A COMPARATIVE STUDY OF TITANIUM AND STAINLESS STEEL PLATE IN TREATMENT OF MANDIBULAR FRACTURE

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Abstract

AIM: The aim of study was to evaluate the biocompatibility of Titanium miniplates over stainless steel miniplatesinmandibular anterior fracture.

Materials and Methodology: A total number of 20 patients with isolated mandibular fracture (single or multiple) without pre existing infection and comminution were selected. Patients were randomly divided into 2 equal groups of 10 patients each. Group A patients underwent osteosynthesis using TITANIUM miniplates while Group B patients underwent osteosynthesis using STAINLESS STEEL miniplatesFractures were treated under LA/GA by the same oral and maxillofacial surgeon . Pain (in Visual Analogue Scale score), swelling ,infection, Wound dehiscence, hardware failure was measured postoperatively on 1st week, 1st month and 3 month 6 month.

Results: In this study the mean age of patients in group A 30.7 and Group B 26.8 and the total mean age of all patients were 28.8.Out of total patients 60% patients were male and 30% patients were female .Road traffic accident was the most common cause of injury (55%). Right Parasymphysis alone was the commonest site of fracture comprising of 60% followed by left Parasymphysis (30%). Symphysis alone was the least common site of fracture (10%)**.** Majority of patients were treated by intraoral approach i.e 17 (85%) and remaining 3 (15%) by extraoral approaches. Majority of patients (75%) were treated under General anesthesia and 25% patient with local anesthesia. At 1 week interval, the mean pain score in Group A was 5.7±.674 and in Group B it was 6.30±.674. At 6 months none of the patients in Group A and Group B had pain,. At none of the time intervals, a statistically significant difference was observed between two groups ($p>0.05$). Infection was observed in only 2 (10%) patient in Group B .Statistically, there was no significant difference between two groups ($p>0.05$) at any time interval. Only 2 (10%) patient in Group B had hardware failure. Statistically, there was no significant difference between two groups at any time interval ($p>0.05$)**.** At 1 week interval, the mean swelling score in Group A was 15.02±1.36 and in Group B it was 17.4± 1.05 a statistically significant difference was observed between two groups ($p<0.05$). whereas on 1 month the mean swelling score in Group A was 11.9±1.57 as compared to 13.8±1.38 in Group B statistically significant difference was observed between two groups ($p<0.05$). From 3 month onwards the mean swelling score in Group A was 10.1±.87 and in Group B it was 11.29± 1.75. No statistically significant difference was observed between two groups ($p>0.05$). At 6 months the mean swelling score in Group A was 10.2±.918 and in Group B it was 10.4± 0.95. No statistically significant difference was observed between two groups ($p>0.05$).

Conclusions: In this study of short duration it is showed that the titaniumminiplates were more biocompatible when compared to stainless steel miniplates as evident by rate of infection, pain, swelling, wound dehiscence and hardware failure. but there is no statistical significant difference found between titanium and stainless steel miniplates in treatment of mandibular anterior fracture.

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INTRODUCTION-

In the era of increasing auto mobilization, industrialization and technology, the treatment of maxillofacial injuries has attained a prominent position. Road traffic accidents, which are becoming more and more frequent, particularly have brought about an increase in maxillofacial injuries. The head being the exposed part of the body is involved in highest percentage of injuries of all body regions. The other causes of maxillofacial injuries are interpersonal violence, falls, sporting injury and industrial trauma[1].

The facial skeleton can be roughly divided into three areas: the upper one third, the middle one third and the lower one third. The most common facial fractures are in the mandible (61%), followed by maxilla (46%), zygoma (27%) and nasal bones (19.5%). Injury to temporomandibular joint complex is a frequent finding. In other words we can say that the fracture of the mandible worldwide occurs more frequently than any other fracture of the facial skeleton[12].

Mandibular fractures are more common than middle third fracture (anatomical factor). It could be observed either alone or in combination with other facial fractures. Minor mandibular fracture may be associated with head injury owing to the cranio-mandibular articulation[3]. Mandibular fracture may compromise the patency of the airway in particular with loss of consciousness. It has been found that fracture of mandible can occur with frontal impact force as low as 425 lb (190 Kg) (Condylar fracture). Fracture of condyle is regarded as a safety mechanism to the patient. Frontal force of 800-900 lb (350-400 Kg) is required to cause symphysial fracture[4]. The symphysis and parasymphysis are one of the most frequently fractured sites in the mandible after the angle and the condyle making up 18-20 % of the mandibular fractures in adults[5].

Surgical treatment of mandibular fractures has advanced significantly, semi rigid internal fixation and early return to function have replaced the use of wire osteosynthesis and prolonged use of maxillomandibular fixation (MMF)[6]. In the past few decades, interest has increased in the different methods of open reduction and internal fixation (ORIF)[7]. Champys described the ideal lines of the osteosynthesis on which plates have to be applied to resist torsional forces[8]

Champy popularized the treatment of mandible fractures with miniplate fixation along the ideal lines of osteosynthesis. This is a form of load-sharing osteosynthesis to be applied in simple fracture patterns having an acceptable amount of bone stock[9]. The ideal line of osteosynthesis in the symphysis/parasymphysis/body region runs at the vertical height of the tooth apices from the canine region to the oblique line. This carries into the oblique ridge which turns into the anterior outer rim of the ramus. All biomechanical models developed to date have shown that two points of fixation (ie, two plates) provide much more stability than a single one. The basal triangle decreases the bone buttressing and interfragmentary support. This condition demands a degree of stability beyond pure load sharing. The superior border plate is positioned on the ideal line of osteosynthesis. The inferior border plate is located at the base of the mandibular symphysis/parasymphysis/body in a longitudinal field below the course of the mandibular canal[3]. Champy et al did a series of experiments and recommended osteosynthesis of parasymphysial fractures by fixation of two miniplates, one at the inferior border of the mandible and the other below the apices of teeth to act as a tension band, to neutralize the torsional forces generated during mastication and to allow optimal healing at fractured site[10,11,12].

MATERIALS AND METHOD

This prospective study was conducted on 20 trauma patients having mandibular anterior fracture without any systemic disease reported in the department of oral and maxillofacial surgery.

20 patients were randomly divided into two group of 10 patients i.e Group A and Group B.

Group A: Group A patients were treated by titanium miniplates.
Group B: Group B patients were treated by stainless steal miniplates.

Regardless of the groups all the patients were operated either under local anaesthesia or general anaesthesia with nasotracheal intubation .

INCLUSION CRITERIA:

1. Patient were selected randomly irrespective of age, sex, religion and socio economic status.
2. Patient were selected on the basis of site and location of mandible fracture including, symphysis, parasymphsis region.
3. Patient who were willing participate in this study.

EXCLUSION CRITERIA:

1. Participants who did not meet the criteria were excluded.
2. Pregnant and lactating women were not included in the study.
3. Medical compromised patient.
4. Comminuted Mandibular fracture.
5. Fractures others than specific sites.

METHODOLOGY

Surgical Approach for group A:

Erich's arch bars were placed and IMF was done under LA. After standard painting and draping the intraoral mandibular vestibular degloving approach was used. A curvilinear (vestibular) incision 5 mm apical to the mucogingival junction was given. The mentalis muscle was exposed and incised perpendicular and deep to the bone, leaving a flap of muscle attached to bone for closure. A full thickness mucoperiosteal flap was raised carefully keeping the mental neurovascular bundle intact. If the existing cut of lacerated wound was present extraorally, then that was used to expose the fracture site.

Reduction and Fixation

After obtaining adequate exposure of the fractured segments, the segments were manipulated with reduction forceps and anatomical reduction was achieved. After reduction of the fractured segments, intraoperative intermaxillary fixation was done to achieve the satisfactory occlusion. Fixation of the fractured segment was achieved by using two 2mm/2.5 mm (4 hole with gap and 2 hole with gap) conventional miniplate with 2.5x8mm/2.5x10mm or 2mm **x** 10mm/2x8 mm/2x6mm screws. Adequacy of fixation and occlusion were rechecked after placement of the conventional miniplate.

Closure

The area was irrigated and adequate hemostasis was achieved. The inner layers of the wound was closed using 3-0 Vicryl and mucosal layer was closed with 3-0 silk. Intermaxillary fixation was released and an adhesive pressure bandage was given extraorally.

Surgical Approach for group B:

Erich's arch bars were placed and IMF was performed under LA. After standard painting and draping the intraoral mandibular vestibular degloving approach was used. A curvilinear (vestibular) incision 5 mm apical to the mucogingival junction was given. The mentalis muscle was exposed and incised perpendicular and deep to the bone, leaving a flap of muscle attached to bone for closure. A full thickness mucoperiosteal flap was raised carefully keeping the mental neurovascular bundle intact. If the existing cut of lacerated wound was present then that was used to expose the fracture site.

Reduction and Fixation

Adequate exposure of the fractured segments was obtained. The segments were manipulated with reduction forceps and anatomical reduction was achieved. After reduction, intraoperative intermaxillary fixation was done to achieve the satisfactory occlusion and fractured segments were fixed with bone plates. Two 2mm/2.5 mm, miniplate were adapted and fixed with using screws (2mm x 8mm/2x10 mm/2x6 mm/2.5x8 mm/2.5x10 mm) 5mm above the lower border of mandible and a second 2mm , 2 hole with gap miniplate was adapated and fixed with using 2 screws (2mmx 6mm) above at the distance of 5mm from the lower miniplate. Adequacy of fixation and occlusion were rechecked after placement of the miniplates..

Closure

The area was irrigated and adequate hemostasis was achieved. The deeper layers of the wound was closed using 3-0 Vicryl® and mucosal layer was closed with 3-0 silk. Intermaxillary fixation was released and an adhesive pressure bandage was given extraorally.

Post operative care

Postoperatively I.V. antibiotics and analgesics used were Injection (Amoxicillin + Clavulanic acid) 1gm twelve hourly combined with Injection Metronidazole 500mg/100ml eight hourly and Injection diclofenac 75mg twelve hourly I.M. prescribed. Postoperative 5 days IV antibiotics were administered followed by 5 days of oral administration. The patients were put on Injection Dexamethasone 8 mg twelve hourly IV postoperatively and the dosage tapered down in the subsequent 2 days to decrease oedema and inflammation in the surgical site. If any subsequent infection occurred the antibiotics were changed according to the culture and sensitivity reports. patients were put on postoperative IMF. Elastics for a period of 3-7 days was placed for cases where occlusion was unsatisfactory postoperatively.

- Patients were adviced to take soft diet postoperatively for next 15 days.
- Extra oral Pressure dressing (DYNAPLAST) was placed post-operatively for 48 hours.

- Chlorhexidine mouthwash was advised to all the patients after 24 hours post-operatively for next 15 days.

Radiograph was taken postoperatively to check the adequacy of reduction and fixation. After discharge the patient were recalled on the 1st week, 1st month, 3rd month and respectively. On each appointment apart from the routine examination pain, postoperative swelling, infection, wound dehiscence, hardware failure.

Patient was evaluated post-operatively done under following parameters:

1. Pain: Pain magnitude were assessed by a visual analogue scale (VAS) (photo) with horizontal line that ran from (0 mm) "no pain" to(10 mm) "worst pain".
2. Swelling: For assessing the dimensions of swelling measuring tape was used to measure swelling in two dimensions only. The measuring points used were the edge of the tragus of the ear on the operated side to the corner of mouth and gonion to lateral canthus of eye of the operated side.
3. The distance between the tragus and the corner of mouth was added to the distance between the gonion and lateral canthus of eye over the maximum convexity of the soft tissues and the average of measurements was then recorded in centimeter (cm).
4. Infection: Present- if one of the following present-
   1.Redness
   2.Pus discharge
   3.Sinus

Absent-if all these indicators are absent.

4. Wound dehiscence: Present/Absent.
5. Hardware failure (exposure/fracture of plate): Present/Absent.

Follow up:

Clinically patients were evaluated 1 week, 1 month, 3 month, and 6 month

Radio grahically patients were evaluated postoperatively, 1 month, 3 month and 6 month for any malunion, nonunion and resorption around screws.

STATISTICAL TOOLS EMPLOYED:

The statistical analysis was done using SPSS (Statistical Package for Social Sciences) Version 20 statistical Analysis Software. The values were represented in Number (%) and Mean±SD.

RESULTS-

A total number of 20 patients with isolated mandibular fracture (single or multiple) without pre existing infection and comminution were selected. Patients were randomly divided into 2 equal groups of 10 patients each. Group A patients underwent osteosynthesis using TITANIUM miniplates while Group B patients underwent osteosynthesis using STAINLESS STEEL miniplates. The healing of fracture was assessed clinically and radiologically. Data was subjected to statistical analysis using SPSS version 20. Comparison of study groups based on post-operative evaluation of infection, malocclusion, pain, wound dehiscence and swelling was done using Independent T test; $p \leq 0.05$ was considered to be statistically significant.

Road traffic accident was the most common cause of injury (55%). Fall from height, assault and other etiologies comprised 15% of the study subjects each **(TABLE-1).**

The age of patients ranged from 18 to 65 years. Majority of patients were within 26 to 35 years of age (50%). The 40% of patient are in age group of 18 to 25 year of age. There were only 5% patients aged above 45-55 years. Mean age of the patients was 28.7 years. (**TABLE-2).** Majority 12(60%) of patients were males. Only 8 (40%) were female**. (TABLE-3).**

Right Parasymphysis alone was the commonest site of fracture comprising of 60% followed by left Parasymphysis (30%). Symphysis alone was the least common site of fracture (10%) (**TABLE-4).** Majority of patients were treated by intraoral approach i.e. 17 (85%) and remaining 3 (15%) by extra oral approaches. (**TABLE-5**) Preoperative occlusion was found to be deranged in all the patients in both the groups. The functional occlusion was achieved postoperatively in all the patients **(TABLE-6).** Study subjects were divided into two groups Group-A treated with titanium miniplates and Group-B with stainless steel miniplates (**TABLE-7).** Majority of patients (75%) were treated under General anesthesia and 25% patient with local anesthesia. (**TABLE-8)**

At 1 week interval, the mean pain score in Group A was 5.7±.674 and in Group B it was 6.30±.674 whereas on 1 month the mean pain score in Group A was 0.20±0.42 as compared to 0.40±0.51 in Group B. From 3 month onwards none of the patients in Group I had any pain whereas at 3 month the mean pain score in Group B was 0.1±0.31. At 6 months none of the Group A patients had pain, however, 2 patient of Group B

had mild pain (score 3). At none of the time intervals, a statistically significant difference was observed between two groups (p>0.05) (**TABLE 9).** Infection was observed in only 2 (10%) patient in Group B at 3 months. Statistically, there was no significant difference between two groups (p>0.05) at any time interval **(Table 10).** Only 2 (10%) patient in Group B had hardware failure at 3 months interval. Statistically, there was no significant difference between two groups at any time interval (p>0.05) **(Table 11).** At 1 week interval, the mean swelling score in Group A was 15.02±1.36 and in Group B it was 17.4± 1.05 a statistically significant difference was observed between two groups (p<0.05). whereas on 1 month the mean swelling score in Group A was 11.9±1.57 as compared to 13.8±1.38 in Group B statistically significant difference was observed between two groups (p<0.05). From 3 month onwards the mean swelling score in Group A was 10.1±.87 and in Group B it was 11.29± 1.75. No statistically significant difference was observed between two groups (p>0.05). At 6 months the mean swelling score in Group A was 10.2±.918 and in Group B it was 10.4± 0.95. No statistically significant difference was observed between two groups (p>0.05) (**TABLE-12).**

TABLE- 1: Present table showing the various Etiological factors for maxillofacial trauma.

Etiology	**Number of patients**	**Percentage**
Road Traffic accident	11	55
Fall	3	15
Assault	3	15
Other	3	15
Total	**20**	**100**

Table1: Shows the Distribution of study subjects based on Etiological factors for maxillofacial trauma. Out of the total of 20 patients mostly patients underwent RTA i.e 55 % followed by fall, assault, others 15%.

TABLE 2: Present table showing the age distribution among patients.

AGE	FREQUENCY	PERCENTAGE(%)
18-25	8	40
26-35	10	50
36-45	0	0
46-55	1	5
56-65	1	5
Total	20	100

Table2: shows the distribution of study subjects based on age distribution Out of the total of 20 patients mostly patients lies in age group of 26-35 followed by 40% in age group of 18-25 and 5% 46-65 group.

TABLE 3: Distribution of study subjects based on Gender

GENDER	FREQUENCY	PERCENTAGE
MALE	12	60
FEMALE	8	40
TOTAL	20	100

Table 3 shows the distribution of study subjects based on Gender. Out of the total of 20 subjects there were 12males and 8 females. The gender distribution in the study groups was 7 males, 3 females and 6 males, 4 females in groups A and B respectively.

TABLE 4 : Present table showing frequency distribution of fracture type.

TYPE OF FRACTURE	NO. OF PATIENTS	PERCENTAGE
LEFT PARASYMPHYSIS	6	30
RIGHT PARASYMPHYSIS	12	60
SYMPHYSIS	02	10
TOTAL	20	100

Table 4 shows the distribution of study subjects based on fracture site Out of the total of 20

subjects there were 12 patients with right para symphysis fracture followed by 6 patients with left para symphysis and 2 patients with symphysis fracture.

Table-5: Distribution of study subjects based on surgical approach

Approach	Group A	Group B
Intra-oral	9	8
Extra-oral	1	2

Distribution of study subjects based on the surgical approach used is shown in table 5; it was observed that intra oral approach was the most common surgical approach used. Intra oral approach was used in 9 and 8 study subjects in group A and B respectively. Extra oral approach was used in 1 subject in group A and 2 subjects in group B.

Table-6 : Comparison of preoperative and postoperative Occlusion arrangement.

Occlusion arrangement	Preoperative		Postoperative	
	Group A	Group B	Group A	Group B
Deranged	20	20	0	0
Intact	0	0	20	20

Table 6 shows the distribution of study subjects based on Occlusion arrangement. Out of 20 subjects occlusion was deranged preoperatively in all cases and angle class1 postoperatively.

Table- 7: Group Distribution among patient

GROUP	FREQUENCY	PERCENTAGE
A (Titanium)	10	50
B(stainless steal)	10	50
TOTAL	20	100

TABLE 8: Present table showing type of Anesthesia used among patient.

ANESTHESIA	NO.OF PATIENTS	PERCENTAGE
LOCAL ANESTHESIA	5	25
GENERAL ANESTHESIA	15	75
TOTAL	20	100

Table 8 shows the distribution of study subjects based on Type of Anesthesia used. Out of 20 subjects 75% of patients treated under General anesthesia followed by 25% of patients treated under local anesthesia.

TABLE 9 : Comparison of Pain (VAS scale) in Group A and B.

Follow up period	**Group A (n=10)**		**Group B (n=10)**		**'p'**
	Mean	**SD**	**Mean**	**SD**	
1 week	5.7	.674	6.3	1.52	0.062
1month	0.20	0.421	0.40	0.51	0.355
3 month	0	0	0.1	0.31	0.343
6 month	0	0	0	0	0

Distribution of study subjects based on the Pain assessment used is shown in table 10; it was observed that at none of the time intervals, a statistically significant difference was observed between two groups (p>0.05).

Table 10: Comparison of Infection in Group A and Group B

Time intervals	Group A (10=20)		Group B (n=10)		statistically significant difference	
	No. of patients with infection	%	No. of patients with infection	%	χ^2	P
1 Wk	0	0	0	0	–	–
1 mths	0	0	0	0	–	–
3 mths	0	0	0	0	–	–
6 mths	0	0	2	10	1.053	0.305

(Chi-square test)

On comparing the study groups based in occurrence of post-operative infection it was found that 2 subjects in group B presented with post-operative infection. This difference was statistically not significant (p>0.05).

Table 11: Comparison of Hardware Failure in Group A and Group B

Time intervals	Group A (n=10)		Group B (n=10)		Significance of difference	
	No. of patients with swelling	%	No. of patients with swelling	%	χ^2	P
1 Wk	0	0	0	0	–	–
1 mths	0	0	0	0	–	–
3 mths	0	0	0	0	–	–
6 mths	0	0	2	10	1.053	0.305

TABLE-12: : Comparison of Swelling in Group A and Group B.

Follow up period	**Group A (n=10)**		**Group B (n=10)**		**'p'**
	Mean	**SD**	**Mean**	**SD**	
1 week	15.2	1.36	17.4	1.05	0.000
1month	11.9	1.57	13.87	1.38	0.008
3 month	10.1	.875	11.29	1.759	0.72
6 month	10.20	.918	10.4	.950	.607

DISCUSSION-

Michelet *et al*. developed the concept of miniplates osteosynthesis in the late 1960s. In 1973, they published a report documenting the successful use of a small plate and monocortical screws for the treatment of mandibular fractures[43]. The original goal of miniplate osteosynthesis was to provide stable mandibular fracture reduction without requiring interfragmentary compression or maxillomandibular fixation. Studies performed in the early 1970s at the Group d' Etude en Biomecanique Osseuse et Articularie de Strasbourg demonstrated that the miniplate achieves this goal by neutralizing undesirable tensile forces while retaining favourable compressive forces during function[17].

Champy *et al.* (1978) elaborated on Michelet's work with the intraoral application of the monocortical miniplate for the treatment of mandibular angle fracture[13]. The reduced size of the miniplate system offers several advantages over the larger mandibular plates. Smaller incision and less soft tissue dissection are required for their placement. In addition, miniplates can often be placed intraorally, thereby avoiding an external scar. Because of the smaller size and thinner profile of the miniplates, they are less likely to be palpable, possibly reducing the need for subsequent plate removal. The smaller size of the miniplates may decrease the degree of stress shielding seen following rigid fixation; however this remains to be demonstrated. Finally because the screws are monocortical, the plates may be placed in the areas of mandible adjacent to tooth roots with minimal risk of dental injury[58].

The rationale of using miniplate plate in mandibular fracture is that the osteosynthesis achieved by plate screwed on the outer cortical plate is solid enough to support the strain developed by masticatory muscle. On the horizontal ramus, the masticatory forces create within the mandible causes elongation strain along the alveolar border and compressive strain along the lower border. Only the traction strains are injurious and have to be neutralized. The study of movements with regards to the mathematical model of mandible (Champy*et al.* 1978)[13.] Showed that at the level of horizontal ramus, there are almost only flexion movements, the value of

which increases from the front backwards. In the anterior part of mandible, anterior to first premolar, there are mainly moments of torsion. They are higher, when they are nearer to the mandibular symphysis. Therefore the principle of osteosynthesis is to re-establish, the mechanical qualities of the mandible, taking into account the anatomical conditions.

In the present study, it is seen titanium miniplates are effective in the treatment of mandibular fractures and overall complication rates are lesser as compared to Stainless steel miniplates although the difference is not statistically significant(.p>0.05)

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Clinical Application

Champy *et al.*[13](1978), Cawood JI (1985)[8], Ellis *et al.* (2002)[23] earlier used miniplates for the patient with mandibular fracture and found uneventful healing. The same finding was reported in our study. Intra-oral & extraoral approaches were used in all cases of monocortical plating (Champy *et al.*, 1978). A minimum of 2 screws, on each side of segment were used to prevent rotational movement of fractured fragment which was in correlation with study of Schroll (1927), Perren (1996), Spiessel (1976), Champy (1978). None of the patients were placed into postsurgical maxillomandibular fixation (Edward Ellis and John Graham 2002)[23].

According to estimates of Association of Automobile Manufactures of India (AIAMI) the number of automobiles on road has grown more than ten fold during the last ten years (Source : AIAMI website). Apart from this our centre is also tertiary centre where patients come from as far as neighboring states. In this study, road traffic accidents were found to be responsible for majority of the fractures i.e. 11 patients (55%), which also correlates with the study of Row & william[44] (1968), Kruger. [45](1964) and to Champy M et al[13], Ellis E III[23], Hussain S et al[28], Thapliyar GK et al[33], Devadiga A et al[34], Subhashraj K et al[32], Okoturo EM et al.[35]

In the present study the number of male patients was higher (80%) than the number of female patients (20%), which was in accordance with the study of Ellis *et al.* (2002)[23], Gabrielli *et al*[27]. (2003), Cawood JI (1985)[8]. They demonstrated the high incidence of facial trauma in males.

In our study mean age of patients was 30.4 years of group A & 26.4 years of group B and total mean age was 29 years. Similarly, mean age of the patients in other studies were in the same range like 28.6 years in the study of Guimond et al[30], 26 years in Bui et al study, 28 years in the study of Ellis E III[46]and 29 years in the study of Edward AL et al[36].

In our study showed in symphysis/parasymphysis fracture (alone-40% or in combination with angle or condyle-60%) frequently fractured site, usually in conjunction with other site (30 patients). This is in accordance with various study like as Ellis E III[46], Hussain S et al[28], Parmar et al[11] and Jain et al[37]. Boole JR et al[22] stated, the symphysis is one of the most frequent sites of mandibular fractures in children, and comprises about 20% of adult mandibular fractures. Symphysis/parasymphysis fractures with displacement are often fixed with 1 or 2 miniplates.

Preoperative occlusion was found to be deranged in all the patients in both the groups. Maxillomandibular fixation was done in patients, and functional occlusion was achieved postoperatively in all the patients. This study is incoherent with the study done by Edward Ellis and John Graham (2002)[32].

At 1 week interval, the mean pain score in Group A was 5.7±.674 and in Group B it was 6.30±.674 whereas on 1 month the mean pain score in Group A was 0.20±0.42 as compared to 0.40±0.51 in Group B. From 3 month onwards none of the patients in Group I had any pain whereas at 3 month the mean pain score in Group B was 0.1±0.31. At 6 months none of the patients in both the groups had pain, however. At none of the time intervals, a statistically significant difference was observed between two groups (p>0.05).

Infection was observed in only 2 (10%) patient in Group B at 3 months. Statistically, there was no significant difference between two groups (p>0.05) at any time interval**.**

Only 2 (10%) patient in Group B had hardware failure at 3 months interval. Statistically, there was no significant difference between two groups at any time interval (p>0.05)**.** At 1 week interval, the mean swelling score in Group A was 15.02±1.36 and in Group B it was 17.4± 1.05 a statistically significant difference was observed between two groups (p<0.05). whereas on 1 month the mean swelling score in Group A was 11.9±1.57 as compared to 13.8±1.38 in Group B statistically significant difference was observed between two groups (p<0.05). From 3 month onwards the mean swelling score in Group A was

10.1±.87 and in Group B it was 11.29± 1.75. No statistically significant difference was observed between two groups (p>0.05). At 6 months the mean swelling score in Group A was 10.2±.918 and in Group B it was 10.4± 0.95. No statistically significant difference was observed between two groups (p>0.05).

In Group A, no patient reported with infection at follow-up of 6 months.

In Group B, two (10%) patient reported with infection follow up (3 months) who presented with extra oral sinus and pus discharge near the fracture site. Pus culture and sensitivity test was done and specific antibiotic therapy started. After antibiotic therapy improvement was seen and pus discharge stopped. Infection was because of loosening of screw. This may be attributed to the high speed drilling of bone leading to bone necrosis at the bone and screw interface and ultimately loosening of screw. Cordey and co-workers stated that the friction between the screw head and plate is the main weak point of the entire fixation (Cordey*et al*. 2000). But there was no mobility at fracture site and fracture has been united, so plate was removed. This however did not affect our final result.

Infection rate seen in our study (i.e. 10%) is in correlation with the infection rate reported in the studies of Champy[13] (1978) - 3.8%, Cawood[8](1985) - 6%, Smith[47] (1991) - 2.5%, **TB, Bays RA** (1993)[48] - Our study does accordance with the study conducted by Ellis E III & Graham J[23], Pilania D et al[4] and Hussain S.[28]

There were 2 patients in Group B with Hardware failure. Rehman AU et al[49] study plate removal of 33.3% from the fracture osteosynthesis of mandible in the body region and 18.5% in parasymphyseal region. Over all complication rate in current study was low when compared with results of other cited studies.[3,10,11,17] One has to keep in mind that results depends much more on the characteristics of the fracture, compliance of the patient, absence of systemic disease, postoperative care, and adherence to partial postoperative functional restrictions.

Pilania D et al[4] stated that the reduced size of the miniplate system offers several advantages over the larger mandibular plates. Smaller incision and less soft tissue dissection are required for their placement, thereby avoiding an external scar. Because of the smaller size and thinner profile of the miniplates, they are less likely to be palpable, possibly reducing the need for subsequent plate removal. Also, because the screws are monocortical, the plates may be placed in the areas of mandible dentate regions with minimal risk of dental injury.

CONCLUSION-

The study was primarily aimed to evaluate the biocompatibility of titanium miniplates over stainless steel miniplates**.**

Based on the finding of our study, the following conclusions were derived.

1. The most common cause of mandibular fracture was found to be road traffic accident (55%).
2. Patients in the 26-35 years of age were the predominant age group presenting with mandibular fracture (50%).
3. Males were most commonly affected with mandibular fracture (60%).
4. Parasymphysis (right and left) alone was the commonest site of fracture comprising of 30%+60% respectively followed by symphysis (10%).
5. Swelling was seen in first week at 1st follow up in 6 (30%) patients of both Group A& Group B. Swelling subsided gradually in next follow-up in all patients.
6. Infection was observed in only 2 (10%) patient in Group B at 3rd month follow-up because of loosening of screw.
7. Pain decreases significantly at 1 week, 1month and pain was absent after 6 month In both the groups.
8. Hardware failure was observed in 2 (10%) patients in group B.
9. Wound dehiscence was observed in 2(10%) patients in group B.

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