producing stress in the fracture lines. The advantages of the above techniques over-ruled its disadvantages and the other conventional techniques.

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