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ABSTRACT

Introduction. The aim of this retrospective study was to assess incidences and reasons for the removal of stainless steel miniplates over a 2-year period in patients with mandibular fractures who had received treatment at the Oral and Maxillofacial Surgery Unit, Ahmedabad Dental College And Hospital.

Material and Method. The medical records of all patients who underwent removal of bone plates after mandibular fractures were reviewed over a 2-year period (June 2013 to June 2015). Data concerning gender distribution, reason for removal, site of removal, and general medical factors were evaluated for each patient.

Results. Mandibular bone fractures in 114 cases were underwent open reduction and internal fixation using stainless steel miniplates and screws for osteosynthesis with that in 150 plates were fixated. From 114 cases, in 5 cases (4 males and 1 females), and from 150 bone plates, 8 bone plates were removed. Out of 8 boneplates, 3 were removed from mandibular symphysis region (37.4%), 3 from mandibular body region (37.4%), 1 from mandibular parasymphysis region (12.5%) and 1 from mandibular angle region. (12.5%).

Conclusions. Based on this study, the incidence of bone plate removal was relatively low. Mandibular symphysis and body was the common site of bone plate removal followed by mandibular parasymphysis and angle region. The most common cause for bone plate removal was infection/discharging sinus followed by pain, loosening of screws and paresthesia.

KEYWORDS: Osteosynthesis, Causes of removal of miniplates, Stainless steel plates.

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INTRODUCTION:

Injuries to the cranio- maxillofacial area affect a significant number of trauma patients, and consequences of trauma to this region can include any combination of dental, bone and soft tissue injury.

Osteosynthesis using bone plates and screws has been used in the facial region since last 19th century. In the maxillofacial region modern internal fixation devices have gained more popularity in 1978 when Champy adapted technique from Michelet et al. and now a days these devices form an important part in management of facial bone trauma ,and also orthognathic and mandibular reconstructive surgery. Today open reduction and internal fixation can be achived with a variety of different plating systems either using an intraoral approach or an extraoral approach.

The application of internal fixation in mandibular fracture cases is among the great advances that have been made in the field. The use of this technique has resulted many advantages like stable intra operative

mandibular position, the avoidance or reduce time of maxillomandibular fixation and long term stability for the patients. However, complications can arise. The most common complications include infection, malunion, paresthesia, iatrogenic piercing of the tooth roots or the mandibular canal, hardware exposure, pain, and plate palpation. 1

The rationale of the present study was to evaluate the causes of plate removal in mandibular trauma cases.

METHODOLOGY

All cases of mandibular fracture are managed at Oral And Maxillofacial Surgery Department, Ahmedabad Dental College And Hospital. Surgery was performed in standardised manner and patients were systematically followed up postoperatively according to prospective protocol. On admission detailed history and radiographic examination were done in all patients. In history age, gender, type of trauma and site of trauma with duration were recorded. Preoperative radiological evaluation was performed by using either Orthopentogram (OPG),

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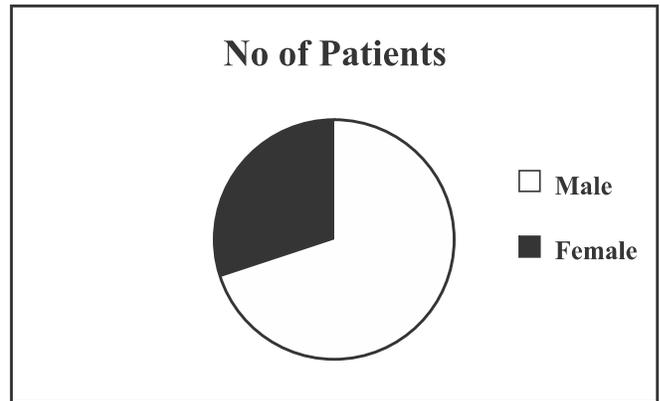
Occipitontal view, Jug handle view, Lateral oblique view of mandible, Posteroanterior view of mandible or Computed tomography scans depending on the patient's medical condition and type of trauma. Preoperative radiologic findings recorded were, status of dentition (dentate, partially dentate or edentulous), presence of the teeth in the line of fracture, fracture site, presence of additional mandibular fracture. The operation was performed under general anesthesia with nasotracheal intubation. Prior to open reduction eyelet wiring or archbar was given in all dentate patients for intraoperative maxillomandibular fixation, which was followed by post operative intermaxillary fixation ranging from one to six week depending upon age group and type of fracture. Stainless steel miniplates of 2.0 and/or 2.5mm were placed and fixed with stainless steel screws using intraoral and/or extraoral approach.

For post operatively antibiotic coverage cefotexime 1gm, metronidazole 100mg intravenously given for 5 days. Patients were advised to rinse their mouth three times daily with a 0.1% chlorhexidine until removal of dental wirings. Liquid diet was strongly recommended for 6 weeks postoperatively. Panoramic radiographs for evaluation of accuracy of surgical reduction and plate localization were taken before discharge. Planned followup interval were 1, 2, 6 and 12 weeks postoperatively. Postsurgical complications, defined as a need for further intervention, were recorded prospectively over time span of at least 6 months postoperatively.

RESULTS

A total of 150 stainless steel plates were placed in 114 patients to treat various mandibular fractures during the two years of study period. Out of these 150 plates, 8 plates were removed from 5 patients (5.33%) with Male to female ratio 4:1(Graph – 1). Out of 8 plates, 3 were removed from mandibular symphysis region, 3 from mandibular body region, 1 from mandibular parasymphysis region and 1 from mandibular angle region. 4 plates were removed due to infection/discharging sinus (n-4,50%), 2 plates were removed due to pain (n-2,25%), 1 was removed due to loosening of screws(n-1,12.5%) and 1 was removed due to paresthesia (n-1,12.5%). Infection/discharging

sinus (Figure-1,2) has been the most common cause of plate removal.



Graph 1 - Gender distribution of plate removal 80% male, 20% female

TABLE 1 SITES OF THE PLATE REMOVAL

Serial No	Site of plate removal from the mandible	No of plates	Percentage
1	Symphysis region	3	37.4%
2	Body	3	37.4%
3	Parasymphysis	1	12.5%
4	Angle	1	12.5%

TABLE 2 REASONS FOR THE PLATE REMOVAL

Serial No	Reasons	No of cases	Percentage
1	Infection/Draining sinus	4	50%
2	Pain	2	25%
3	Loosening of screws	1	12.5%
4	Paresthesia	1	12.5%



Figure 1: Discharging sinus due to infection in the parasymphysis of the mandible



Figure 2: Infected plate with screw in parasymphysis region

DISCUSSION

The basic orthopedic principles of bone healing and fixation biomechanics are applicable to cranio-maxillofacial reconstructive surgery for osteosynthesis. In general, however, the emphasis is less on providing mechanical stability to resist high levels of applied physiological forces than on establishing rigid immobilization both to obtain proper, stable anatomic configuration and to promote rapid healing.³ For each particular surgical application, there exists a variety of fixation techniques to achieve these goals.

Monocortical miniplate fixation is an accepted and reliable method of fixation for patients with maxillofacial trauma undergoing orthognathic surgery.⁴ Spiessel⁵ Michelete et al⁶ and Champhy et

al⁷ developed internal fixation systems that were designed to replace or supplement maxilla-mandibular fixation in the treatment of maxillofacial injuries and deformities.

The long term management of maxillofacial bone plates removal remains controversial, with some authors recommending routine removal and others in favour of retention unless removal is clinically indicated.

The plates most frequently used in oral surgery are made of Co-Cr alloys, but Ti and Ni-Cr alloys are also used. But consideration must be given to possible bio-incompatibility of the metals. It has been shown that release of metals occurs in vivo from all type of alloys used in implantology with local tissue reaction and some degree of cytotoxicity. Ti has been shown to be well tolerated in biological test and causes only weak local reaction in vivo.

In contrast to toxic effects, allergic, sensitizing responses are also seen which may impair healing and/or cause pain. Ions or complexes from the implants may also interfere with physiological functions in the body, causing symptoms that are less recognized as toxic or allergic effects.²

The severity of corrosion and the quantity of corrosion products released may depend, on the corrosion susceptibility of the implant material, on the tissue response to the implant and to the surgical procedures used during implantation. Very little information is available on the release of elements from the metal implants use for immobilization of mandibular fractures.

In the present study 150 plates were inserted during the two years study period. Out of these 8 plates were removed (5.3%)

Various international studies showed the following rate for plate removal

Rallis and Mourozic ⁸ (2006)	6.1%
Mosbah et al ⁹ (2003)	14%
Bhatt and Langford ¹⁰ (2003)	10%
Islamaoglu et al ¹¹ (2002)	7%
Mathew and Frame ¹² (1999)	5-40%
Tuovinen et al ¹³ (1994)	9%
Nakamura et al ¹⁴ (1994)	85

According to the present study the plate removal was predominantly done from male patients as compared to female with a male to female ratio of 4:1.

In the maxillofacial skeleton most of the plates were removed from the mandible. Mandibular body was the most common site of plate removal followed by parasymphysis, symphysis and angle region. As far as the cause of removal of the plate concerned infection/discharging sinus had been the most common cause of the plate removal (50%). In 25% of cases pain was the reason of plate removal and paresthesia (12.5%) and loosening of the screws (12.5%) had been the least common causes of plate removal. While in Rallis and Mourouzi 8 series of plate removal, infection had been the most common cause of plate removal .i.e, 24.3%. Infection rate in our patients is a bit on higher rate.

Miniplate removal from the maxillofacial skeleton has been a controversial issue in the past decades and there has been uncertainty in the past about the need to remove miniplates and screws routinely following satisfactory healing of jaw fractures. Cawood¹⁵ recommended routine removal of stainless steel miniplates 3 or 4 months after insertion. Iizuka and Lindqvist routinely removed stainless steel plates about a year postoperatively

because there was no grounds for leaving a foreign metal object in situ after the bone had healed. Moberg et al¹⁶ advised removal of nickel-chromium and cobalt-chromium alloy implants after satisfactory healing. Because metal elements released from the surface could induce allergic sensitization. It has, however, been suggested that titanium and titanium alloys are suitable for use of maxillofacial implants because their biocompatibility is superior to that of stainless steel. Rosenberg et al¹⁷ removed titanium miniplates only if the patient had symptoms, or if they infected or wound broken.

CONCLUSIONS

From this study it was concluded that routine removal of stainless steel miniplates is not required for mandibular fracture cases. But whenever required, infection/discharging sinus was the most common cause followed by pain, paresthesia, loosening of screws.

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