Retrospective Study on Efficacy of Intermaxillary Fixation Screws

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Abstract

Background: We evaluated the efficacy of intermaxillary fixation (IMF) screws in the treatment of mandibular fractures.

Methods: Two hundred patients with mandibular fractures, treated by IMF using these screws, were evaluated by pre and postoperative panoramic radiographs. Clinical testing was carried out for vitality and abnormal mobility of teeth adjacent to the site of screw insertions. Other factors such as possible iatrogenic dental injuries, loss, breakage or screw cover by oral mucosa and postoperative occlusion were also studied.

Result: The most important complication noticed was iatrogenic damage to dental roots.

Conclusion: Use of intraoral cortical bone screws for IMF is a valid alternative to arch bars in the treatment of mandibular fractures. Iatrogenic injury to dental roots is the commonest problem which can be minimized by an experienced surgeon.

MJAFI 2009; 65 : 237-239

Key Words : Intermaxillary fixation; Bone screws; Mandibular fractures; Iatrogenic injury

Introduction

Successful treatment of mandibular fractures depends on reduction, restoration of normal occlusion and fixation. Before fracture reduction, temporary intermaxillary fixation (IMF) with correct registration of occlusion is required. Stable IMF can be achieved by various techniques, the standard being the use of arch bars applied to both dental arches. IMF screws were initiated as a means of achieving temporary jaw fixation, as the only therapeutic method, or prior to internal fixation of certain types of mandibular fractures. In the present retrospective study of four years the effectiveness of this method was evaluated.

Material and Methods

A total of 200 patients with mandibular fractures were treated with IMF screws instead of arch bars to provide intermaxillary fixation and stable occlusion. Only mandibular fractures were included in the study in order to specifically study IMF stability in a single bone. The following cases were selected:

1. Unilateral/bilateral parasymphysis/body fractures of the mandible.
2. Unilateral fractures of condyle, ramus and angle of the mandible.
3. Unilateral fracture parasymphysis/body with fracture proximal to the dentition.

The cases of associated midface fractures, grossly

communitated mandibular fractures, associated dentoalveolar fracture mandible and those with fracture edentulous mandible were excluded from the study.

Self-tapping titanium screws 6-12 mm long and 2 mm in diameter were inserted. At least one screw was inserted in each quadrant, under local or general anaesthesia into pre-drilled holes at the junction of the attached and mobile mucosa taking care not to pass the drill between the roots of the teeth (Figs. 1,3). Temporary IMF was achieved using wires or elastic bands. One/two weeks of IMF fixation using screws included both presurgical and post surgical period. When reducing condylar fractures, intermaxillary fixation also helped to achieve closed reduction with stable fixation of the jaws. Of the 200 patients, 137 were males and 63 females in the age group of 15-65 years. Four screws (unilateral fractures) each were placed in 161 patients, six screws each in 38 cases (bilateral fracture body/parasymphysis) and in another case eight screws (Bilateral fracture body/parasymphysis) were inserted. A total of 880 screws were inserted. In 159 patients, the IMF screws were inserted during the open reduction and internal fixation under general anaesthesia whereas in 41 cases the screws were inserted under local anaesthesia and occlusion established prior to surgery. In the latter, good occlusion was obtained by means of closed reduction. Antibiotic therapy was maintained for five postoperative days. The screws were removed without anaesthesia except for 18 screws which were covered by oral mucosa in the postoperative period. All patients were checked using a panoramic radiograph, immediately postoperatively and a second radiograph after screw removal, to evaluate for any

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Fig. 1 : Intermaxillary fixation screw in situ

Fig. 2 : Post operative orthopantomograph showing implants in situ and iatrogenic injury to the left lower first premolar

possible iatrogenic injury to the teeth (Fig. 2). At removal, the vitality/sensitivity was monitored by means of thermic pulp testing of the teeth adjacent to the screw holes, as well as any abnormal mobility of the teeth and occlusal stability of the jaws. All patients had a clinical follow-up of at least six months.

Results

A total of 18 (2.04 %) screws were covered by oral mucosa at the time of removal, whereas 7 (0.79 %) screws were lost prior to planned removal. There was no fracture of any screw. Injuries to dental roots caused by screws was seen in eight patients (4%) with a total of nine teeth damaged (five premolars and four canines). The damage consisted of indentation to the roots of seven teeth and root canal perforation in two teeth. These two cases were treated endodontically. Postoperative malocclusion was noted in four other patients, with bilateral condylar fractures and a parasymphiseal fracture, following open reduction and internal fixation of the condylar and the parasymphiseal fracture.

Discussion

Various methods have been used for IMF in the management of mandibular fractures. The most common technique is to use arch bars or eyelet wires. These techniques take a relatively long time for application and removal besides having an inherent risk of perforation

Fig. 3 : Intermaxillary fixation screws with wires

of the surgeon's gloves and consequent "needlestick" injury caused by the sharp-ended wires [1]. Moreover this technique is difficult to use when the teeth are grossly carious, periodontally compromised, crowded and when they carry extensive crown and bridgework. Finally, wires tightened during the application of arch bars around the teeth may cause an ischaemic necrosis of the mucosa, extrusion and subsequent loss of vitality of the tooth. It is also difficult to maintain gingival health [2].

We used the technique described by Arthur and Berardo (1989), which utilizes at least four self-tapping titanium screws inserted transmucosally, one for each quadrant [3]. The screws, 8mm long and 2mm in diameter, are inserted at the junction of the attached and mobile mucosa between the canines and first premolars. There are many advantages to this procedure, with respect to the use of arch bars. First, insertion is easy and takes about 10 minutes with significant intra operative savings in time and cost and they are equally easy to remove, without anaesthesia. There is practically no danger that the procedure will cause injury to the surgeon due to sharp-ended wires, with consequently decreased risk of transmission of blood-borne disease to surgeon and patient alike. In addition, the risks of damage to the dental papillae and oral mucosa are considerably reduced; the teeth and dental prostheses are not subjected to traction, and it is easier to maintain dental hygiene [4]. Finally, the method is compatible with rigid fixation using any plating system. The main risk of using screws is the possibility of damaging dental roots while drilling the hole [5], especially in patients with dental crowding. There are reports of other complications such as breakage, or loss of screws, or the screws being covered by oral mucosa, infections associated with their placement, loss of teeth and anaesthesia due to injury to the mental or inferior alveolar neurovascular bundle [6].

This retrospective study, involving placement of 880 screws shows that the main risk is iatrogenic damage to the dental roots. Postoperative dental panoramic

radiographs revealed that nine screws had caused injuries to the dental roots of five premolars and four canines. These lesions consisted of scratching the roots which carried no consequences for vitality or stability of the teeth concerned. Two premolars presented with holes passing through the root and involving the pulp cavity which were subsequently treated endodontically. Root injury to 1 % of cases in this report was a result of the limited skill of the surgeon. The latter has a lower density than the dental roots, with consequently different resistance to the bur. If resistance is felt to drilling, one must stop and prepare another hole, because this could indicate that the bur is partly or fully within a tooth root. It is certainly important to evaluate a dental panoramic radiograph prior to drilling and inserting the screws in order to accurately visualize the position of the roots, especially in cases of dental crowding. We never experienced the loss of any tooth adjacent to these screws. Also there was no breakage of screws, either during or after the operation, as reported by others. Only seven screws were lost before the planned time of removal, due to postoperative mobility. Upon removal of the screws, 18 were covered with oral mucosa. They were positioned either in the mobile mucosa or close to a surgical incision used to expose the mandibular fracture. Only in these cases were the screws removed under local anaesthesia. There was no oral infection or anaesthesia of the lower lip following placement of screws in the mandible. We agree that use of these screws is not indicated where the function of a "tension band" and postoperative directional traction are required, as in multiple comminuted mandibular fractures, alveolar bone fractures or gunshot fractures. It was impossible to achieve postoperative directional traction to correct a postoperative malocclusion as reported with a patient suffering from a parasymphysal and bilateral condylar fractures. Therefore this method is mainly used in cases of single or double mandibular fractures with minimal displacement, compound condylar fractures, and fractures in edentulous patients if the proper dentures

are available. We had four (2%) cases of malocclusion after treatment of mandibular fractures in this study which is similar to the reported incidence by other workers [7]. We conclude that this technique is a good alternative to arch bars, when correctly applied. Contraindications to usage of screws includes paediatric patients with unerupted teeth, and cases with severe osteoporosis.

Considering the results obtained, we intend to continue using this system, extending it to the treatment of other facial fractures, i.e. fractures of the middle third of the face without concomitant mandibular fracture.

Conflicts of Interest

None identified

Intellectual Contribution of Authors

Study Concept : Col NK Sahoo, Maj R Sharma

Drafting & Manuscript Revision : Col PS Menon, Maj R Sharma

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