EFFICACY OF THREE DIMENSIONAL TITANIUM MINIPLATES OVER THE CONVENTIONAL TITANIUM MINIPLATES OSTEOSYNTHESIS IN THE MANAGEMENT OF ANTERIOR MANDIBULAR FRACTURES

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CERTIFICATE

This is to certify that **Dr.M.MAHALAKSHMI,** Post Graduate student (2014-2017) in the Department of **Oral and Maxillofacial Surgery,** Adhiparasakthi Dental College and Hospital, Melmaruvathur – 603319, has done this dissertation titled **"EFFICACY OF THREE DIMENSIONAL TITANIUM MINIPLATES OVER THE CONVENTIONAL TITANIUM MINIPLATES OSTEOSYNTHESIS IN THE MANAGEMENT OF ANTERIOR MANDIBULAR FRACTURES."** Under our direct guidance and supervision in partial fulfilment of the regulations laid down by the Tamilnadu Dr.M.G.R Medical University, Chennai – 600032 for MDS., (Branch-III) **Oral and Maxillofacial Surgery** degree examination.

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DECLARATION

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I hereby declare that no part of the dissertation will be utilized for gaining financial assistance or any promotion without obtaining prior permission of the Principal, Adhiparasakthi Dental College and Hospital, Melmaruvathur – 603319. In addition, I declare that no part of this work will be published either in print or in electronic media without the guides who has been actively involved in dissertation. The author has the right to reserve for publish work solely with the permission of the Principal, Adhiparasakthi Dental College and Hospital, Melmaruvathur – 603319

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ABSTRACT

BACKGROUND:

There are many studies in the treatment of mandibular fractures that have been published. The two concept of osteosynthesis are semirigid and rigid fixation. To overcome the shortcomings of above techniques , three dimensional miniplates has been emerged. This study was designed to evaluate the efficacy of 3D titanium miniplate over champys miniplate in anterior mandibular fratures.

AIM:

The purpose of the study was to evaluate the clinical efficacy of 3-dimensional titanium miniplates in the management of anterior mandibular fractures by pain, occlusal stability, post operative infection, postoperative fragment rigidity, wound dehiscence and the outcomes were compared with that of conventional titanium miniplates

MATERIALS AND METHODS:

This study was done in 20 patients with anterior mandibular fractures. Group A consists of 10 patients in whom 3D plates were used for fixation while in Group B consists of other 10 patients, 4 holes Champy's straight plates were used.The efficacy of 3D miniplate over Champy's miniplate was evaluated

RESULTS:

There was significantly greater pain in Group B patients at 1stweek and 1st month when compared to Group A patients(Mann-Whitney U test). There was significant variation in pain between interval across each categories of Group A and Group B(kruskal-wallis test).The post operative infection, neurological deficit was statistically insignificant(chi-square test).There was no case presented with wound dehiscence. During postoperative evaluation occlusal stability and fragment rigidity were good in all 20 patients.

CONCLUSION:

The results of this study suggest that patients treated with3D plates showed a lesser post operative pain and carries low infection rate and lesser area of exposure.

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3D	: Three dimensional
DCP	: Dynamic Compression Plate
EDCP	: Eccentric Compression Plate
IAN	: Inferior alveolar nerve
IMF	: Inter Maxillary Fixation
OPG	: Ortho Pantamogram

INTRODUCTION

Trauma is defined in general as “a physical force that results in injury”. Injuries to the maxillofacial region are clinically highly significant as they affect both function and esthetics. There is often a psychological aspect associated with the injury secondary to patients concern regarding permanent scarring and subsequent facial disfigurement.

Fractures of mandible are most common bone injuries because of its anatomical prominence and exposed position in the facial skeleton, accounting for 23% - 97% of all facial fractures. The most common mechanisms of injury to mandible include motor vehicle crashes, interpersonal violence, and sport injuries. The body and posterior region of the mandible are more prone for fractures.

The first description of mandibular fractures dated to the 17th century BC in Edwin Smith Papyrus, bought by Smith in Luxor in 1862 and later translated by Breasted. Since the ancient time of Hippocrates, the principle for treating mandibular fractures has always been repositioning and immobilization of bony fragments. Hippocrates taught the methods of immobilizing a fractured mandible, the ends of the fracture were reduced by hand and the fracture site was immobilized by gold or Lenin threads tied around the adjacent teeth. In addition to this intraoral immobilization, he recommended extra oral

fixation by strips of Carthaginian leather glued to the skin and the ends were tied over the skull.

About 500BC, the Indian surgeon Sushruta wrote a treatment on operations. He has recommended using complicated bandaging and bamboo splints covered with a mixture of flour and glue that were applied under the chin to immobilize the fractures for fractured jaws.

During the period of 12th to early 18th century, the barber surgeons used the classical treatment of fractures. After manually resetting the fractured jaw, ensuring that the normal occlusion was maintained , and the mandible was immobilized by bandages. Various modifications of bandages were used to immobilize the lower jaw by binding it to the upper jaw with a bandage that passed under the chin and over the head.

The 18th century saw a more scientific approach emerged in medicine as a result of advances in the knowledge of anatomical and physiological processes. The new era of scientific dentistry was ushered in by the publication of a book in 1728 by Pierre Fauchard, entitled Traite de chirurgiedentaire. He is credited with name of being the “Father of modern dentistry”. At the turn of the 19th century, there was a shift in the management of fractures of the jaw away from general surgeons to dental surgeons, because the management of fractures depend on manipulating the dentition. Modern dental

materials facilitated the construction of dental splints. These were the domains of the dental surgeon. Many refinements were introduced by improving intraoral and extraoral splints or the use of either trans-mandibular or circum-mandibular wire fixation to immobilize the mandibular fracture directly or indirectly.

In 1826, Rodgers did the first open reductions. He inserted wire sutures in a case of pseudarthrosis of the humerus. Baudens is credited with being the pioneer of wiring mandibular fractures, in the as early as 1840 he used circumferential wires to immobilize an oblique fracture. Soon after (1847), Buck has implied method of drilling holes in adjacent segments and wiring them together and applied wire sutures directly to the fractured bone . Modifications of this technique by using two double wires (Rose) and the figure-of-eight wire suture (Raas) improved stability. In 1866, Thomas Gunning designed the 'Gunning splint'. In 1871, London dentist Gurnell Hammond developed a wire ligature splint for immobilisation of the mandible. In 1887, Thomas L. Gilmer reintroduced intermaxillary fixation and the use of arch bars for mandibular fractures. Dr. Angle (1890) introduced an alternative to wiring the segments of the jaw. On either side of the fracture,it consisted of banding teeth, and then bound in the bands together by wire to immobilize the fracture. Robert H. Ivy (1922) modified the another technique of intermaxillary fixation by creating a loop (eyelet) in the wire ligature.

Modern traumatology started with the development of Osteosynthesis. Generally, mandibular fractures are treated surgically, either by rigid or semi-rigid fixation. These two techniques that reflect almost opposite concept of mandibular osteosynthesis. Rigid fixation is promoted by the Arbeitsgemeinschaft fur Osteosynthesefragen (AO) / Association for the Society Internal Fixation (ASIF). In this concept, compression, tension, torsion and shearing forces, which develop under functional loading, are neutralized by thick solid plates fixed by bicortical screws. Dynamic Compression Plating (DCP) and Eccentric Dynamic Compression Plating (EDCP) plates were used in this concept.

Miniplate osteosynthesis hypothesis was first introduced by Michelet et al. in 1973, and in future developed by Champy and Lodde in 1975. The Champy's method of semi rigid fixation uses easily bendable monocortical mini plate along an 'ideal osteosynthesis line'. The developing forces are neutralized by masticatory force that produces a natural strain of compression along the lower border of the mandible. Above two techniques are associated with disadvantages, of those semi- rigid fixation is a doubt whether this fixation is sufficiently stable for fractures that cannot be adequately reduced.

During the following two decades a large number of modifications of plates were described, which led to the present use of osteosynthesis. Today, for mandibular reconstruction many different

systems are available, ranging from the heavy compression plates to low profile plates for midfacial fixation. The thickness of plates ranges from 0.5 to 3.0mm and are made either of stainless steel, vitallium or titanium. Very Recently, biodegradable, self-reinforced polylactide plates and screws have been used for the internal fixation of fractures of the mandible with good results. A major breakthrough in this field was achieved when "Mosthafa Farmand in 1992 developed a new miniplate system which takes advantage of the biogeometry to provide stable fixation and he called it a 3-dimensional plating system. The concept behind these plates is that of a geometrically closed quadrangular plate, secured with bone screws creating stability in all three dimensions. Concurrently, changes in materials and designs used for plates and screws have also occurred at a staggering rate. Depending upon the individual manufacturer's discretion, different systems with different metals have been used to make plates and screws. The preference to use titanium in the manufacture of 3-D plates was obvious due to its excellent properties like resistance to corrosion, good biocompatibility, pliability and artifact free images in CT scans and MRI scans.

The shortcomings of rigid and semi-rigid fixation has the reason that for the development of 3- dimensional (3D) miniplates consist of two 2-hole miniplates with gap which are interconnected by vertical cross struts. The quadrangle geometry of plates provides a good

stability in three dimensions of the fracture site since it offers good resistance against torque forces.

The aim of this study was to use the 3-D titanium plates and screws as per the specifications of Mostafa Farmand. The 3-D plating was performed in10 patients with anterior mandibular trauma and 10 patients with conventional titanium miniplates. This study was to evaluate the clinical efficacy of 3-dimensional titanium miniplates over the conventional titanium miniplates by pain, occlusal stability, postsurgical infection, postoperative fragment rigidity, wound dehiscence, neurological deficit and the outcomes will be compared with that of conventional titanium miniplates .

The indications, advantages, disadvantages, techniques and complications of these plates are substantiated with case reports.

AIM AND OBJECTIVES

1. To evaluate the clinical efficacy of 3-dimensional titanium miniplates in the management of anterior mandibular fractures by pain, occlusal stability, post operative infection, postoperative fragment rigidity, wound dehiscence, operative time and the outcomes will be compared with that of conventional titanium miniplates
2. To discuss about various advantages and disadvantages of three dimensional titanium miniplates in Anterior Mandibular Fractures.
3. To emphasize on a simple and less time consuming technique in Semi Rigid Internal fixation of symphysis and parasymphysis region.
4. To realize the importance of shape and design (Architect) of the three dimensional plate and the role it plays in the stabilization of mandible and comparing with conventional titanium champy's miniplates.
5. To explore the overall differential outcome of three dimensional plating system over the conventional champy's titanium miniplates.

GENERAL REVIEW

The goal of mandibular fracture is to reestablish normal occlusion and masticatory function with minimal complications (Gerlach et al., 2007). Conservative management was the earlier option for immobilization of the mandible. it has been achieved by dental wiring, arch bars, cap splints and gunning splints. later surgical treatment has been developed in the treatment of mandibular fractures both intra oral or extra orally with transosseous wiring[schwenzes 1982],lag screws[nider dellmann 1982],or bone plates [schilli 1975,spiessel 1976].

In open osteosynthesis technique ,there was a trend change from rigid fixation in 1968 to semi rigid fixation in 1973. Miniplate osteosynthesis was first introduced by Michelet et al in 1973, Michelet has started experimenting with monocortical non – compression miniplates. he has used small ,easily bendable,non compression miniplates anchored with monocortical screws for the treatment of the mandibular fractures.

Miniplate osteosynthesis was later popularized by the Champy and Lode in 1975. he has used cantilever beam model to show that physiologically coordinated muscle function produces compressive forces at the lower border and tension force at the upper border of the mandible , plates placed along the ideal lines of osteosynthesis

to obtain optimal fixation and stability. These plates were small and screws are monocortical to avoid injury to inferior alveolar nerve and dentition.

3D miniplates concept was first developed by Mostafa Farmand in 1992 . According to Farmand 3D plates resembles geometrically closed quadrangular secured with bone screws so that stability can be achieved by its configuration through the thickness can be reduced to 1mm. The 3D plates are designed by large free areas between the plate arms and minimal dissection is needed for these plates so that blood supply to the bone is not compromised.

The basic form is quadrangular with 2x2 hole square plate and 3x2 or 4x2 hole rectangular plate. A transbuccal or intraoral approach was used to insert the screws(Farmand,1995). 3D plates when compared to conventional miniplates 3D plating system uses fewer plates and screws, so that it uses lesser number of foreign material. It offers good resistance against torque forces as compared with conventional miniplates and improved biomechanical stability .The operative time period for adaptation and fixation was less and reduces the cost of the treatment as described by Zix et al, Hughes Lieger and Lizuka and Farmand .

Titanium is the metal of choice for fixation plates since it is the most biocompatible implant material. it has the minimal adverse reactions, the indication for removal of the titanium miniplates can be defined by individual patient's complaints.

3D plates has a compact design and easy to use. it holds the fracture segments rigidly in the way resisting the 3- dimensional forces namely shearing, bending and torsional forces. In Farmand's study on 3D plates, 90 plates were placed in the mandible and none of the patients required additional fixation post-operatively (Farmand, 1995).

REVIEW OF LITERATURE

Maxime Champy et al (1978)[1] used modified Michelet's (1973) technique of mandibular osteosynthesis, which consists of monocortical juxta-alveolar and sub-apical osteosynthesis, without compression and without intermaxillary fixation. This technique can be used in many types of mandibular fracture, single or multiple, associated or isolated, except in the case of a fracture of the condylar neck and in the presence of pre-existing infection.

K.Ikemura et al (1984)[2] performed biomechanical tests in 18 adult male mongrel dogs in order to compare rigidity of the fixation and resultant bone healing of monocortical versus bicortical osteosynthesis. The biomechanical tests revealed that bicortical osteosynthesis was superior to monocortical in the rigidity of the fixation. However, the results during removal of the plate at 14 weeks postoperatively showed that there was no apparent difference between the two. They suggested that monocortical osteosynthesis is useful in the treatment of mandibular fractures, except for fractures with bone defects and comminuted fractures.

G.Szabo et al (1984)[3] reported that champy's plates are mostly accepted for the fixation of simple mandibular fractures, middle face fractures and after LeFort I osteotomies. They extended their use in case of complicated mandibular fractures, fixation of bone graft, and

immediate reconstruction following removal of mandibular tumours. Main advantages with champy plates are they are small, flexible, easily adaptable and monocortical screws allow them for rapid surgical application.

J.I.Cawood et al (1985)[4] evaluated miniplate osteosynthesis by comparing miniplates versus intermaxillary fixation. He observed that the rate of complications like malocclusion, infection, sensory disturbance were higher in the miniplate group but the miniplate group had an advantage of early recovery of normal jaw opening and body weight.

Ikemura et al (1988)[5] used miniplates in the treatment of 66 patients with facial bone fractures. In simple fractures of the dentulous mandible, monocortical osteosynthesis was performed. Extensive fractures with marked displaced fragments were treated with bicortical osteosynthesis using plates. They reported complications like wound dehiscence and plate exposure in five patients, one patient developed a gingival abscess and two patients reported with malocclusion.

Bjorn Johansson et al (1988)[6] reported successful treatment of 42 potentially infected fractured mandibles with miniplates. Primary healing occurred in 76% of the patients and in 24% of the patients postoperative infection persisted and additional treatment became necessary. They concluded that internal fixation with miniplate is well

tolerated in infected lines if the main principles (proper curettage, rigid osteosynthesis and specific antibiotics) are followed.

Gregory Arthur & Berardo et al (1989)[7] gave a simplified method of maxillo-mandibular fixation. They introduced the use of bone screws for achieving intermaxillary fixation. According to them, this method could be used as the sole means of fracture treatment. Thus in the early and mid 20th century, intermaxillary fixation methods became very popular and universally accepted treatment modality of fractured mandible.

W.R.Smith (1991)[8]concluded that the complication rates of delayed osteosynthesis were similar to those of early osteosynthesis. He based his findings on a retrospective study of 51 fractured mandibles. However, the controversy of compression and non- compression methods of fixation did not resolve.

M. Farmand (1993)[9] developed a new type of plating system called as a 3 dimensional plating system which was used for 3-5 years in 140 patients in maxillo facial surgeries. He concluded with better results than the other system and the complication rate was also very low.

Hayter et al (1993)[10] presented a review of application of miniplates in maxillofacial trauma. The advantages are highlighted particularly in relation to functional considerations, jaw function, weight loss, and

pulmonary function. Miniplates are considered to be the best treatment for patients with maxillofacial fractures.

Seiji Nakamura et al (1994)[11] conducted a study over postoperative complications of delayed osteosynthesis with stainless steel mini plates in 110 patients with mandibular fractures. In 91 patients they removed plates once sufficient bony union was obtained, healing conditions and surrounding tissues were examined and they didn't show any serious problems. So short term retention with miniplates will be effective and suitable for osteosynthesis of mandibular fractures.

Joerg Wittenberg (1994)[12] evaluated the three-Dimentional plating system for the fixation of mandibular angle fractures. He concluded that 3-D plate provided an adequate stability for mandibular angle fracture with a reasonable level of success.

R. A. Loukota et al (1995)[13] conducted an invitro study of the effect of compression and tensile forces on different types of maxillofacial miniplates. In flatwise bending tests there was a wide scatter of values of bending stiffness and ultimate load. Repeated bending the plates reduced their stiffness, particularly in the continuous holed plates, and increased their ultimate load to failure. The data generated in the current study may assist the surgeon in deciding which type of plate to select for a particular clinical situation.

M.A. Kuriakose et al (1996)[14] conducted a study to compare the internal fixation of mandibular fractures using either rigid 2.7mm AO/ASIF plates or mini-plates over a three year period. They concluded that both plating systems were successful in restoring functional occlusion. Rigid plates required an extra-oral approach with the risk of facial nerve damage. Incidence of infection and plate removal was higher with mini plate. A better treatment outcome for angle and comminuted fractures was observed with rigid plates.

T.F.Renton et al (1996)[15] in 205 patients conducted a retrospective study to assess, adherence to Champy's principles in placement of miniplates in mandibular fractures minimises morbidity. The patients were assigned into three groups according to the type of fixation; 83 patients had miniplate fixation according to Champy's principles, 40 patients had miniplate fixation ignoring Champy's principles, 82 patients had transosseous wire (TOW) fixation. The results showed that the preoperative variables were statistically similar in all groups. The postoperative variables indicated a statistically higher complication rate for the transosseous wire group compared with the miniplate groups, and morbidity was reduced in the group following Champy's principles. The morbidity rates in this study compare favourably with other studies even though the patients in this study had a much higher incidence of multiple fractures. Titanium miniplates appear as effective as miniplates constructed of other materials used in previous studies, especially when Champy's principles are followed.

J.Tames et al (1996)[16] conducted an invitro three dimensional studies of loads across the fracture for different fracture sites of mandible. In a three dimensional model, bending and torsion moments and shear forces were compared for five mandibular fractures in angle, posterior body, anterior body, canine and symphysis region. They concluded mandibular fractures can be divided into 2 groups with one group consisting of angle and posterior body fractures, other group consists of anterior body, canine and symphysis fracture with similar load patterns across the fracture.

J. M. Wittenberg et al (1997)[17] carried out the biomechanical study to investigate the effectiveness of fixation devices of simulated angle fractures in sheep mandibles. The fractures were stabilized by a Leibinger 8-hole three dimensional (3-D) plate, a Synthes eight-hole mesh plate, and a Synthes six-hole reconstruction plate with 2.0-mm and 2.4-mm mono and bicortical screws. Each mandible was tested in bending (class III cantilever model). The bone mineral density of the mandibles was measured by computed tomography scan. The Leibinger 3-D plate showed plate deformation in bending of >230 N. None of the plates showed failure in the bone/screw interface. The gap and displacement values for the mesh and 3-D plates were comparable to those of the reconstruction plates. These results indicate that a 3-D or mesh plates can be used for fixation of mandibular angle fractures.

A.M. Fordyce et al (1999)[18] conducted a retrospective study and reported that intermaxillary fixation was not usually necessary to reduce mandibular fractures. Sixty-six patients had their fractures reduced manually to obtain anatomical reduction without the use of intraoperative IMF. Forty-nine were treated conventionally using intraoperative IMF. The two groups were broadly similar in severity and type of fracture. IMF was not used routinely postoperatively. Overall there were significantly fewer occlusal discrepancies in the early postoperative period in those patients treated by anatomical reduction (6/66 compared with 16/49, $P = 0.002$) but there was no difference in the final outcome of the occlusion between the two methods of reduction.

Robert. H.Mathong et al (2000)[19] conducted a retrospective study to review of nonunion of mandibular fractures from 1994 to 1998. The adequacy of reduction and appropriateness of this fixation technique were evaluated by analysis of post-operative imaging studies. In 906 patients with 1,432 mandibular fractures, there were 25 nonunion complications. They concluded that incidence of non- union appears to be unchanged overtime regardless of varied and advanced methods of fixation and reduction.

Pedro M.Villarreal et al (2000)[20] evaluated mandibular fracture repair after maxillomandibular fixation, rigid internal fixation using computer assisted denstometric image (CADIA) system. In 52 patients, 32 were

treated by MMF and 20 by RIF. Optical density of the bone around the fracture line was assessed and concluded that use of RIF results in more rapid bone mineralization.

Ashraf F. Ayoub et al (2003)[21] conducted study to compare dimac wires with arch bars for IMF. They stated that mean time required for the application of dimac wires was significantly less than that of arch bar. Needle stick injuries were significantly less with dimac wires. Oral hygiene maintenance will be difficult with arch bars and there will be periodontal damage.

Marisa A.Cabrini Gabrielli et al (2003)[22] reviewed the use of 2.0mm miniplates for the fixation of mandibular fractures. 191 patients who experienced a total of 280 mandibular fractures that were treated with 2.0mm miniplates were reviewed. Miniplates were used in the same positions described by AO/ASIF. No intermaxillary fixation was used. The overall incidence of complications, including infections was similar to those described for more rigid methods of fixation.

Leslie R. Halpern et al (2004)[23] conducted a study to document preoperative neurosensory changes in inferior alveolar nerve treated for mandibular fractures. 61 patients with 97 fractured sites were treated. Abnormal preoperative IAN neurosensory examinations were documented in 81% of the fractured sites and in (85%), the IAN neurosensory score was unchanged or improved after treatment. They

concluded that open reduction and internal fixation, fracture displacement of 5 mm or more, and a normal preoperative IAN neurosensory examination were associated with an increased risk for deterioration of the IAN neurosensory score after treatment of mandibular fractures.

Fabio Roccia et al (2005)[24] carried out study over the intermaxillary fixation using intraoral cortical bone screws. Sixty-two patients with mandibular fractures, treated by intermaxillary fixation using these screws, were evaluated. Complications like iatrogenic damage to dental roots (1.5%), 4.9% of the screws were covered by oral mucosa and 1.9% were lost. Malocclusion was observed in one patient (1.6%) and lack of consolidation of a displaced fracture of the mandibular body in another patient.

Andrew JL et al (2005)[25] conducted a survey to suggest an evolution in the management of mandibular angle fractures. According to them, only six percent (6%) of surgeons preferred the use of 3-D plates in angle fracture. These unique plates are composed of linear, square or rectangular units and may theoretically provide increased torsional stability. They typically used this plate in symphyseal/ parasymphyseal fractures, which are under a great degree of torsional strain than other areas of mandible.

Claude et al (2005)[26] carried out a retrospective evaluation of 37 patients with non-comminuted mandibular angle fractures fixate with transorally placed curved 2.0-mm 3-dimensional strut plates. Two patients developed infections requiring plate removal and re-application of fixation. Both of these patients had a molar in the fracture line that was left in place during the first operation. One patient developed a mucosal wound dehiscence without consequence. They concluded that this plate is low in profile, strong yet malleable, facilitating reduction and stabilization at both the superior and inferior borders. The infection rate of 5.4% found in this study compares favourably with that seen with reconstruction plates

R. Mukerji et al (2006)[27] had done a historical perspective study on principles of the treatment of mandibular fractures from the ancient period to the recent past. Splinting of teeth is an old way of immobilising fractures but modern biomaterials has changed clinical practice towards plating the bone and early restoration of function. He presented a brief historical overview of techniques and systems that have been used for stabilisation of mandibular fractures.

Zhi Li et al (2006)[28] conducted a retrospective review to investigate the characteristic and contributing factors of mandibular fractures in a period of 10 years. A total of 135 abnormal unions were identified within the 84 patients, 44 patients suffered more than one abnormal union, mostly in condyle. Abnormal union is associated with patient's

age and gender, severity and type of original trauma, and fracture site, social, economic and cultural factors in china.

Alkan. A et al (2007)[29] evaluated the biomechanical behaviour of different miniplate fixation techniques for the treatment of fractures of the mandibular angle. Twenty sheep hemi-mandibles were used to evaluate 4 different plating techniques. The groups were fixed with Champy's technique, biplanar plate placement, monoplanar plate placement, and 3-dimensional curved angle strut plate placement. The biomechanical behaviour of the groups for the forces (N) that caused displacement of 1.75mm was compared using the Instron software program and displacement graphics. The study demonstrated that 3D strut plate's technique had greater resistance to compression loads than the Champy's technique.

Gunter Laur et al (2007)[30] used new delta shaped 3-Dimensional plate for transoral endoscopic-assisted osteosynthesis of condylar neck fractures for minimizing the risk of damaging the facial nerve. A total of 16 patients with 19 condylar neck fractures and 3 bilateral fractures were treated by this method. 6 months after operation average mouth opening is 41mm, radoigraphically fracture alignment was good in 15 cases. No plate fracture or bending was noticed. In 3 patients loose screws were found on plate removal.

Hasan husnu korkmaz (2007)[31] had done a study by finite element model to formulate biochemical justification for stable fixation on a fractured mandible. Miniplates were investigated and recommendations were made about locations, orientation, type, selection, number, position and type of plate system. Longer plate in superior position and shorter plate in inferior position produced a more stable condition. In the study, results were obtained on the choice of particular size, thickness, design or configuration for application.

J. Zix et al (2007)[32] conducted a study to evaluate the usefulness of 3-D miniplate for open reduction and monocortical fixation of mandibular angle fractures. The mean operation time from incision to wound closure was 65 minutes. Two patients had a mucosal wound dehiscence with no consequences. None developed an infection requiring a plate removal. They concluded that the 3D plating system is suitable for fixation of simple mandibular fractures and is an easy to use alternative to conventional miniplates. 3D plating may be contraindicated in patients in whom insufficient interfragmentary bone contact causes minor stability of fractures.

Manoj kumar jain et al (2010)[33] conducted a prospective randomized clinical trial on conventional miniplate system and 3D miniplate system in patients with mandibular fractures. He noticed that in most cases 3D plate provides good stability, extra vertical bars incorporated

for counteracting the torque forces, and operative time is less because of simultaneous stabilization at both superior and inferior borders.

P.D.Ribeiro-junior et al (2010)[34] evaluated the conventional and locking miniplate/ screw system for treatment of mandibular angle fracture through an invitro study. 60 polyurethane hemi mandibles were assigned into 4 groups. In group 1 and group 2, two conventional G1 and locking G2 screws and miniplates were installed. The hemi mandibles were loaded in compressive strength until a 4mm displacement was observed between the segments vertically or horizontally. They concluded locking plate/screw systems provide greater resistance to displacement, long locking miniplates provide greater stability than short ones.

Vijay Ebenezer et al (2011)[35] conducted a study to evaluate the clinical efficacy of three-dimensional (3D) miniplate for monocortical fixation of mandibular angle fractures. Patients with either isolated mandibular angle fractures or other associated fractures in the mandible were selected. Standard extraoral and intraoral approaches were employed for reduction of fractures. None of the patients were subjected to intermaxillary fixation. All patients had early recovery of normal jaw function. Primary healing and good union of the fracture site with minimal weight loss due to early reinstatement of masticatory function.

L. Gandi et al (2012)[36] conducted a study to evaluate efficacy of three dimensional (3-D) titanium mini plates in the management of mandibular fractures in 20 patients over a period of 2 yrs prospectively. Finally they concluded because of the closed quadrangular geometric shape, and the ease of contouring and adapting to bony fragments, 3-D titanium miniplates provide good stabilization of fractured fragments in three dimensions.

Gaurav et al (2012) [37] conducted a prospective clinical trial study. They concluded that three dimensional plates stabilize the bone fragments in three dimensions because of the closed quadrangular geometric shape, and the ease of contouring and adapting.

Y.Guruprasa et al (2012)[38] conducted a study over 3-D titanium miniplates in management of mandibular fractures. They concluded that three dimensional plates stabilize the bone fragments in three dimensions. Due to better stability IMF is not necessary, thereby enhancing the overall comfort, convenience and wellbeing of the patients. As titanium is most biocompatible material secondary operative procedure for plate removal may not be necessary .

Kamal malhotra et al (2012)[39] conducted a study of versatility of titanium 3d plate in comparison with conventional titanium miniplate fixation for the management of mandibular fracture. They conclude that 3D plating system was found to be advantageous over conventional

miniplates. It uses lesser foreign material, reduces the operation time and overall cost of the treatment.

Mahamoud E.Khalifa et al (2012)[40] conducted a comparative study over 3-D titanium plates versus conventional titanium miniplates in fixation of anterior mandibular fractures. Intraoperatively duration of surgery was measured from the time of incision till the closure of wound. Subsequent postoperative clinical follow up for malocclusion, neurosensory deficit, wound breakdown, infection and presence of malunion/ non-union was performed. Postoperative radiographs were taken to assess the gap between fracture segments. All patients were followed up clinically and radiographically for 6 months postoperatively. Finally, he noticed that the 3D miniplate system is a better and easier method for fixation of mandibular fractures, compared to the conventional mini-plate. But there is a limitation to use in cases of oblique fractures and those involving the mental nerve as well as there is excessive implant material because of the extra vertical bars.

Naresh kumar et al (2012)[41] conducted a study of titanium miniplate osteosynthesis of mandibular fractures. They concluded that the titanium miniplate and screw system exhibits good strength, negligible complications,excellent biocompatibility and good results
in the management of mandibular fractures.

B. Pawan kumar et al (2012) [42]conducted a Comparative study of three dimensional stainless steel plate versus stainless steel miniplate in the management of mandibular parasymphysis fracture. They concluded that the fixation of mandibular fracture with 3D plates provides three dimensional stability and carries low morbidity and infection rates. The only probable limitation of these plates may be excessive implant material due to the extra vertical bars incorporated for countering the torque forces and in cases where the fracture line passing through the mental foramina region.

Sadhasivam Gokkula Krishnan et al(2012)[43] conducted an analysis study of post operative complications and efficacy of 3D miniplates in fixation of mandibular fractures.The results of this prospective study showed that 3D titanium miniplates were effective in the treatment of mandibular fractures and overall complication rates were lesser.

Dhananjay H Barde et al (2014)[44] conducted a research study of Efficacy of 3-Dimensional plates over Champys miniplates in mandibular anterior fractures .They concluded that the 3D plate was found to be standard in profile, strong yet malleable, facilitating reduction and stabilization at both the superior and inferior borders giving three dimensional stability at fracture site.

E.A .Elmorassi et al (2014)[45] conducted a study of Three-dimensional versus standard miniplate fixation in the management of mandibular angle fractures: a systematic review and meta-analysis. The results of this meta-analysis showed lower postoperative complication rates with the use of 3D miniplate fixation in comparison with the use of standard miniplate fixation in the management of mandibular angle fractures.

E.A .Elmorassi et al (2015))[46] conducted a prospective, randomized, double-blind, controlled clinical study study of Comparison between three dimensional and standard miniplates in the management of mandibular angle fractures.They concluded that the 3D curved strut plate is an effective treatment modality in MAFs, with complication rates comparable to those found with standard miniplates, and without any significantly different overall complication rate.

MATERIALS AND METHODS

The study conducted is a Prospective, Randomized clinical in vivo study on patients attending the Department of Casualty in Melmaruvathur Adhiparasakthi Institute of Medical Sciences and in Department of Oral and Maxillofacial surgery, Adhiparasakthi Dental College and Hospital, Melmaruvathur, Tamilnadu with anterior mandible fractures. Ethical clearance for the study was obtained from the Institutional review board, APDC&H (Reference No:2014-MD-BrIII-SAD-06). All the subjects participated in the study were informed about the nature of the study and all the participants signed an informed consent form.

Totally 20 patients with Anterior Mandibular Fractures were selected according to inclusion, exclusion criteria.

SOURCE OF DATA

Patients seeking treatment for Anterior Mandibular Fractures reporting to Department of Oral & Maxillofacial Surgery, Adhiparasakthi dental college and hospital, Melmaruvathur, Tamilnadu

METHODS OF DATA COLLECTION

All 20 patients had undergone Open Reduction and Internal Fixation (ORIF) under General Anesthesia for treatment of Anterior Mandibular Fractures in the Department of Oral & Maxillofacial Surgery, Adhiparasakthi Dental College and Hospital, Melmaruvathur, Tamilnadu.

All patients in age group of 18-60 years Mandibular fractures involving Symphysis & Parasymphysis region.

As per surgical principles all patients underwent preoperative evaluation in the following aspects

- Case history
- Clinical examination
- Radiological examination
- Hematological evaluation
- Systemic evaluation

Patients were evaluated preoperatively, intraoperatively and postoperatively for various parameters. Pre operative and post operative orthopantomogram (OPG) was considered mandatory to check for preoperative displacement of fractured segments and also for adequacy of post operative reduction and fixation. All patients were followed up for a minimum of 6 months post operatively. Post operative clinical evaluation will be done at immediate postoperative, 1st week, 1st month, and 6nd month respectively.

PLATE DESIGN

We have used commercially available three dimensional titanium mini plate .The three dimensional miniplate is made of titanium with a thickness of 2mm and titanium screws of length 8mm.

MATERIALS

1. Armamentarium for surgery(Figure 1&2)
2. Three dimensional titanium mini plates and screws (Figure 3)
3. Conventional Champy's mini plate (Figure 4)

1. **Plates**

a. Composition : Titanium (Grade 2)

N - 0.03%

C-0.10%

H- 0.015%

Fe - 0.03 %

O - 0.25 %

Titanium (Rest) %

Four hole titanium three dimension plate

Length of the plates : 9mm

Breadth : 9mm

Thickness : 2mm

2. **Screws**

a. Type : Non compression, mono cortical screws with hexagonal head

b. Diameter : 2mm

c. Thread length : 8mm

Burs : TC burs (no:702)

ARMAMENTARIUM

Figure 1

ARMAMENTARIUM

Figure2

3D miniplates used in group A patients

Figure 3

Champy's miniplate used in Group B patients.

Figure 4

STUDY VARIABLES

Study variables included careful pre-operative, intra-operative and post-operative assessments.

Pre-operative Assessment

- Type of fracture & associated facial injuries.
- Fracture displacement in terms of Mild/ Moderate/ Severe.
- Occlusal evaluation.

Intraoperative Assessment

- Adequacy of exposure.
- Plate adaptation in terms of Good/ Satisfactory.
- Plate handling time.
- Stability of fracture fragment.

Post operative Assessment

- Pain, Paresthesia, Swelling
- Wound dehiscence, Infection
- Fragment stability
- Occlusal integrity
- Malunion/ nonunion
- Neurological deficit

OPERATIVE MANAGEMENT

Of total, 20 patients were operated under General Anesthesia. After Endotracheal Intubation, lubrication for eye, using eye ointment, eye coverage using gauge & plaster will be done. Throat pack was

placed in all patients. Face preparation was done using Povidone - Iodine. Standard draping procedure will be carried out.

Intra oral site was prepared using 5% Povidone -Iodine solution. Infiltration of local anesthetic (2% lignocaine with 1:2,00, 000 Adrenaline) will be given laterally on both sides of the fracture site. Two type of Incisions were used to approach the fracture site, curvolinear incision for 12 patients, vestibular incision for 8 patients.

Full thickness mucoperiosteal flap was elevated and raised to expose the fracture site. After adequate exposure, fracture segments was manipulated and reduced to attain the normal anatomic positions for fixation. After manual reduction IMF was done with ideal occlusion.

After achieving adequate reduction & IMF, Three Dimensional Miniplate (10 cases) and champy's conventional miniplate (10 cases) was adapted to fit onto the contour of Mandible. Bur holes was drilled using standard TC burs of size 702 under copious saline irrigation. Screws were inserted to stabilize the plates in position.

Following adequate fixation, site was irrigated with betadine and saline. After achieving hemostasis, wound closure was done using 3-0 vicryl sutures. IMF was released, occlusion and intra operative stability were checked and an extraoral pressure dressing was done.

Postoperative Drugs

Injection Taxim (Cefotaxim) 1 gm I.V (twice daily)

injection Metronidazole 500mg I.V (thrice daily)

Injection Voveran (Diclofenac) 75 mg I.M (twice daily)

Injection Rantac (Ranitidine) 50 mg I.V (twice daily)

0.2% Chlorhexidine mouthwash (thrice daily)

RESULTS

- This study was done in the Department of Oral and Maxillofacial Surgery, Adhi parasakthi Dental College, Melmaruvathur with a sample size of 20 patients with maxillofacial trauma.
- Study subjects were divided into two groups.
- Group A- ORIF with 3D titanium miniplates
- Group B – ORIF with conventional miniplates
- The operative procedure -Open reduction and internal fixation was performed under general anaesthesia (ORIF) to the selected subjects.
- Follow-up was done in each group and were assessed for
- Pain-by visual analogue scale
- Post-surgical infection-by clinical assessment of fever, swelling, pus discharge
- Fragment stability-bimanual palpation
- Occlusal integrity-by clinical examination
- Neurological deficit – pin and prick test
- and the data's were compared statistically using Mann-Whitney U test, chi-square test.

1. Clinical examination was performed in Immediate post-operative, at first week, first month, third month and sixth month of each group to evaluate Occlusal integrity, Post-surgical infection.

2. Bimanual palpation was performed at first week, first month of each group to evaluate the appropriate position of the fracture site
3. Radiograph (Digital Orthopantamogram) was performed in preoperative, Immediate post-operative, first month, and sixth month of each group to evaluate Fragment stability

The results are

1. The mean age of 10 patients in Group A was 31 years .The mean age of 10 patients in Group B was 31.8 years[chart1&2 &3]

Age wise distribution in Group-A patients

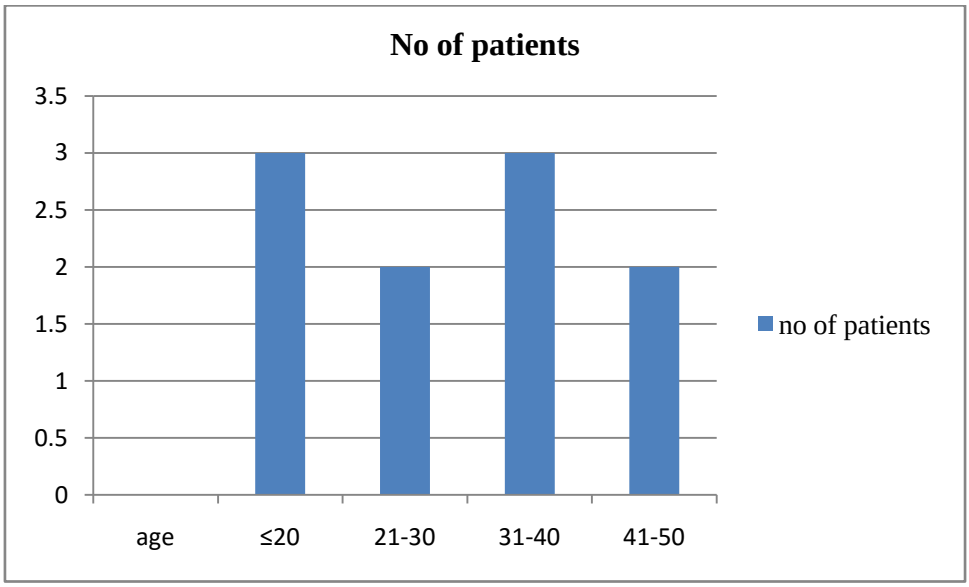

Chart 1

Age wise distribution in Group-B patients

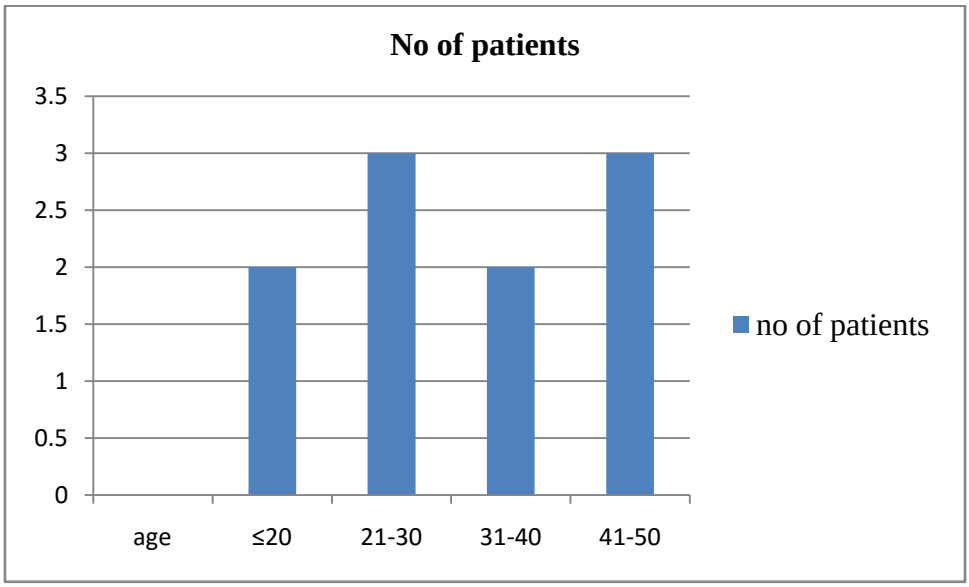

Chart 2

Comparison of Age distribution in both groups

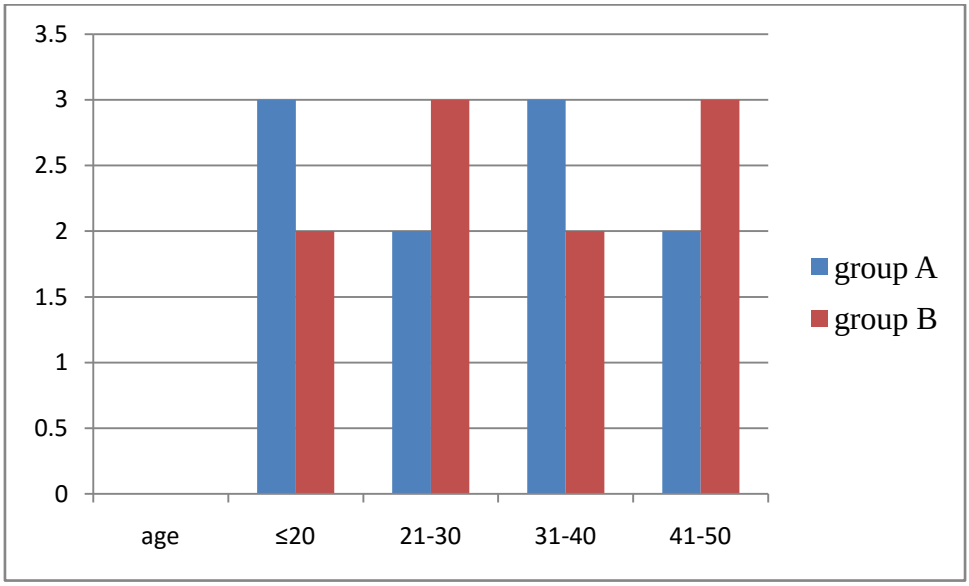

Chart 3

2. The common etiology was road traffic accidents(RTA) in all 20 patients.
3. The most common fracture was at parasymphysis(55%)and second comes parasymphysis with angle and third comes parasymphysis with condyle(10%) followed by symphysis(5%) and finally symphysis with angle(5%) [chart4]

Type of fracture

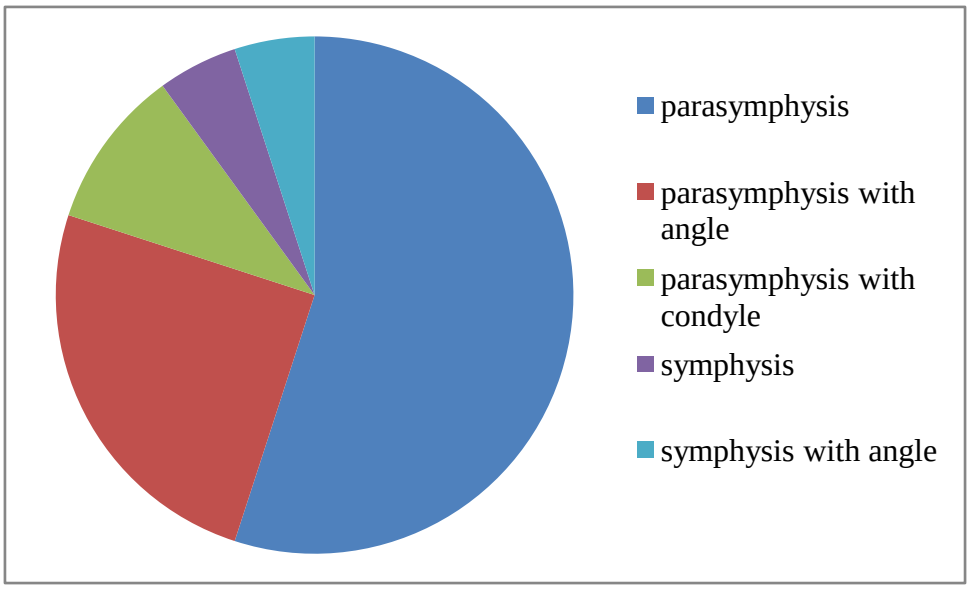

Chart 4

4. As per the average preoperative pain score in Group A was 3.9 and Group B was 4. Mann Whitney U test was applied to compare the average pain scores .There was significantly greater pain at postoperative 1st week and 1st month. but there was no significant difference between the groups at immediate post operative, 3rd month and 6th month.(Table 1 &2]

Mann- Whitney U test

Comparison Of Pain Score By Visual Analogue Scale In Group A and Group B

At Each Visit

S.no	Duration of visit	Group	Number	Mean rank	Standard error	P value
1.	Immediate post op day	Group A	10	10.50	.000	1.000
		Group B	10	10.50		
2	At first week	Group A	10	7.50	10.513	.023*
		Group B	10	13.50		
3	At first month	Group A	10	6.00	11.413	.000*
		Group B	10	15.00		
4	At third month	Group A	10	8.00	9.934	.063
		Group B	10	13.00		
5	At sixth month	Group A	10	10.50	1.000	1.000
		Group B	10	10.50		

Significance level is .05

*Exact significance displayed for this test

Table 1

Hypothesis test summary-Mann whitney U test

Null Hypothesis	Test	significance	Decision
The distribution of preoperative is the same across categories of group	Independent samples Mann-whitney U test	.739[1]	Retain the null hypothesis.
The distribution of immediate post operative is the same across categories of group	Independent samples Mann-whitney U test	1.000[1]	Retain the null hypothesis.
The distribution of 1st week is the same across categories of group	Independent samples Mann-whitney U test	.023[1]	Reject the null hypothesis.
The distribution of 1st month is the same across categories of group	Independent samples Mann-whitney U test	.000[1]	Reject the null hypothesis
The distribution of 3rd month is the same across categories of group	Independent samples Mann-whitney U test	.063[1]	Retain the null hypothesis.
The distribution of 6th month is the same across categories of group	Independent samples Mann-whitney U test	1.000[1]	Retain the null hypothesis.

Asymptomatic significances are displayed. The significance level is .05

[1]Exact significance is displayed for this test.

Table 2

Kruskal-Wallis test was applied to find out the pain score variation in pre-operative, Immediate post-operative, at first week, 1st month, 3rd month and 6th month within each groups. There was significantly variation in pain scores across categories of period in both Group A and Group B [Table3&4&5].

Kruskal-Wallis test

Tabulation Of VAS Score In Individual Visit Of Each Group

(Group A)

S.no	Duration of visit	Test statistic	Standard error	Significance
1	Month3-Month 6	.000	7.515	1.000
2	Month3-Month 1	19.500		.142
3	Month3-immediate post op	20.800		.085
4	Month3-week1	34.900		.000*
5	Month3-preop	44.800		.000*
6	Month 6- Month 1	19.500		.142
7	Month 6-immediate post op	20.800		.085
8	Month 6- week1	34.900		.000*
9	Month 6- preop	44.800		.000*
10	Month 1--immediate post op	1.300		1.000
11	Month 1-- week1	15.400		.607
12	Month 1-- preop	25.300		.011*
13	immediate post op-week1	-14.100		.910
14	immediate post op-preop	24.000		.021*
15	week1-preop	9.900		1.000

*- significant

Table 3

Kruskal-Wallis test

Tabulation Of VAS Score In Individual Visit Of Each Group

(Group B)

S.no	Duration of visit	Test statistic	Standard error	Significance
1	Month 6- Month 3	7.750	7.6 b25	1.000
2	Month 6- immediate post op	15.500		.631
3	Month 6- Month 1	26.750		.007*
4	Month6-week1	37.500		.000*
5	Month 6- pre op	47.500		.000*
6	Month3-immediate post op	7.750		1.000
7	Month3-Month 1	19.000		.191
8	Month3-week1	29.750		.001*
9	Month3-preop	39.750		.000*
10	immediate post op-Month 1	-11.250		1.000
11	immediate post op-week1	-22.000		.059
12	immediate post op-preop	32.000		.000*
13	Month 1-- week1	10.750		1.000
14	Month 1-- preop	20.750		.098
15	week1-preop	10.000		1.000

*- significant

Table 4

Hypothesis test summary-Kruskal-Wallis test

Null Hypothesis	Test	significance	Decision
The distribution of VAS in Group A is the same across categories of group	Independent samples Kruskal-Wallis test	.ooo	Reject the null hypothesis.
The distribution of VAS in Group B is the same across categories of group	Independent samples Kruskal-Wallis test	.ooo	Reject the null hypothesis.

Asymptomatic significances are displayed. The significance level is .05

Table 5

5. Patients were evaluated post operatively at Immediate post-operative, first week, 1st month, 3rd month and 6th month in both groups for signs of infection. The post-operative infection was seen in one case of Group A and two cases of Group B. It was statistically insignificant by chi-square test[Table6]

Cross Tabulation Of Post Operative Infection In Both Groups

	Group	**Infection**	**Number**	**Chi-square value**	**Result**
1.	Group A	Present	1	0.39	Not significant P>0.05
		Absent	9		
2	Group B	Present	2		
		Absent	8		

Table 6

6. occlusion was evaluated preoperatively and post operatively. All the 20 patients had deranged occlusion at the time of their report to the hospital. After surgery occlusion was corrected to normal in all 20 cases.
7. No case reported with wound dehiscence in all 20 patients
8. Bimanual palpation was performed at first week, 1st month of each group to evaluate the appropriate position of the fracture site. No case reported with altered position while doing bimanual palpation
9. Radiographs were taken to evaluate fragment stability at pre-operative, Immediate post-operative, 1st month, and 6th month. In both the groups no patients presented with fragment stability.
10. By using pin and prick test neurological deficit was evaluated. Neurological deficit was not present in Group A patients and seen in 1 case of Group B patient[Table7].

Cross Tabulation Of neurological deficit In Both Groups

	Group	**Infection**	**Number**	**Chi-square value**	**Result**
1.	Group A	Present	0	1.05	Not significant P>0.05
		Absent	10		
2	Group B	Present	1		
		Absent	9		

Table 7

DISCUSSION

Any report of study on mandibular fractures must be initiated first with a discussion of the history of mandible fractures and evolution of treatment. Writings on mandible fractures appeared as early as 1650 BC, when an Egyptian papyrus described the examination, diagnosis, and treatment of mandible fractures and other surgical ailments. The case in which a mandible fracture was described was thought to be incurable and therefore was not treated; patient subsequently died.

Hippocrates described direct reapproximation of the fracture segments with the use of circumdental wires, similar to today's bridle wire. He advocated wiring of the adjacent teeth with external bandaging to immobilize the fracture. Many authors and physicians have described the treatment of mandible fractures. Ideas have varied, but all treatments were subtle modifications of the Hippocratic concept of reapproximation and immobilization.

It was not until 1180 that a textbook written in Salerno, Italy has described the importance of establishing a proper occlusion. In 1492 an edition of the book Cirurgia printed in Lyons made first mention of the use of maxillomandibular fixation in the treatment of mandibular fractures.

Before the advent of modern appliances, instruments and techniques used in the treatment of mandibular fractures, many ingenious devices were marketed for the treatment of mandible fractures. Each had its own individual advantages, but as a group they failed to provide direct, stable reduction and immobilization of the mandibular segments[47].

Modern traumatology started with the development of Osteosynthesis and there is drastic shift from closed techniques to open techniques. Rigid fixation is promoted by the AO/ASIF. DCP and EDCP plates were used in this concept. The Dynamic compression plates were designed with a special configuration of the screw hole to allow compression across the fracture when the screw head is fully tightened. The two holes adjacent to the fracture are drilled to cause compression across the fracture and the outer holes are drilled with a passive position[48].

T.F.Renton[15] reported that most favourable site of internal fixation of fractured bone was where the muscular tensile forces were at their greatest. Under physiological strain there are forces of tension along the alveolar border and forces of compression along the lower border of mandible. Champy et al (1976, 1978) analyzed movements of mandible using a mathematical model of mandible and were able to determine the ideal line of osteosynthesis to neutralize the displacing forces.

Generally, fracture in the symphysis require two plates, body fracture one plate below the roots of premolar teeth and angle fracture requires one plate along the oblique ridge. The neutral zone closely follows the course of the inferior alveolar nerve. The portion of a fracture passing through the neutral zone does not have displacement force on it when an occlusal load is placed; a compressive force is applied to the inferior border of the mandible and mentum. In this compression zone, fulcrum occurs when force is applied to the occlusal surface allowing for a point around which a fracture will rotate.

Champy et al[1] approached the treatment of fractures of the mandible from a different approach. They described the mandible as a parabola with a thick outer cortex and a thinner inner cortex with a central spongiosa. His group was felt that the thick outer cortex provided osteosynthesis screws with good anchorage, particularly chin and behind the third molar. They felt that smaller plates placed in this ideal osteosynthesis line with monocortical screws were all that was needed to achieve healing under functional loads.

He developed the technique of Michelet et al to describe a method of monocortical, small- plate osteosynthesis utilizing malleable plates inserted intraorally. Jaw function produces forces of tension along the alveolar border and forces of compression along the lower border. These forces produce movements of flexion within the body of mandible which are strongest towards the angle and weakest in the

premolar region. In addition these forces produce predominantly torsional movements within the mandibular symphysis that increase in strength towards the midline. By placing the plates at the most biomechanically favourable site to neutralize tension forces causing fracture distraction, one can minimize plate thickness, with the consequent advantage of increased malleablity[16]. Therefore the technical advantages of miniplate osteosynthesis are as follows:

1. Small and easily adapted.
2. Mono -cortical application[4].
3. Intra oral approach.
4. Functional stability.

These miniplates produce adequate stability and render IMF unnecessary. R.A.Loukota et al[13] done a study on mechanical analysis of maxillofacial miniplates and found the mean ultimate load seen to vary from 300N to 1200N. The bending stiffness was to be found between 90 to 230Nm/deg in edgewise direction. The maximum masticatory forces in healthy young men with healthy teeth have been measured as 660N in molar region and 290N in incisor region. The ultimate tensile properties of miniplate were found to be above 500N, where the stainless steel champy plate was more than double this value. During the following two decades a large number of modifications of plates were described, which led to the present use of osteosynthesis. Today many different systems are available, ranging from the heavy compression plates for mandibular reconstruction and low profile

plates for midfacial fixation. The thickness of plates ranges from 0.5 to 3.0mm and are made either of stainless steel, titanium, or vitallium. Recently 3D plates, biodegradable, self-reinforced polylactide plates and screws have been used for the internal fixation of fractures of the mandible with good results.

FARMAND[9] in 1992 developed the concept of 3D miniplates. Their shape is basically on the quadrangle principle as a geometrically stable configuration for support. When the mandible is in function, primary forces of concern include bending, vertical displacement and shearing. In the 3D miniplate since the two horizontally placed miniplates are further joined by using vertical struts they further minimize bending. Since the entire plate acts as one single unit, because of its interconnections and quadrangular shape, the vertical displacement and shearing of bone is also reduced to minimal, thus holding the bone fragment in three dimensions. Since the stability achieved by the geometric shape of these plates surpasses the standard miniplates, the thickness can be reduced to 1 mm. The basic form was quadrangular with 2 ×2 hole square plate and 3×2 or 4×2 hole rectangular plate. Unlike compression and reconstruction plates, their stability was not derived from the thickness of the plate. In the combination with the monocortical screws fixed to outer cortical plate, the rectangular plates form a cuboid, which possess 3D stability. The 3D plating system was based on the principle of obtaining support through geometrically stable configuration.

Principles of three-dimensional plate osteosynthesis

- Tissue dissection only in the vicinity of the planned osteotomy or fracture line
- The three-dimensional plates are positioned parallel to the osteotomy or fracture line
- The connecting arms of the plate should be positioned rectangular to the fractured line.

The 3D miniplate itself was a misnomer as the plates themselves were not 3-dimensional, but holds the fracture segments rigidly by resist the 3-dimensional forces namely shearing, bending and torsional forces that act upon the fracture site in function.

The use of 3D miniplates in mandibular fracture fixation so for not become established. In recently published survey by GEAR et al[25], among 104 AO/ASIF surgeons, only 6% use this type of plate.

In the present study 10 cases of maxillofacial trauma with mandibular fractures patients treated with open reduction and internal fixation using 3-D miniplates and 10 cases using conventional miniplates.

In our study parasymphysis(55%) fractures was the most common type of fractures followed by parasymphysis with angle and third comes parasymphysis with condyle(10%) followed by

symphysis(5%) and finally symphysis with angle(5%). In a study of 191 patients of 280 mandibular fractures frequent location was the angle region (28.21%), parasymphyseal (21.07%) in order of frequency[22].

The time required for the adaptation and fixation of the plate at the fracture site was recorded . In our study the operating time required for the adaptation and fixation of 3D plate was less. ZIX et al[32] and others on 3D plate who reported reduced operating time because 3D plate is geometric configured plate which consist of two horizontal bars interconnected with two vertical bars. So single 3D plate stabilized the fracture both at superior and inferior border at a time, hence time is saved in plate fixation. Post operative radiographic evaluation in patients showed excellent reduction in both groups.

Alper Alkan et al[29] carried out an in-vitro study to evaluate the biomechanical behaviour of four different types of rigid fixation systems with semi-rigid fixation system that are used currently. The study demonstrated that 3D struts plates had greater resistance to compression loads than the Champy's technique. Gunter et al[4] used 3-D plate for transoral endoscopic assisted condylar fractures; the three dimensional nature of the plate due to its triangular shape provides internal stability. In our study patients showed increased stability after fracture reduction and fixation.

Seiji Nakamura et al[11] and others noticed post operative complications like malocclusion(3.6%), exposure of miniplate (3.6%), delayed union (1.8%) and infection (1.0%) in 110 patients with mandibular fractures. Post operative complications may be due to inadequate reduction and stabilization, delay in treatment, teeth in fracture line, failure to provide antibiotics, alcohol or drug abuse.

Claude Guimond et al[7] used 2mm three dimensional curve dangle strut plate; they noticed low morbidity and infection rate. In our study we noticed post operative infection in one patient in Group A and two patients in Group B . No occlusal discrepancies were encountered during the postoperative period with any patient, so the result obtained with occlusion was good with three dimensional plating.

Lesilie R.Halpern et al[23] conducted a study on perioperative neurosensory changes with treatment in 61 patients with 97 mandibular fracture sites. They found IAN neurosensory disturbances were unchanged or improved immediately after treatment in most patients. In our cases temporary paresthesia was noted to be present in one patient in Group B This supports the notion that placement of two miniplates increases the chances of mental nerve injury, injury to tooth roots, chances of infection (two foreign bodies). The use of single miniplate causes minimum injury to the mental nerve in the case of fracture line running close to the mental foramen.

J.M.Witten berg et al[17] used 3-D plates in mandibular fractures and they noticed that the use of 3-D plates easier to place intra orally. Because of closed quadrangular geometric shape and ease of contouring and adapting to bony fragments it provide good stabilization in three dimensions. So there is a low morbidity and infection rate.

The only probable limitation may be excessive implant material due to extra vertical bars for countering the torque forces and in case where the fracture line passing through the mental foramina.

In general three dimensional plating has numerous advantages including good intra operative and post operative stability with no displacement or derangement of occlusion. Additively reduced cost and reduced operating time with no special armamentarium required for placement of this system.

CONCLUSION

This study was conducted in 20 patients of mandibular fractures with an aim of evaluating the efficacy of 3D titanium miniplates in the management of anterior mandibular fractures. Complications encountered during their use were also recorded and reported in this study. Out of 20 total patients of anterior mandibular fractures, 10 cases of Group A treated by 3D plates and 10 cases of Group B treated by conventional miniplates, the resulting osteosynthesis were evaluated with certain parameters.

The age of patients were ranged from 18 to 60 years irrespective of sex. The procedures were done under general anesthesia. Osteosynthesis was done as per the principles advised by the Champy for linear plates and by Farmand for 3D plates.

Patients were kept on follow up for 6months and evaluated for the treatment results and complications.

The following conclusions were drawn from the study:

1. 3D plates were indeed easy and simple to use. Significant reduction in operating time could be achieved with the use of 3D plates which makes it a time-saving.
2. Patients treated with 3D plates showed a lesser post operative pain in 1st week,1 st month and 3rd month.

3. Patients treated with 3D plates showed a less incidence of post operative infection.
4. Other complications were found to be extremely rare.
5. This 3-D plating system can be used with satisfactory results, especially in anterior mandibular fractures.
6. This technique does not require expensive armamentarium.
7. These plates ensure three dimensional stability and the period of immobilization was not necessary as in other systems. Thereby, the morbidity associated with prolonged immobilization is reduced.
8. This system are associated with minimal incidence of complication.
9. This system require lesser area of exposure.

The probable limitations of 3D plates may be excessive implant material due to the extra vertical bars incorporated for countering the torque forces, cases where the fracture line passes through the mental foramina region and angle of the mandible where 3D plates cannot be adapted.

The results of the present study were put to comparison with previous studies on fracture mandible and were found to be in accordance with them where 3D plates cannot be adopted.

All patients in present study appreciated early recovery of normal jaw function, primary healing and good union at fracture.

During the course of present study, the 3D plate was found to be standard in profile, strong yet malleable, facilitating reduction and stabilization at both the superior and inferior borders giving three dimensional stability at fracture site.

To conclude, 3D plate seems to be an easy alternative to conventional miniplates. The small sample size and limited follow up could be considered as the limitations of our study. It is hence recommended to have a multicentre study with large number of patients and correlation among these studies to authenticate our claims.

REFERENCES

1. Maxime champy, J. P. Loddi, R. Schmitt, J. H. Jaeger, D. Muster; Mandibular Osteosynthesis by Miniature Screwed Plates via a Buccal Approach: J. max.-fac. Surg. 6 (1978) 14-21
2. K. Ikemura, Y. Kouno, H. Shibata and K. Yamasaki; Biomechanical study on monocortical osteosynthesis for the fracture of the mandible: Int. J. Oral Surg. 1984: 13: 307-312.
3. Gyorgy Szabo, Adam Kovacs and Gyorgy Pulay: Champy plates in mandibular surgery: Int. J. Oral Surg. 1984: 13: 290-293.
4. G.Lauer, W.Pradel, M.Schneider and U.Eckelt; Anew 3-dimensional plate for Transoral endoscopic- assisted osteosynthesis of condylar neck fractures: J Oral Maxillofac Surg 65: 964-971, 2007.
5. Kunio Ikemura, Hideharu Hidaka, Tetsuji Etoh, and Katsuaki Kabata, Osteosynthesis in Facial Bone Fractures Using Miniplates: Clinical and Experimental Studies: J Oral Maxillofac Surg 46:10-14, 1988.
6. B.jorn Johansson, Leonard Krekmanov, Mats Thomsson; Miniplate Osteosynthesis of Infected Mandibular Fractures: J. Cranio-Max.-Fac. Surg. 16 (1988) 22-27.
7. Gregory Arthur, and Nicholas Berardo ; A Simplified Technique of Maxillomandibular Fixation; J Oral Maxillofac Surg 47:1234, 1989.

8. W.P.Smith; Delayed miniplate osteosynthesis or mandibular fractures : British Journal of Oral and Maxillofacial Surgery (1991) 29,7 3-76.
9. Farmand. M, Dupoinrieux L; The value of 3-dimensional plates in maxillofacial surgery. Rev Stomatol chir Maxillofac 1992;93(6):353-357.
10. Hayter, J. I. Cawood."The functional case for miniplates in maxillofacial surgery". Int. J. Oral Maxillofac. Surg 1993; 22: 91-96.
11. Seiji Nakamura, Yasuharu Takenoshita, and Masuichiro Oka; Complications of Miniplate Osteosynthesis for Mandibular Fractures: J Oral Maxillofac Surg 52:233-238. 1994
12. J.M.Wittenberg, D.P.Mukherjee, B.R.smith, R.N.Kuruse; Biomechanical evaluation of new fixation devices for mandibular angle fractures: J Oral Maxillofac Surg 1997; 26: 68-73.
13. R. A. Loukota, J. C. Shelton, Mechanical analysis of maxillofacial miniplates: British Journal of Oral and Maxillofacial Surgery 1995 33.174-179.
14. M. A. Kuriakose, M. Fardy, M. Sirikumara, D. W. Patton, A. W. Sugar; A comparative review of 266 mandibular fractures with internal fixation using rigid (AO/ASIF) plates or mini-plates: British Journal of Oral and Maxillofacial Surgery (1996),34 ;315-321.

15. T. F. Renton, D. Wiesenfeld; Mandibular fracture osteosynthesis: a comparison of three techniques: British Journal of Oral and Maxiilofacial Surgery (1996) 34, 166-113.
16. J. Tams, J.-P. van Loon, F. R. Rozema, E. Otten, R. R. M. Bos; A three-dimensional study of loads across the fracture for different fracture sites of the mandible: British journal of oral and maxillofacial surgery (1996) 34,400-405.
17. J.M.Wittenberg, D.P.Mukherjee, B.R.smith, R.N.Kuruse; Biomechanical evaluation of new fixation devices for mandibular angle fractures: J Oral Maxillofac Surg 1997; 26: 68-73.
18. A.M. Fordyce, Z. Lalani, A.K. Songra, A.J. Hildreth, A.T.M. Carton, J.E. Hawkesford; Intermaxillary fixation is not usually necessary to reduce mandibular Fractures; British Journal of Oral and Maxillofacial Surgery 37 (1999) , 52-57
19. Robert H. Mathog, Vincent Toma, Lewis Clayman, and Steven Wolf; Nonunion of the Mandible: An Analysis of Contributing Factors: J.Oral Maxillofac Surg 58:746-752, 2000.
20. Pedro M. Villarreal, Luis M. Junquera, and L.G. Consuegra; Study of Mandibular Fracture Repair Using Quantitative Radiodensitometry: A Comparison Between Maxillomandibular and Rigid Internal Fixation; J Oral Maxillofac Surg 2000; 58:776-781.
21. Ashraf F. Ayoub, John Rowson Comparative assessment of two methods used for interdental immobilization Journal of Cranio-Maxillofacial Surgery (2003) 31, 159-161.

22. Marisa Aparecida Cabrini Gabrielli, Mario Francisco Real Gabrielli, Elcio Marcantonio, and Eduardo Hochuli-Vieira; Fixation of Mandibular Fractures With 2.0-mm Miniplates: Review of 191 Cases: J Oral Maxillofac Surg 61:430-436, 2003.
23. Leslie R. Halpern, Leonard B. Kaban and Thomas B. Dodson; Perioperative Neurosensory Changes Associated With Treatment of Mandibular Fractures: J Oral Maxillofac Surg 62:576-581, 2004.
24. Fabio Roccia, Amedeo Tavolaccini, Alessandro Dell'acqua, Massimo Fasolis ; An audit of mandibular fractures treated by intermaxillary fixation using intraoral cortical bone screws Journal of Cranio-Maxillofacial Surgery (2005) 33, 251-254.
25. Andrew J.L. Gear, Elena Apasova, John P. Schmitz and Warren chubert; Treatment Modalities for Mandibular Angle Fractures: J Oral Maxillofac Surg 63:655-663, 2005
26. Claude Guimond, James V. Johnson, and J.M.Marchena; Fixation of mandibular angle fractures with a 2.0-mm 3-Dimensional curved angle strut plate: J Oral Maxillofac Surg 63: 209-214, 2005.
27. R. Mukerji, G. Mukerji, M. McGurk : Mandibular fractures: Historical perspective; British Journal of Oral and Maxillofacial Surgery 44 (2006) 222-228.
28. Zhi Li,Wei Zhang, Zu-Bing Li, and Jin-Rong Li: Abnormal Union of Mandibular Fractures:A Review of 84 Cases: J Oral Maxillofac Surg 64:1225-1231, 2006

29. A.Alkan, N. Celebi, B.Ozden, B.Bas; Biomechanical comparision of different plating techniques in repair of mandibular angle fractures: Oral Med Oral Pathol Oral Radiol Endod 2007; 104: 752-6.

30. G.Lauer, W.Pradel, M.Schneider and U.Eckelt; Anew 3-dimensional plate for Transoral endoscopic- assisted osteosynthesis of condylar neck fractures: J Oral Maxillofac Surg 65: 964-971, 2007.

31. Hasan Husnu Korkmaz : Evaluation of different miniplates in fixation of fractured human mandible with the finite element method. Oral Surgery Oral Med Oral Pathol Oral Radiol Endod 2007; 103:e1-e13.

32. J.Zix, Olivier Lieger, and T.Lizuka; Use of straight and curved 3-dimensional titanium miniplates for fracture fixation at the mandibular angle: J Oral Maxillofac Surg 65: 1758-1763, 2007.

33. Manoj Kumar Jain, K.S. Manjunath, B.K. Bhagwan, and Dipit K. Shah, Comparison of 3-Dimensional and Standard Miniplate Fixation in the Management of Mandibular Fractures: J Oral Maxillofac Surg 68:1568-1572, 2010.

34. P.D. Ribeiro- junior, O.Magro- Filho, K.A.Shastri, M.B.Papageorge; invitro evaluation of conventional and locking miniplate/screw systems for the treatment of mandibular angle fractures: J Oral Maxillofac Surg 2010; 39:1109-1114.

35. V. Ebenezer, B.K. Ramalingam; Three-Dimensional Miniplate Fixation in Mandibular Angle Fractures: Indian Journal of Multidisciplinary Dentistry, Vol. 1, Issue 2, Jan-Feb 2011.

36. L.Gandi, V.S.Kattimani; Three Dimensional Bone Plating System in the Management of Mandibular Fractures- A Clinical Study: Annals and essences of dentistry Vol. IV Issue 2 Apr-Jun 2012 and JIDA,Vol. 6, No. 2, February 2012.

37. Mittal, G., Dubbudu, R. R., & Cariappa, K. M. (2012). Three Dimensional Titanium Mini Plates in Oral & Maxillofacial Surgery: A Prospective Clinical Trial. *Journal of Maxillofacial andOralSurgery*,*11*(June),152–159. http://doi.org/10.1007/s1266-011-0267-0

38. Y.Guruprasa, U.Kura; 3d titanium miniplates in management of mandibular fractures: Guident: January 2012; 58-59.

39. Malhotra, K., Sharma, A., Giraddi, G., & Shahi, A. K. (2012). Versatility of Titanium 3D Plate in Comparison with Conventional Titanium Miniplate Fixation for the Management of Mandibular Fracture. *Journal of Maxillofacial and Oral Surgery*, *11*(3), 284–290. http://doi.org/10.1007/s12663-012-0340-3

40. M. E. Khalifa, Hesham E, El-Hawary and M. M. Hussein; Titanium 3Dimensional Miniplate versus Conventional Titanium Miniplate in Fixation of Anterior Mandibular Fracture: Life Sci J 2012; 9(2):1006- 1010.

41. Madhav, V. N. . (2012). of Dental Sciences. *Indian Journal of Dental Sciences.*, *4*(4), 123–126

42. B.Pavan Kumar, Jeevan Kumar, A.P.Mohan, V.Venkatesh & H.Rahul Kumar; A Comparative Study Of Three Dimensional Stainless Steel Plate Versus Stainless Steel Miniplate In The Management Of Mandibular Parasymphysis Fracture: J.Bio.Innov 1(2), Pp: 19-32, 2012.

43. Gokkulakrishnan, S., Singh, S., Sharma, A., & Shahi, A. K. (2012). An analysis of postoperative complications and efficacy of 3-D miniplates in fixation of mandibular fractures. *Dental Research Journal*, *9*(4), 414–21.Barde, D. H., Mudhol, A., Ali, F. M., Madan, R. S., Kar, S., & Ustaad, F. (2014). Efficacy of 3-Dimensional plates over Champys miniplates in mandibular anterior fractures. *Journal of International Oral Health : JIOH*, *6*(1), 20–6E.a elmorassi

44. Barde, D. H., Mudhol, A., Ali, F. M., Madan, R. S., Kar, S., & Ustaad, F. (2014). Efficacy of 3-Dimensional plates over Champys miniplates in mandibular anterior fractures. *Journal of International Oral Health : JIOH*, *6*(1), 20–6.

45. Al-Moraissi, E. À., El-Sharkawy, T. M., El-Ghareeb, T. I., & Chrcanovic, B. R. (2014). Three-dimensional versus standard miniplate fixation in the management of mandibular angle fractures: A systematic review and meta-analysis. *International Journal of Oral and Maxillofacial Surgery*, *43*(6), 708–716. http://doi.org/10.1016/j.ijom.2014.02.002

46. Al-Moraissi, E. a., Mounair, R. M., El-Sharkawy, T. M., & El-Ghareeb, T. I. (2015). Comparison between three-dimensional and standard miniplates in the management of mandibular angle fractures: A prospective, randomized, double-blind, controlled clinical study. *International Journal of Oral and Maxillofacial Surgery*, *44*(3), 316–32 http://doi.org/10.1016/j.ijom.2014.10.012

47. Raymond J. Fonseca, Oral and maxillofacial Surgery, Trauma vol- 3 Saunders 2008: P95- P100.

48. Raymond J.Fonseca, Walker RV, Betts NJ, Dexter Barber H, Powers MP: Oral and Maxillofacial Trauma, Vol 2, Third edition, Elsevier Saunders 2005: P1140- P1150

PROFORMA

EFFICACY OF THREE DIMENSIONAL TITANIUM MINIPLATES OVER THE CONVENTIONAL TITANIUM MINIPLATES OSTEOSYNTHESIS IN THE MANAGEMENT OF ANTERIOR MANDIBULAR FRACTURES

ADHIPARASAKTHI DENTAL COLLEGE & HOSPITAL
Department Of Oral Maxillo-Facial Surgery – TRAUMA CASE SHEET

Date:

Name : **OP no:**

Age/sex : **IP no:**

Contact No:

MLC: Yes / No : **RTA/Assault/Others**

DOA: **DOS:** **DOD:**

Chief Complaint: **Duration:**

History of presenting illness: **Mode of Injury:**

LOC- **Vomiting-** **ENT Bleed-**

Associated Injury: **Seizures-** **Nausea**

H/o Past Medical/surgery/Dental/ History:

Diabetes, Hypertension, H/o Jaundice for the last six months, Previous hospitalization, or undergone any surgery under G.A/L.A

Drug History:

Allergic if any:
Any drug he/she is taking regularly:

Personal History:

Habit	Frequency	Duration

General Examination

Vital Signs: Pulse_____ Respiratory Rate:_____ Temperature:_____ Pupils:

BP:_____

Gait: Systems: (RS, CVS, NS, ABD/GIT, Excretory, Endocrine)

Local Examination

Extra-oral Examination:

- Facial symmetry:
- Abrasion:

  Site: Nos: Size: Extent:
- Laceration:

  Site:

  Size:

  Extent:

  Bleeding:

  Suture Presence:

  Examination of Face

  Upper Face:

  Frontal- Nasal-

  Circumorbital edema- Echymosis-

  Visual disturbance-

  Blured- Diplopia-

  EOM Movements-

  Middle Face:

  Maxilla-

  Vertical Buttresses-

Medial Anterior Buttresses-

Lateral Buttresses-

Anterior-Posterior Horizontal Buttresses-

Lateral-to-Lateral Horizontal Buttresses-

Malar Eminence-

Lower Face:

Mandible-

Step Deformity of Facial Bones:

Profile: Competency of lip: MouthOpening (IID):

Cervical Lymph Nodes:

Tenderness - Palpable Mobile

TMJ Examination:

Deviation- Tenderness-

Lateral Excurtion: Clicking-

Swelling

Inspection:

Number- Margins-

Size- Extent-

Site- Bleeding

Palpation:

After confirming all inspection findings:

Warmth- Consistency- Illumination-

Skin over the swelling- Mobility- Pulsation-

Intra-oral Examination:

- **Soft tissues**

Mucosa: Frenum: Tongue:

Buccal: Labial: Papilla:

Labial: Lingual: Movment:

Palatal:

Gingiva: Floor of the mouth: Soft palate:

- **Mucosal Laceration:**

Inspection:

Number- Site- Size- Extent-

Palpation:

After confirming all inspection findings:

Bleeding on probing: Foreign Body involvement:

- **Hard tissues**

Inspection:

Teeth present: Missing: Fractured teeth:

Caries: Grossly Deccayed: Filled:

Root stump: Impacted: Supernumerary:

Occlusion:

Overjet- ' Deepbite- Open bite- Cross bite-

Palpation:

Mobility of tooth: Tender on Percussion:

Segmental mobility:

Maxilla-

Mandible-

Dentoalveolar segment-

Provisional diagnosis:

Investigations:

Routine blood and biochemistry examination:

Radiological Examination:

Interpretation:

Discussion:

Final diagnosis:

Treatment Plan:

Prognosis:

Treatment done:

Review/ Follow up:

ADHIPARASAKTHI DENTAL COLLEGE - ETHICS COMMITTEE:

PARTICIPANT INFORMED CONSENT FORM (PICF)

(English)

Protocol / Study number: _____

Participant identification number for this trial: _____

Title of project:

Name of Principal Investigator: Tel.No(s):

The contents of the information sheet dated that was provided have been read carefully by me / explained in detail to me, in a language that I comprehend, and I have fully understood the contents. I confirm that I have had the opportunity to ask questions.

The nature and purpose of the study and its potential risks / benefits and expected duration of the study, and other relevant details of the study have been explained to me in detail. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason, without my medical care or legal right being affected.

I understand that the information collected about me from my participation in this research and sections of any of my medical notes may be looked at by responsible individuals from APDCH. I give permission for these individuals to have access to my records.

I agree to take part in the above study.

---------- Date:

(Signatures / Left Thumb Impression) Place:

Name of the Participant:

Son / Daughter / Spouse of:

Complete postal address:,

This is to certify that the above consent has been obtained in my presence.

Signatures of the Principal Investigator Date:

Place:

1) Witness – 1 2) Witness – 2

--- ---

Signatures Signatures

ஆதிபராசக்தி பல்மருத்துவ கல்லூரி மற்றும் மருத்துவமனை

மேல்மருவத்தூர்

வாய் நோய் அறுவை சிகிச்சைக்கான ஒப்புதல் படிவம்

துறை : _____

தேதி :

நோயாளியின் பெயர் : _____

வயது / பாலினம் : _____

புறநோயாளி ஏண் : _____

அறுவை சிகிச்சை மருத்துவ நிபுணரின் பெயர் : _____

சிகிச்சையின் பெயர் : _____

_____

அளிக்கப்படும் மயக்க மருந்தின் வகை : _____

எனது தற்போதைய வாய்நலம் குறித்தும் , அதற்கு உரிய அறுவை சிகிச்சை முறைகளையும் , மாற்று அறுவை சிகிச்சை முறைகளையும் மற்றும் அறுவை சிகிச்சை மேற் கொள்ளாவிடில் ஏற்படும் பின் விளைவுகளும் பல் மருத்துவர் முழுமையாக என்னிடம் கூறினார் . அதற்கான எனது சந்தேகங்களையும் பல் மருத்துவரிடம் கேட்டு தெளிவுபடுத்திக்கொண்டேன் . மேலும் அறுவை சிகிச்சை முறை , என் அறுவை சிகிச்சையின் போது தேவைப்படும் மயக்க மருந்துகள் மாற்றும் பிற மருந்துகள் செலுத்த சம்மதிக்கின்றேன். நான் மனப்பூர்வமாக எனது அறுவை சிகிச்சைமுறை மாற்றும் அதனால் வரும் பின் விளைவுகளையும் ஏற்றுக் கொள்கிறேன் மற்றும் மருத்துவர் கூறும் அறிவுரைகளும் கடைபிடிப்பேன்.

நோயாளியின் உதவியாளர் / பெற்றோரின் கையொப்பம் நோயாளியின் கையொப்பம்

அறுவை சிகிச்சை நிபுணரின் கையொப்பம் மருத்துவரின் கையொப்பம்

INSTITUTIONAL ETHICS COMMITTEE AND REVIEW BOARD

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Melmaruvathur, Tamilnadu-603319

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This ethical committee has undergone the research protocol submitted by Dr.M.Mahalakshmi Post Graduate Student, Department of Oral And Maxillofacial Surgery under the title **Efficacy of three dimensional titanium miniplates over the conventional titanium miniplates osteosynthesis in the management of anterior mandibular fractures** Reference No: **2014-MD-BrIII-SAD-06,** under the guidance of Prof Dr.Gokkulakrishnan for consideration of approval to proceed with the study.

This committee has discussed about the material being involved with the study, the qualification of the investigator, the present norms and recommendation from the Clinical Research scientific body and comes to a conclusion that this research protocol fulfils the specific requirements and the committee authorizes the proposal.

Member secretary