

Case Reports: The Use of Intermaxillary Screws to Achieve Intermaxillary Fixation in the Treatment of Mandibular Fractures

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Abstract

Introduction: Treatment of mandibular fractures commonly involves the use of arch bars in temporary maxillo-mandibular fixation (also called intermaxillary fixation) to aid bone plating, for the postoperative application of light elastic traction to correct minor occlusal discrepancies and intermaxillary fixation for post reduction immobilisation. The purpose of this paper is to describe a quick and simple alternative for intermaxillary fixation. **Clinical Picture:** Three cases of mandibular fractures are presented to demonstrate the use of intermaxillary screws instead of conventional arch-bar wiring. **Treatment:** Two cases were treated with closed reduction methods while the other case was treated with open reduction. **Outcome:** Subsequent fracture healing was not compromised using this technique. **Conclusions:** With careful case selection, successful treatment outcome may be achieved using this time-saving and technically simple procedure. Some of the advantages and disadvantages of the intermaxillary screws are discussed.

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Key words: Arch bars, Facial, Maxillo-mandibular fixation, Trauma

Introduction

The mandible is a unique bone in the human skeleton and occupies a prominent position in the craniofacial region. Traumatic injury to the face, especially in the lower third, may result in fractures of the mandible. Road traffic accidents, industrial mishaps, brawls, falls and sports-related injuries contribute to the aetiology of the injury.¹⁻³ Common treatment modalities for mandibular fractures may be divided into rigid internal fixation (open reduction) or intermaxillary fixation (closed reduction), depending on severity and the anatomic locations of the fractures.²⁻⁶

With rigid internal fixation, temporary intermaxillary fixation is commonly applied intraoperatively to facilitate bone plating of the jaw fragments. Release of the intermaxillary fixation or the subsequent application of light elastic intermaxillary traction is carried out post-operatively. In other situations, intermaxillary fixation alone is treatment in itself, especially for fractures with

little or no displacement. The jaws may be tied together for varying periods of 2 to 6 or more weeks, again depending on severity of the injury and the position of the fracture site.^{2,3,5}

Three cases are reported here to demonstrate the use of an alternative and quicker method of achieving intermaxillary fixation and traction in place of the traditional method of using arch bar or eyelet wiring.

Case Reports

We report 3 cases of mandibular fractures seen and treated at the National University Hospital, Singapore. Intermaxillary screws were used in these patients. The screws used were threaded titanium screws of 2.0-mm diameter (Surgical Technology UK Ltd, Bolton BL2 1DG, UK) (Fig. 1). These were specially designed for intermaxillary fixation. The screws had a capstan head and were inserted with a hexagonal headed central drive

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screwdriver. Available in thread lengths of 10.0 mm to 16.0 mm, the set included a dedicated long shank bur with a diameter of 1.5 mm and length of 20.0 mm. Intermaxillary screws of thread length 12.0 mm to 14.0 mm were used in all 3 cases. For both maxilla and mandible, the site of placement was between the canine and the first premolar at the muco-gingival junction where the attached gingiva meets the non-keratinised alveolar mucosa. A small stab incision was made at the site of placement with a No.15 blade. Care was taken to avoid damaging the adjacent tooth roots while preparing the drill holes to receive the screw. In the mandibular region, the area beyond the first premolar was avoided to prevent damage to the mental nerve, which exits via the mental foramen between the first premolar and the second premolar. One screw was placed in each quadrant (Fig. 2).

The first case was a 32-year-old Malay man who was assaulted and sustained a left subcondylar fracture and comminuted symphyseal fracture. Open reduction and internal fixation of the mandibular fractures were performed under general anaesthesia. A prefabricated flexible (Erich) arch bar was placed in the mandibular arch for stabilisation of the mobile fragments and 2 intermaxillary screws were inserted in the intact maxilla. Temporary intermaxillary fixation was achieved between the screws and the cleats of the arch-bar (Fig. 3). This was released after bone plating. The patient was reviewed 1 day postoperatively and light elastic traction was applied for correction of minor occlusal discrepancies.

The second case was a 25-year-old Chinese man who was involved in an industrial accident, in which he sustained a symphyseal fracture of the mandible. Clinically, there were no associated soft tissue injuries and occlusion was minimally deranged. Treatment was performed under local anaesthesia and 4 intermaxillary screws were appropriately placed in the 4 quadrants. The patient was then discharged with light elastics in place for intermaxillary traction.

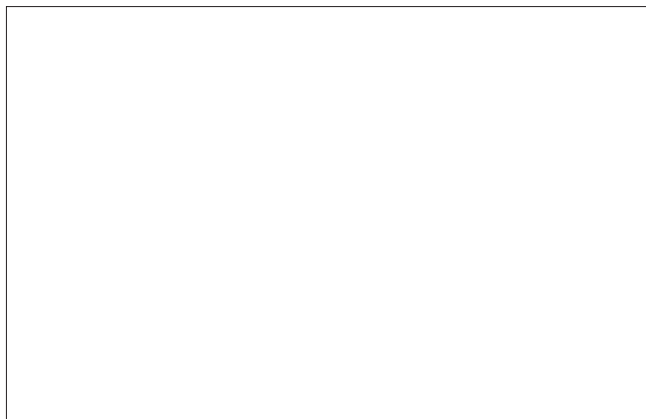


Fig. 1. The intermaxillary fixation screw.

The third case was a 24-year-old Chinese man who skidded off his motorcycle, sustaining a left subcondylar fracture of the mandible. Clinically, there was no obvious malocclusion, although the patient complained of discomfort over the left temporomandibular joint. The management of this patient was similar to the second case. This involved placement of 4 intermaxillary screws under local anaesthesia and was followed by the application of stainless steel wiring for intermaxillary traction.

All 3 cases were reviewed at the first and third postoperative week. Occlusion and treatment outcome were satisfactory. Patients presented with good oral hygiene and had no pain at the points of insertion. Numbness of the lips was not clinically evident and the teeth adjacent to the intermaxillary screws presented without any clinical symptoms of non-vitality. The screws were removed at the end of the third to fourth week under local anaesthesia with minimal discomfort to the patients. Healing of the soft tissue wound and bony area of the screw sites took place.

Discussion

Mandibular fractures may occur at a single site or at multiple sites. In the National University Hospital, single

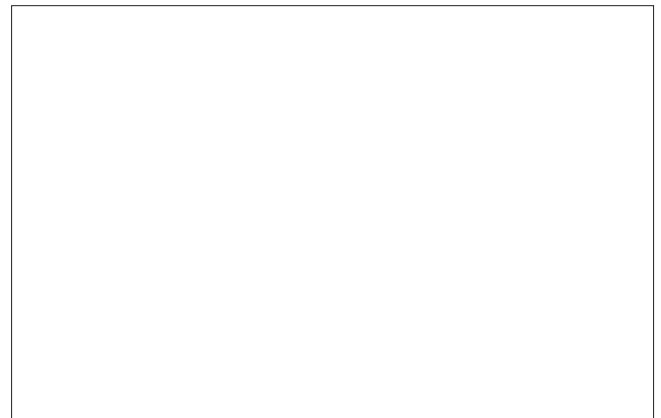


Fig. 2. Inserting the intermaxillary fixation screw.

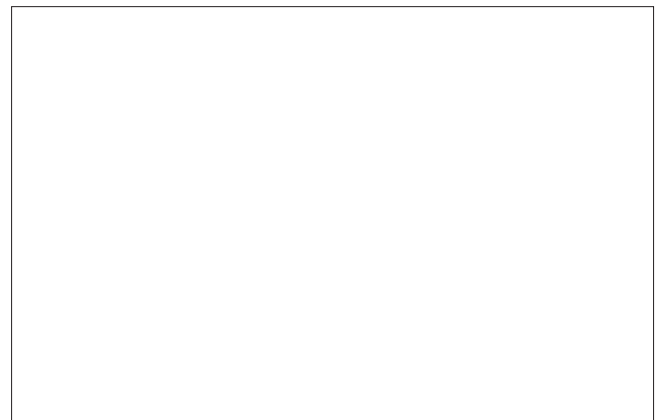


Fig. 3. Temporary intermaxillary fixation achieved with the intermaxillary fixation screws and arch bar in place.

mandibular fractures occur most commonly with an occurrence of about 62.6% while paired or multiple fractures have an occurrence of about 36.4%. The parasymphyseal region (22.3%) is the commonest site for single fractures of the mandible. Other affected regions include the symphyseal (14.9%), condylar (11.9%), angle (6.0%) and body of the mandible (7.5%). Multiple or combination fractures of the mandible do occur and may result in a direct fracture at the site of injury or in an indirect fracture of the condylar or angle region on the opposite side. Under this category, the parasymphyseal region and opposite condyle is the commonest combination (11.9%).² In the treatment of mandibular fractures, intermaxillary fixation is used for immobilisation of fractures or correction of minor occlusal discrepancies in undisplaced or minimally displaced fractures or following reduction of displaced fractures to aid good healing and approximation of fracture sites.

Many materials and methods are available for intermaxillary fixation. These include cap splints, acrylic or cast metal fixation plates, arch-bars, orthodontic wires, eyelet wires, occlusal splints and even pearl steel wires.^{7,8} Of these, prefabricated arch-bars and wires are most commonly utilised. However, wiring techniques have their inherent shortfalls. Patients often find the arch-bars and wires irritating and often traumatising to the cheeks and lips. In addition, intraoral wires and bars tend to retain food and plaque, with deleterious effects on the periodontium. Placement of arch bars is also time-consuming with the inherent risk of needle-stick injuries from wires during the procedure.

The use of various intermaxillary bone screws for fracture treatment has been previously described in the literature.⁹⁻¹² In this particular system, the capstan head on the special screw design minimises damage to the gingival tissues and alveolar mucosa when stainless steel wires or light elastics are applied.¹³ For patients, the intermaxillary screws are less conspicuous and it is easier to achieve good oral hygiene. Treatment is easily rendered under local anaesthesia with minimal discomfort and distress. Surgeons may also find that the technique of inserting these screws very simple and time-saving. Clinically, the intermaxillary screws provide a form of skeletal fixation in that the screws are inserted into the bone of the maxilla or mandible. This may be an advantage over the arch bars that are secured by wires placed interdentally and rely on the dentition for retention. In patients with extensive crown and bridge work or less than adequate dentition, this advantage may be significant. As the screws are not anchored on the teeth, theoretically, there is little risk of tooth movement or drifting when compared with arch-bar placement and wiring. Not uncommonly, orthodontic movement and extrusion of teeth may occur with the use of arch-bars if the arch-bars are not properly bent and adapted to the dental arch forms.

However, the intermaxillary screws are not without disadvantages. Injudicious placement of these screws may cause damage to the apices of adjacent teeth, perforation of the maxillary sinus and damage to the mental nerves. The site between the premolar and canine teeth may exhibit crowding, precluding its use in some cases. At the same time, the site of soft tissue incision and point of bony insertion may be subjected to postoperative infection. The intermaxillary screws may not also be suitable for use in the treatment of mandibular fractures in paediatric patients as their placement may compromise the permanent tooth germs. Technically, this technique has some limitations as well. As there are less number of anchor points for the application of intermaxillary fixation and traction, this may contribute to less control of the force vectors when elastic traction is applied. At the same time, this technique may not be suitable for more extensive or complex fractures involving the maxilla and mandible. It has no place in the treatment of dentoalveolar fractures, in which alternative methods of immobilisation are required. However, as illustrated in the first case, a combination of screws in the intact maxilla and arch bar wiring for the mandibular fracture may be used to good effect. The use of these screws may also not be suitable in patients with certain dentofacial presentations, for example, in severe bimaxillary protrusion of the jaws, as the application of intermaxillary fixation and traction may be difficult and damaging to the gingival tissue and alveolar mucosa. An important point to note is also the fact that the application of the screws is costly and should be taken into account when deciding on the type of intermaxillary fixation.

Conclusion

The technique of using intermaxillary screws to achieve intermaxillary fixation and traction for the treatment of mandibular fractures is a time-saving and technically simple procedure. It has a place in the definitive care of the patient who has sustained fractures of the mandible. However, careful case selection is needed to ensure successful treatment outcomes.

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