www.jmscr.igmpublication.org
Impact Factor 5.84
Index Copernicus Value: 71.58
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v5i11.80

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Single versus two Miniplates in the Treatment of Mandibular Parasympheal and Sympheal Fracture; A Study on Fifty Patients

Authors
Nahida Dar[1], Wasim Salman[2]
[1]Oral and Maxillofacial Surgeon
[2]Anesthesia, Senior Resident

Abstract
Aim: *was to compare between single versus two mini plates in parasympheal and sympheal fracture.*
Materials and Methods: *50 patients were randomly selected with age distribution from 18 years to 60 years with ASA 1 and 2. They were divided into two groups 25 each. In one group single 6 holeminiplate was used at the inferior border and arch bar was used as a tension band. In the second group 6 hole min iplate and 4 hole were for fixation.*
Results: *In group 1 that is single miniplate patients only 1 patient needed imf as there was mobility across the fragments after two weeks. Rest of the patients healed quite well. In group 2 all patients there was good bony union without any complications.*
Conclusion: *There was no statistically significant difference. P>1.*

Introduction

Restoration of function and appearance with particular care to re-establish the occlusion is the basic aim of treatment of mandibular fractures. For a long period of time intermaxillary fixation was the only method of treatment .With the introduction of modern anaesthesia, antibiotics and blood transfusion, open reduction with fixation of fragments has become routine in the treatment of fractures with gross displacement, comminution and in the edentulous mandible. Through decades various plate and screw osteosynthesis have been introduced like AO plating system, miniplating system, resorbable plates and screws and 3-D titanium plates.

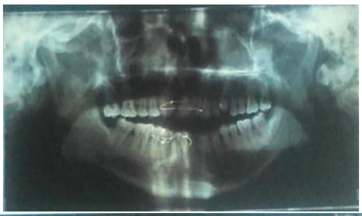
Monocortical miniplate osteosynthesis has been used successfully for the management of facial fractures. Michelet et al.[8] developed the concept of miniplate osteosynthesis in the late 1960s. In 1973, they published a report documenting the successful use of a small plate and monocortical screws for the treatment of mandibular fractures. The original goal of miniplate osteosynthesis was to provide stable mandibular fracture reduction without requiring inter fragmentary compression or maxillomandibular fixation. Studies performed in the early 1970s at the Grouped' Etudes en Biomecanique Osseuse et Articulaire de Strasbourg demonstrated that the miniplate achieves this goal by neutralizing undesirable tensile forces while retaining favorable compressive forces during function. Champyet al. (1976)[10] elaborated on Michelet's work with the intraoral application of the monocortical miniplate for the treatment of mandibular angle fractures.

The reduced size of the miniplate system offers several advantages over the larger mandibular plates. Smaller incisions 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 areas of the mandible adjacent to tooth roots with minimal risk of dental injury.

As for as 2-D plates are concerned posterior to mental foramen, one plate is sufficient, while anterior to the mental foramen, one should place 2 miniplates separated by 4-5 mm in order to neutralize torsional force. In case of angle fracture plating is done over the external oblique ridge.

Patient 1

Patient 2



Discussion and Review

We will never know with certainty the time when an early Homo sapiens first adjusted a fracture dislocation. Perhaps it occurred during the early Stone Age that a broken extremity was splinted with wood or bamboo sticks were embedded in clay and allowed to harden.

Writings on mandibular fractures appeared as early as 1650 BC when an Egyptian Papyrus described the examination, diagnosis and treatment of mandibular fractures and other surgical ailmentent.[1]

Hippocrates described direct reapproximation of fracture segments with the use of circum dental wires, similar to today's bridle wire. Hippocrates had the insight to realize that reapproximation and immobilization are paramount in the treatment of mandibular fractures.[1]

It was not until 1180 that a textbook written in Salerno, Italy, described the importance of establishing a proper occlusion. In 1492, an edition of the book Cyrurgia printed in Lyons made first mention of the use of maxillomandibular fixation in treatment of mandibular fracture.[1]

The date of first use of internal fixation is not known. Lapeyode and Sicre wired a fractured bone in or before 1775. Gurit in 1864, reported a number of cases in which fractured bone ends were freshened, reduced and secured with wires, screws and nails.One of the first uses of bone plates in a manner consistent with their use today was by Hansmann in 1886. He is credited with the idea of metallic bone plates and screws internally secured to the fractures. After the advent of roentgenology in 1895, the greatest advances in internal fixation stemmed from the pioneering efforts of several notable surgeons in various parts of the world. In Germany, Konig, Matti, Kuntscher, and others made great strider by applied metallic fixation devices to the surface of, or into the medullary cavity of, long bone fractures.[2]

In England, Lane (1893)[3] began experimenting and reporting on the use of internal fixation of fractures . He devised the steel lane plate, the best in use until Sherman's design in 1912. In the United States, Sherman[4]did much to further the design and composition of bone plates and screws. In Belgium, the Lambotte brothers, strongly advocated the use of internal fixation in certain types of fractures'.In the mid 1950s, a group of 15 Swiss Surgeons under the leadership of Miller[5] formed the AO (Arbeitsgemeinschaft fur osteosynthesisfragen: association for osteosynthesis) or ASIF (Association for the study of internal fixation). The AO/ASIF established the four basic principles for the treatment of skeletal fractures:

Anatomic reduction of fragments

Functionally stable fixation of the fragments

Preserving blood supply to the fragments by atraumatic operating technique

Early, active and pain free mobilization.

Mathys, a manufacturer, and Straumann, a metallurgist are credited with developing the first compression plate using the-gliding screw principle, which obviated the need for an external compression device. In 1958, Bagby and Janes modified a conventional non-compression plate in a very simple but indigenous manner, allowing the application of compression to the fracture by simply tightening the screws.[6]

In 1968, Luhr published his works on mandibular bone plates, which used a similar principle. This report was closely followed by the compression plate of Mittelmeier in 1968. One of the earlier reports to appear in maxillofacial literature regarding the use of rigid fixation was that of Brons and Boering (1970). They evaluated two forms of stable internal fixation using bone wiring, plating and screws in 40 cases of mandibular body fractures. Intermaxillary fixation was omitted. They concluded that rigid internal fixation had a useful role in mandibular fractures.[7]

Michelet et al (1973) analyzed 300 cases of fractures of facial bones and mandible using plates and screws. They concluded that the miniaturized plates ensured perfect adaptation of the osseous fragments, restoration of occlusion and reduced period of intermaxillary fixation.[8]

Champy in 1978, after an analysis of 183 cases of mandibular osteosynthesis with a 5-year follow up, using a modified technique of Michelet concluded that compression of the fragments is not necessary for fracture healing. He reported 4.8% malocclusion rate in group treated by miniplate osteosynthesis.[9]

The theory of small plate osteosynthesis in the treatment of mandibular fracture is well documented (Champy et al., 1976). Under physiological strain there are forces of tension along the alveolar border and forces of compression along the lower border. Within the body of mandible these forces produce moments of flexion predominantly which are strongest towards the angle and weakest in the premolar region within the mandibular symphysis these forces produce predominantly torsional movements that increase in strength towards the midline. Champy (1976) studied these movements with regard to a mathematical Araldite model of mandible and as a result was able to determine ideal line of osteosynthesis to overcome the displacing forces. By doing photoelastic analysis, he concluded that by placing the plate at most biomechanically favourable site the thickness of the plate can be kept to a minimum with the consequent advantage of increased malleability. Despite the thin section the complication of plate fracture was not encountered. A further advantage arises from the small size of the plate in that only a small mucoperiosteal flap need be raised on the buccal or labial aspect. Thus the major blood supply to the mandible is preserved since the integrity of the periosteal attachment along the lingual aspect and inferior border of mandible is not disturbed (Cohen, 1960; Bradley, 1975). This is of importance when treating fractures of the edentulous mandible particularly when they are severely atrophic.[10]

Steinhauser (1982) in his study on the use of bone- screws and plates in orthognathic surgery found that maxillary advancements were better stabilized with miniplate fixation rather than conventional suspension. He was of the opinion that this technique should be used for better stabilization of the fragments.[11]

Monocortical miniplate osteosynthesis has been used successfully for the management of facial fractures. Michelet et al.[8] developed the concept of miniplate osteosynthesis in the late 1960s. In 1973, they published a report documenting the successful use of a small plate and mono cortical screws for the treatment of mandibular fractures. The original goal of miniplate osteosynthesis was to provide stable mandibular fracture reduction without requiring inter fragmentary compression or maxillomandibular fixation. Studies performed in the early 1970s at the Grouped' Etudes en Biomecanique Osseuse et Articulaire de Strasbourg demonstrated that the miniplate achieves this goal by neutralizing undesirable tensile forces while retaining favorable compressive forces during function. Champy et al. (1976)[10.] elaborated on Michelet's work with the intraoral application of the mono cortical miniplate for the treatment of mandibular angle fractures.

The reduced size of the miniplate system offers several advantages over the larger mandibular plates. Smaller incisions 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 areas of the mandible adjacent to tooth roots with minimal risk of dental injury.

The rationale of using monocortical plate in mandibular fracture is that osteosynthesis 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 elongation strain along the alveolar border and compressive strain along the lower border within the mandible. Only the traction strain are injurious and have to be neutralized. The study of moments with regards to the mathematical model of mandible (Champy et al., 1978)[9] showed that at the level of horizontal ramus, there are almost only flexion moments, 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, the nearer they are 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.

References

1. Raymond F.J., Walter R.V. Oral and Maxillofacial Trauma, Pennsylvania , W.B. Saunders Company, 1997;3rd Edition , Vol 1 : 481.
2. Rowe and Williams, Maxillofacial Injuries, Churchill Livingstone, 2nd Ed., 1994; Vol. I: 354.
3. Lane WA , On the advantage of steel screw in the treatment of ununited fractures. Lancet1893; 2: 1500.
4. Sherman WO ,Vanadium steel plates and screws. SurgGynecolObstet 1912; 24: 629.
5. Bernard Spiessl. Internal fixation of the mandible. A manual of AO/ASIF principles, 1989; 151.

6. Bagby LW, Janes JM. The effect of compression on the rate of fracture healing using a special plate. Am J Surg1958; 95: 761,
7. Brons R, Boering GJ. Fracture of mandibular body treated by stable internal fixation. J Oral Surg 1970; 28: 407.
8. Michelet et al. Osteosynthesis with miniaturized screwed plates in maxillofacial surgery. J Maxillofac. Surge1973; 1:79
9. Champy M, Lodde JP, Schmidt R. Mandibular osteosynthesis by miniature screwed plates via a buccal approach. J Maxillofac Surg1978; 6: 14.
10. Champy M et al. Mandibular synthèses. Placement of the synthesis as a function of mandibular stress. Rev Stomatol Chir Maxillofac. 1976 ;77(8): 971-6
11. Steinhauser E.W. “Bone screws and plates in orthognathic surgery ” .Int J Oral Surg. 1982 ; 11 : 209-216