

Original Research

Study of complications in compound mandibular fracture reduction and stable internal fixation

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ABSTRACT:

Background: The introduction of new plating systems has facilitated in achieving a stable and rigid fixation of mandibular fractures and its reduction in the required period of postsurgical immobilization. Fractures of the mandible and their treatment are associated with a significant number of complications like Infection, malocclusion, malunion and neurosensory dysfunction. **Objectives:** Assessment of the post-surgical complications of compound mandibular fractures after treatment with open reduction and stable internal fixation. **Methodology:** This study was conducted on 60 patients who were treated for isolated mandibular fractures and were assessed for any complications after the treatment. The patients ranging in the age group between 20-50 years were included in the study. The study was done during the period from October 2017 to October 2018 at KIM'S Dental college Amalapuram, Andhra Pradesh. The patients were selected randomly and were grouped into two. One group comprising of 30 patients were treated with rigid fixation and the other group comprising of another 30 patients were treated with semi rigid fixation. **Results:** The study population consists of 22 (36.7%) male and 38 (63.3%) female. The mean age of Patients was 36.3 ± 5.93 years. The most common site of fracture was the angle of the mandible (48%) and the least was symphysis (12%). Maximum number of infections (20%) was seen in semi rigid fixation. 16.6% of malocclusion was seen in rigid fixation, malunion was seen in 16.6% rigid fixation whereas in 16% of rigid fixation cases sensory disturbances was observed. **Conclusion:** The intraoral approach exposes bone to a higher bacterial count and could contribute to the development of infection. No significant differences were observed in the incidence of infection between the two plating systems.

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INTRODUCTION:

The introduction of new plating systems has facilitated in achieving a stable and rigid fixation of mandibular fractures and its reduction in the required period of postsurgical immobilization.^{1,2} Literature shows that there is still a high incidence of post treatment complications associated with plating system. These complications are significant because of their associated morbidity and the potential expense of additional surgery and care.

There are different systems of internal mandibular fixation. Acceptable results were reported using the 2 mm miniplate system which originated from the work of Champy et al and Michelet et al who initially advocated the possibility of treating mandibular fractures by placing the miniplate with monocortical screws in the neutral axis of the mandible along with the dental arch as a tension band without requiring post-surgical intermaxillary fixation (IMF).^{3,4}

Fractures of the mandible and their treatment are associated with a significant number of complications like Infection, malocclusion, malunion and neurosensory dysfunction. There is high rate of infection when the time span between the time of fracture and the time of treatment exceeded the first few hours. However, despite these possible complications the internal fixation of the mandibular fractures has become the most accepted treatment.

According to a study by Luis AP asseri and Edward Ellis, fracture of mandibular angle is associated with significant number of post-surgical complications regardless of the method of treatment. Infection was the most common complication occurring solely or in combination with malocclusion and malunion.⁵

This prospective study has been carried out to assess the various complications that were encountered following

the treatment of compound mandibular fractures with open reduction and stable internal fixation.

AIMS AND OBJECTIVES:

Assessment of the post-surgical complications of compound mandibular fractures after treatment with open reduction and stable internal fixation.

MATERIALS AND METHODS:

This study was conducted on 60 patients who were treated for isolated mandibular fractures and were assessed for any complications after the treatment. The patients ranging in the age group between 20-50 years were included in the study. The study was done during the period from October 2017 to October 2018 at KIM'S Dental college Amalapuram, Andhra Pradesh

The patients were selected randomly and were grouped into two. One group comprising of 30 patients were treated with rigid fixation and the other group comprising of another 30 patients were treated with semi rigid fixation i.e. miniplates with 2mm monocortical screws. The area that was considered in the study was symphysis, parasymphysis, body of the mandible and the angle region which were non-infected, non comminuted and in subjects where IMF was not medically contraindicated. The time from injury to treatment was also recorded.

The treated patients were prospectively followed and examined for the postoperative complications such as infection, malocclusion, malunion and sensory disturbances. Patients were followed up at the intervals of one week, two weeks and six weeks and were evaluated for any of the above complications.

RESULTS:

Table 1: Age and Gender Distribution of the Study population

AGE	GENDER	
	MALE (%)	FEMALE (%)
20-29	10 (45.5)	17 (44.7)
30-39	7 (31.8)	14 (36.8)
40-49	5 (22.7)	7 (18.4)
Total	22(100)	38 (100)

Chi square = 0.231 p =0.89

The study population consists of 22 (36.7%) male and 38 (63.3%) female. The mean age of Patients was 36.3 ± 5.93 years.

Among male 45.4% of the mandibular fractures were seen in the age group of 20 to 29 years, 31.8% in the age group of 30-39 years and 22.7 % in the age group of 40-49 Years. In females Majority of them 44.8% were in the age group of 20-29 years, 36.8% between 30-39 years and 18.4% between 40 to 49 years. The p value was found to be statistically not significant.

Table 2: Distribution of Cause of Fracture among the Study population

CAUSE	Number	Percent
ASSAULT	19	31.6
RTA	34	56.7
SELF FALL	7	11.7

The majority of the cases of mandibular fractures were due to Road traffic accidents (56.7%), followed by assault (31.6%) and 11.7 % due to self fall or self-injury. The most common site of fracture was the angle of the mandible (48%) and the least was symphysis (12%).

Table 3: Distribution of Teeth in line of fracture according to site of fracture among the Study population

Site of Fracture	Teeth in the line of Fracture		Total
	YES	NO	
Angle	7 (24.1%)	22 (75.9%)	29 (48.3%)
Body	12 (63.2%)	7 (36.8%)	19 (31.7%)
Parasymphysis	3 (60%)	2 (40%)	5 (8.3%)
Symphysis	5 (66.7%)	2 (33.3%)	7(11.7%)
Total	27 (45%)	33 (55%)	60 (100%)

Chi square =3.52 ; p= 0.318

Out of the 60 cases nearly 45% of the cases had teeth in the line of fracture. Among the fractures at the level of angle 24.1% had teeth in the line of fracture , at the level of body 63.2% , at Parasymphysis 60% and at symphysis 66.7% had teeth in the line of fracture . The p value between the site of fracture and teeth in the line of fracture was found to be statistically not significant

Table 4: Distribution of Type of complications observed according to type of fixation among the Study population

Type of fixation	N	Infection	Malocclusion	Malunion	Sensory disturbance
Rigid	30	3(10)	5(16.6)	5(16.6)	5(16.6)
Semi Rigid	30	6 (20)	5(16.6)	3(10)	3 (10)
P value		>0.05	>0.05	>0.05	>0.05

Above tables show the different infection rates, malocclusion, malunion and sensory disturbances in rigid and semi rigid fixation. Maximum number of infections (20%) was seen in semi rigid fixation. 16.6% of malocclusion was seen in rigid fixation, malunion was seen in 16.6% rigid fixation whereas in 16% of rigid fixation cases sensory disturbances was observed. The results in both semi rigid and rigid fixation were not statistically significant.

Table 5: Distribution of Type of complication observed according to site of fracture among the Study population

Site of fracture	N	Infection	Malocclusion	Malunion	Sensory disturbance
Angle	29	6(20.7)	4(13.7)	5(17.2)	2(6.9)
Body	19	1(5.3)	3(15.8)	2(10.5)	6(31.6)
Parasymphysis	5	1(20)	2(40)	1(20)	0
Symphysis	7	1(14.2)	1(14.3)	0	0
p value		>0.05	>0.05	>0.05	>0.05

On comparing the site of fracture with the complication seen in the fractures at the site of angle of mandible had infection in 20.7% and malunion in 17.2% of the patients. Among the patients with fracture at the body of the mandible nearly 31.6% had sensory disturbance, 15.8% had mal occlusion 10.55 had malunion. At the level of Parasymphysis nearly 40 % had malocclusion , 20 % had infection and Malunion. Fracture at the level of Symphysis had infection and malocclusion in 14.35 of the cases.

DISCUSSION:

The history of the treatment and complications of facial bone fractures parallels the development of modern oral and maxillofacial surgery. HAUSMANN was probably the first (1886) to describe a method of mandibular fracture stabilization by means of a screw plate system.⁶ It becomes difficult to determine what factors are important in the development of postsurgical complications. The surgical approach has shown to play an important role in the process. The intraoral approach is expected to expose the bone to a higher bacterial count than an extraoral approach and thereby increasing the chances of infection.^{7,8,9} Leon A Assaeal stated that rigid internal fixation of mandibular fractures permit healing under stable conditions with immediate function. Moreover its application resulted in many technique related failures like infection (24%), tooth injury (7%) and nerve injury.¹⁰ Vedran Ugelsic, Misovireg conducted a study to evaluate the use of IMF, wire fixation and miniplate fixation. For each method the success of was evaluated with respect to surgical approach, fracture site and injury to treatment interval. Five basic parameters were used for evaluation of outcome: occlusion, appearance, mastication, duration of IMF and complications. Results showed that most successful treatment was achieved by miniplate fixation in symphyseal and angle fractures. IMF was indicated in mandibular body fractures and wire fixation has been shown to be the poorest choice for all sites due to the increased rate of malocclusion and infection.¹¹

Luis A Passeri and Edward Ellis through a retrospective study analyzed complications in patients with mandibular angle fractures treated during three year period with either closed reduction or nonrigid means of fixation combined with IMF. Infection was the most common complication occurring solely or in combination with malocclusion and malunion. The results of this study agree with the contention that the fracture of mandibular angle is associated with significant number of post-surgical complications regardless of the method of treatment.¹² TateyukiIizuka and Christian Lindquist monitored the sensory status of inferior alveolar nerve in patients with fractures in the region of the mandibular canal treated with rigid fixation preoperatively and 6 weeks postoperatively. Preoperative sensory disturbances correlated significantly only with the presence of fracture displacement. The results indicated that the sensory disturbance was caused by surgical procedure. In contrast to previous assumptions, displacement of the fracture and preoperative sensory status did not correlate with postoperative occurrence of paresthesia.¹³ This study revealed a significant difference in the incidence of infection between the two plating systems [8 %(rigid) vs. 16 %(semi rigid)]. Infection rates were seen to be higher with semi rigid fixation than in rigid fixation. Infection at the angle (18.75%) region was comparatively higher with semi rigid fixation. The study results were concurrent with the work done by Iizuka et al, according to whom the postoperative infection is not only the result

of contamination but can also be due to insufficient fracture stability as in the cases with semi rigid fixation.¹⁴ According to Lindquist et al, the nerve can be involved in traction and /or compression caused by manipulation of the fracture fragments during fracture reduction and stabilization. Extraction of tooth in line of fracture could also cause injury to the inferior alveolar nerve. In addition a bicortical screw placed near the mandibular canal might irritate or damage the nerve. The postoperative sensory deficits were possibly a result of the combined effects of all these factors.¹⁵

In this study only primary complications were analysed where late complications can also occur. These may be associated with plate removal, osteomyelitis, non union, joint dysfunction, hypertrophic scar formation, prolonged sensory disturbances that in some cases might develop into posttraumatic neuralgia. Such developments may not be recognized unless long term follow up is undertaken.

CONCLUSION:

Development of post-surgical complications after bone plating in mandibular fractures are due to various confounding variables associated with the osteosynthesis. The intraoral approach exposes bone to a higher bacterial count and could contribute to the development of infection. No significant differences were observed in the incidence of infection between the two plating systems. Further studies with long term follow up are required to recognize the late complications.

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