Comparative study between 2.0 mm locking plates and 2.0 mm standard plates in treatment of mandibular angle fractures

A thesis

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بسم الله الرحمن الرحيم

((وعلمك ما لم تكن تعلم وكان فضل الله عليك عظيماً))

صدق الله العظيم

سورة النساء الاية ١١٣

Dedication

To my big family, my father, my mother and brothers and to my small family, my dear wife and my kid for being so patient and supportive during my study.

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Contents

Subject **Page**

List of abbreviations

LMP	**:**	Locking Miniplate
MMF	**:**	Maxillo-Mandibular Fixation
AO	**:**	Association of Osteosynthesis
ASIF	**:**	Association for the Study of Internal Fixation
DCP	**:**	Dynamic Compression Plate
EDCP	**:**	Eccentric Dynamic Compression Plate
PLA	**:**	Polylactide
CBC	**:**	Complet Blood Count
ASA	**:**	American Society of Anasthiologist
IM	**:**	Intramuscular
IV	**:**	Intravenus
cm	**:**	centimeter
mm	**:**	millimeter
Fig.	**:**	Figure

List of figures

Introduction

One of the most rewarding as well as demanding aspects of maxillofacial surgical practice is the management of a patient who suffered from facial trauma.

Being the most prominent bone of the maxillofacial skeleton; the mandible is the most common of the facial bones exposed to fracture. Interpersonal violence and motor vehicle accidents were found to be the most common etiologic factors for mandibular fractures. [1]

The Mandibular fracture patterns largely depend on multiple clinical factors such as the size, direction, nature and surface area of the impacting force. Other factors that are felt to be responsible include the presence of soft tissue bulk and biomechanical characteristics of the mandible, such as bone density, mass, and normal or pathologic anatomic structures creating weak areas within the bone. [2]

The anatomical distribution of the fracture site is largely dependent on the mechanism of injury. The mandibular angle is one of the most common sites of mandibular injuries, comprising approximately 25–33% of all mandibular fractures. [2]

The therapeutic goals in treatment of such kind of fractures depend on the arrangement of bone fragments in their anatomical position and the restoration of the functionality with the least morbidity. The treatment of mandibular fracture has been studied over the past decade and the treatment philosophies continue to evolve.

Early techniques used to immobilize mandibular fractures included bandages, extra-oral and intra-oral appliances, mono-maxillary wiring, bars, splints and finally inter-maxillary fixation. During World War II, realignment through open reduction and wire fixation became popular. More recently, a tremendous amount of open reduction of fractures with internal fixation using non-compression, compression, dynamic compression plates or lag screws has occurred.

Now a day's mini-plate fixation of mandibular fractures has become the most widely used technique. Some studies reported favorable results with the 2.0 titanium mini-plate system and other studies continued to cite high complication rates. Research continues to focus on the size, shape, number, and biomechanics of plate/screw systems to improve surgical outcomes. [3]

The technique of open reduction and internal fixation of mandibular angle fracture using a superior border mini-plates placed intraorally has been described by ***Michelet et al*** [4] *and* ***Champy et al*** [5]. Now this technique is the preferred modality for many maxillofacial surgeons.

The purpose of this study was to evaluate and compare the 2.0-mm locking plate / screw system to 2.0-mm standard plate system in the treatment of mandibular angle fractures through the trans-oral approach.

Review of literature

Mandibular fractures are among the most common injuries in facial trauma. The first descriptions of treating mandible fractures date back to Egypt around 1650 BC. Hippocrates talked of re-approximation and immobilization. Proper occlusion was first addressed in 1180 in Salerno, Italy. Fixation of the maxilla to the mandible was first used in 1492. (6)

External violence, vehicular accidents, sports trauma and gunshot are the major etiological factors of mandibular fractures. Few fractures of the mandible are secondary to surgical procedures such as lower third molar surgery.The major predisposing factors for mandibular fractures are central lesion such as intra-bony cyst or tumors or osteomyelitic destruction of segments of the mandible. (7)

Herford and ***Ellis*** studied 2137 patients with fractured mandible and they reported that 43 % of mandibular fractures were caused by motor vehicle accidents, 34 % were caused as the result of a fall, 4 % occurred in sporting accident and the remainder had miscellaneous causes. (8)

Why is the angle of the mandible commonly associated with fractures?

There are several proposed reasons that include the presence of third molars, a thinner cross-sectional area than the tooth-bearing region, and biomechanically the angle can be considered a "lever" area.

Several authors have implicated the presence of third molars, especially impacted third molars, as a reason for mandibular fractures occurring in the region of the angle.

In fact, some have recommended prophylactic removal of third molars to eliminate their weakening effect in the angle region, in hopes of preventing fractures from occurring [8-14]

There are several ways for classification of mandibular fractures. ***Natvig*** and ***Dingman*** [15] classify mandibular fractures according to the anatomic location of the fracture as follows:

- Region of the symphysis; it is the area in the midline of the mandible.
- Region of the parasymphysis; it is the area bounded by vertical lines just distal to the lower canine teeth.
- Region of the body of the mandible; it is the area from the canine line to the line coinciding to the anterior border of the masseter muscle.
- Region of the angle of the mandible; it is triangular area bounded by the anterior border of the masseter muscle and an oblique line extending from lower third molar area to the posterior superior attachment of the master muscle.
- Region of the ramus; it is area bounded by the region of the angle of the mandible and superiorly by two equal line which form a 90° apex at the mid point of the sigmoid notch.
- Region of the condylar process; this region comprises the condylar process above and the ramus region and includes the neck and condyle of the mandible.
- Region of the coronoid process; it is the area that includes the coronoid process above the ramus region.
- Region of the alveolar process; it is the area which contain the teeth.