COMPLICATIONS ASSOCIATED WITH INTRA ORAL CORTICAL BONE FIXATION SCREWS FOR INTERMAXILLARY FIXATION IN CLOSED REDUCTION OF MANDIBULAR FRACTURES

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ABSTRACT

The objects of this study were to determine the rate of complications associated with Intra Cortical Bone Fixation Screws for Inter-maxillary fixation (IMF) and as a possible alternative to Arch-Bars in patients with un-displaced mandibular fractures.

A descriptive case series study involving 25 adult patients (age range: 16-60 years) and requiring intra cortical bone fixation screws IMF was conducted from 1st August 2011 to 30th April 2012 at the Department of Oral & Maxillofacial Surgery, Abbasi Shaheed Hospital / Karachi Medical and Dental College (KMDC) Karachi. The sampling technique was non-probability purposive. Clinical examination and radiograph 1-OPG (Ortho-Pentomogram), 2-PA View of Face were taken for confirmation of un-displaced mandibular fractures. Patients with pre-existing mental nerve injury and / or soft tissue infection were excluded from the study. IMF was done with using intra cortical bone fixation screws, patients were followed over 6-weeks period at regular weekly interval. Postoperative frequencies of complication including mental nerve injury and soft tissue infection were recorded at review. Overall complications were in (3) 12% patients. The distribution of the various complications were; soft tissue infection in (1) 4% and mental nerve injury in (2) 8% patients.

The high proportion of 12 % complications including those related to nerve injury suggests appropriate selection of both the patients and size of Intra oral cortical bone fixation screw (ICBFS) as well as the use of this technique by surgeons having expertise and skills in the technique.

Key Words: Erich arch-bars, Mandibular fractures, Intra-oral cortical bone screws.

INTRODUCTION

Mandible has prominent and susceptible position on the face and is a favored target of impact forces whether intentionally or unintentionally.1

It is a mobile bone that plays an essential role in mastication, speech and deglutition so the successful treatment of mandibular fractures depends on good reduction and restoration of form and function in a systematic manner.2,3,4,5

Patients with simple mandibular fractures may be treated with closed reduction technique.6 Dal pont7 used S-shaped hooks to engage the inferior border of mandible and piriform rim edge. Once that is placed, a wire was ligated from superior to inferior hooks. This concept of ligating wires with hooks by obtaining proper occlusion was very appealing and hence subsequently modified by Otten8, who recommended that AO mini screws placed into the maxilla and mandible were used as anchors. Finally, in 1989 Arthur and Berardo9 suggested that 2.7mm self-tapping screws can be used and inserted into both the maxilla and mandible and IMF can be achieved. Other methods of closed reduction are IMF using Erich arch-bars and Ivy loops wiring. The fixation of arch-bars with the stainless steel wire increases the chances of skin punctures of not only the surgeon but also put the assistant...
Complications Associated with Intra Oral Cortical Bone Fixation

at risk, hence increasing the risk of cross infection. This can increase the risk of transmission of blood borne diseases like Human immunodeficiency virus (HIV) and Hepatitis B, C virus to the surgical team.10,11

Therefore, an intra-oral cortical bone screws (ICBSF) with intermaxillary fixation (IMF) has been previously described as a definitive treatment modality for simple mandibular fractures repair4,23 thereby eliminating the need of wires.

Intra-oral Cortical Bone Screws Fixation (ICBSF) has many advantages over arch-bars placement. There is decreased risk of mucosal and skin puncture injuries, hence reduced risk of blood borne diseases transmission4,11 significant intraoperative time saving,11 ease of application, achievement of acceptable proper occlusion,4 better feeling as compared to arch bars since IMF remains for at least 4 to 6 weeks of time. In contrast, the arch bar IMF is less satisfactory for partially edentulous and completely edentulous patients. In such cases, other procedures or devices have to be incorporated in order to get better results11 with ICBSF; the performance of better oral hygiene procedures is also easy during the course of IMF.4

Indications for the use of ICBSF technique are similar to those for IMF using conventional methods12 that are, non-displaced favorable fractures, comminuted fractures, fractures exposed by significant loss of soft tissue, edentulous mandibular fractures, and patients in the mixed dentition stage,12 and in hospitals with limited facilities and high patient turnover.13 The ICBSF technique is contraindicated in patients with multiple comminuted mandibular fractures, pediatric patients with un-erupted teeth, those with sparse dentition without partial plates, and in patients where adequate reduction and acceptable occlusion is not achieved intraoperatively.4,8,11

However this technique has certain disadvantages. These include; malocclusion, superficial cellulitis,5,12,14 screw loosening, breakage and ingestion,13 iatrogenic injuries include damage to the adjacent soft and hard tissues, and mental nerve injury causing Paresthesia postoperative.15,16,17,18

The rationale of this study was to evaluate the complication rate using Intra-oral Cortical Bone Screws Fixation (ICBSF) for un-displaced mandibular fracture

This study was first of its kind in the region so can be used as reference or can be compared with results of other studies done in future on Intra-oral Cortical Bone Screws Fixation (ICBSF).

METHODOLOGY

Patients presenting at outpatient department (OPD) of Oral & Maxillofacial Surgery with mandibular fractures were included in this study.

Clinical examination and radiograph 1-OPG (Ortho-Pentomogram), 2-PA View of Face were taken for confirmation of un-displaced mandibular fractures. Informed consent was obtained prior to commencement of the treatment. Standard aseptic measures were taken. Local anesthetic agent was injected locally at the site of procedure. The technique employed was similar to the technique described by Arthur and Berardo.10 After confirmation of the effect of local anesthesia, 8mm ‘ 2mm wide self-tapping/ drilling type of cortical bone screws were inserted in the alveolar bone, in each of the four quadrants of upper and lower arches respectively. A 26 gauge wire was passed through the screw holes and ligated by restoring the patient’s dental occlusion into IMF.

Follow-up visits at the end of 1st week, 4th week, and 6th week were done. At each follow-up visit, soft tissue infection and mental nerve injury was noted. Soft tissue was assessed clinically by the presence of redness, pain and swelling at the site of insertion of bone screws. Touch sensation was assessed by gently rolling a cotton wisp over the surface of the lower lip on both sides and asking the patient to compare the difference. Two point discrimination was assessed by gently touching two dental probes tip over the surface of the lower lip, 4mm apart and asking the patient to pin point the difference between the two. Pain sensation was judged by mild probing over the surface of the lower lip and observing the patient’s response to pain. Loss of sensation in any of the above criteria was recorded as mental nerve paraesthesia.19

Regular follow-up visits, appointments were reminded by phone call, and final outcome was assessed by the end of 6th week.

Statistical analysis

The data was entered and analyzed in statistical program SPSS version 16.0. Qualitative data (frequencies and percentages) such as gender, unilateral /bilateral involvement, site distribution, complications and etiology etc. were presented as n(%). Quantitative data (Numerical variables) like age (in years), were presented as Mean ± Standard Deviation. No statistical test was applied due to descriptive case series study.

RESULTS

A total of 25 patients with un-displaced Mandibular fractures were included in this study. The mean age was 32.40 years ± 7.04 SD.

Out of 25 patients, (2) 8% were females and (23) 92% males. Female to male ratio was 1: 11.5. Unilat
eral fracture involvement was seen in (16) 64% while (9) 36% were bilateral fractures and mandibular fracture with site distribution Table 1.

Road traffic accident (RTA) (10) 40% was common etiological factor followed by Fall (09) 36%, Assault (3) 12%, sports (2) 8% and others (Donkey cart) were (1) 4%. Table 2.

**TABLE 1: SITE DISTRIBUTION OF MANDIBULAR FRACTURES**

<table>
<thead>
<tr>
<th>Mandibular Fracture Site Distribution</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condyle</td>
<td>05</td>
</tr>
<tr>
<td>Angle</td>
<td>02</td>
</tr>
<tr>
<td>Body</td>
<td>05</td>
</tr>
<tr>
<td>Parasymphysis</td>
<td>13</td>
</tr>
<tr>
<td>Symphysis</td>
<td>10</td>
</tr>
</tbody>
</table>

**TABLE 2: ETIOLOGY OF UN-DISPLACED MANDIBULAR FRACTURES**

<table>
<thead>
<tr>
<th>Etiology</th>
<th>Numbers</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Traffic Accident</td>
<td>10</td>
<td>40%</td>
</tr>
<tr>
<td>Fall</td>
<td>09</td>
<td>36%</td>
</tr>
<tr>
<td>Assault</td>
<td>03</td>
<td>12%</td>
</tr>
<tr>
<td>Sports</td>
<td>02</td>
<td>08%</td>
</tr>
<tr>
<td>Others</td>
<td>01</td>
<td>04%</td>
</tr>
</tbody>
</table>

The Frequency of complication using cortical bone screw IMF in closed reduction of mandibular fracture. Rate of complication was (3/25) 12% in which soft tissue infection was observed in (1/25) 4% and mental nerve injury was found in (2/25) 8% as presented in (Fig 1).

**DISCUSSION**

The main goals of successfully treating mandibular fractures are the reduction, fracture stabilization with achievement of proper occlusion and immobilization. In the process of fully satisfying this criteria, we have to use such a technique that will reduce the risk of percutaneous transmission of blood-borne diseases namely, HIV infection, and Hepatitis B,C virus infections, gingival health; Furthermore the operating room and general anesthesia time holds the importance in any procedure that may indirectly reduce the operating cost as well.

The previous literature shows that Arch-Bars, although commonly used but they take relatively longer time in application, also there is increased risk of needle stick injuries to surgical team, more time required to remove the arch-bars after treatment and oral hygiene maintenance is also difficult owing to multiple wires ligated and the complicated structure of the arch-bars itself, leading to the compromised periodontal health and leading to gingivitis.

On the contrary, ICBSF technique is much easier technically to remove, much less painful, less chances of puncture injuries. Oral hygiene can be maintained in a better way. It is also less bothersome to the patient in comparison to arch-bars that to keep a complex metal work in the mouth for 4 to 6 weeks.

In this study, we evaluated two complications that are soft tissue infection and nerve Paresthesia. The results show that most of the patients were in the adult age ranges, which are from 29 to 39 years of age, with least occurring in the old age groups that is from 47 to 60 years of age group. The reason could be the aggressive attitude of a younger age population in our society, leading to more motor vehicle and increasing number of motorcycle related accidents. This data holds similarity with a study performed by Gordon KF and Reed MF in which the same age group has the highest
incidence that is 29 years of mean age. Another observation of male predominance in our study is due to that female are protective and conservative approach towards traffic rules and driving attitudes or even walking as pedestrians and crossing the roads\textsuperscript{22}. The total complication rate that turned out to be 12% shows a very low incidence of complications.

This data supports the opinion of the author as using this technique is advantageous in those cases that fits the inclusion criteria in order to minimize the risks associated with other treatment options and maximizing the benefits on this technique owing to a low frequency of complications appearing in this study.

By the end of 6\textsuperscript{th} week the total soft tissue infection was recorded 4% which is similar to the data obtained from a study performed by Gordon KF and Reed JM\textsuperscript{8} Their study showed 7% of soft tissue infection, but another study was done by Vartanian AJ and Alvi A\textsuperscript{4}, \textsuperscript{14} that showed no infection of soft tissues. A reason for wide dissimilarity observed could be due to the patient compliance towards medicine and maintenance of oral hygiene is more in developed countries as compare to developing countries.

Mental nerve injury was recorded as 8% which is quiet similar to the same study held in Chicago, and they recorded mental nerve injury as 14%.\textsuperscript{4} Although we excluded the patients with pre-existing lower lip Paresthesia from our study, still this rate of complication shows that there could be other reasons of mental nerve injury before or during the procedure apart from the chances of iatrogenic nerve damage observed because majority of the screws placed were anterior to the mental foramen, therefore, chances are that the percentage includes the previous unrecognized nerve damage that was obscured in the initial phase of pain and swelling of the affected site, hence patient did not respond effectively to the method used for excluding those cases, also fracture reduction could damage the nerve by manipulation of the fractured fragments, or could be stretching nerve injury due to extensive lip retraction, the overall complication rate of our study was 12% which was similar with Vartanian AJ\textsuperscript{4}, Ansari K\textsuperscript{20} and Ueki K\textsuperscript{21} but our results were not similar with Roccia et al\textsuperscript{14} and Coburn et al\textsuperscript{18} according to their study the overall rate of complication was 5%.

\textbf{REFERENCE}