

# lag screw placement in anterior mandibular fractures

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## Abstract:

**Aim:** To evaluate the feasibility and accuracy of computer-generated patient-specific template for open reduction and internal fixation of anterior mandibular fractures using lag screws.

**Materials and Methods:** A total of nine patients with anterior mandibular fractures were managed with open reduction and internal fixation with lag screws aided by guiding template.

**Results:** All nine cases showed good stable segment after 3 months. No sensory dysfunction was found except for one with pre operative numbness. no injury to vital structures validated by post operative CT scan.

**Conclusion:** Fixation of anterior mandible fracture using this technique can achieve good stability and appropriate compression. The technique is simple and easily performed, reducing the surgical time, reducing the chances of vital structures injury due to computer guided placement.

## Introduction:

Anterior mandibular fractures are reported as 17% of all mandibular fractures.<sup>1</sup>

The management of mandibular fractures have evolved significantly in the past few decades. Historically these fractures were managed through closed techniques, such as maxillomandibular fixation (MMF), splints, and external fixation. These techniques suffered from morbidity such as improper alignment of the segments with secondary bone healing, loss of function, weight loss, poor oral hygiene and patient inconvenience.

The modern era of fracture treatment has given more way to the use of rigid internal fixation to allow excellent alignment with primary bone healing rapid return of function, good nutrition and easier

maintenance of oral hygiene. In other words to avoid those previously mentioned complications.

The Lag Screw is a form of internal rigid fixation with several advantages over the compression plates, however it has a lot of drawbacks due to the required skill to use it.

Computer-Assisted and Image-Guided techniques are gaining much popularity in the various field of oral and maxillofacial surgery. The use of such techniques for open reduction and internal fixation(ORIF) of mandibular fractures might increase the accuracy of reduction of the fractured segments, shorten the intra operative time and minimize the potential complications of internal fixation especially when technique-

sensitive tools are to be used such as lag screws.

## **Patients and methods :**

A total of nine adult patients were selected from the out patient clinic at the oral and maxillofacial surgery department, faculty of oral and dental medicine at Cairo University.

Criteria for inclusion: 1) an intraoral surgical approach; 2) a simple (linear, non-comminuted) fracture of the symphysis (defined as the region between but not including the mental foramina) with or without concomitant facial fractures..

Patients were informed about closed or open reduction procedures. The individuals who were willing for surgery were included in the study.

All clinical and radiographic parameters were evaluated. Occlusion, facial symmetry and edema, hemorrhage, lacerations, tissue loss, maximal incisal opening, pain and numbness, trismus, infection and Fractured teeth were evaluated

Radiographic evaluation was performed to determine fracture site and extent of displacement. Pre operative orthopantomogram was performed as a preliminary screening radiograph, followed by a Computed tomography (main parameter) for virtual planning, reduction and construction of surgical stent.

Computed tomography (CT) parameters:  
1)Axial images only; 2)Gantry tilt = Zero;  
3)Upper and lower teeth slightly separated;  
4)Slice thickness 0.625 mm; 5)Slice distance 0.625 mm; 6)Bone window.

**Surgical procedure:**

The operation is performed under general anaesthesia using nasal endotracheal intubation. A mandibular vestibular incision is made from canine to canine or extended as needed in the direction of the mental foramen. The fracture was then reduced and the patient wired into intermaxillary fixation. A bone reduction clamp used to further reduce and temporarily stabilize the fracture. countersinking performed Lag screws 2.0 mm stryker leibinger<sup>1</sup> are inserted and tightened. The reduction forceps is disengaged and the stability of the fixation is checked. The occlusion checked. The incision is sutured back in layers.

Post operative CT is performed.

## **Results:**

Nine patients were included in this study.

Consisted of eight males and one female. With age range from twenty years old to thirty four years old. All patients were admitted after a maximum of 1 week from trauma.

Three patients had anterior mandibular fracture alone. Three patients had anterior mandibular fracture with concomitant unilateral sub condylar fracture. One patient had anterior mandibular fracture with concomitant bilateral sub condylar fracture. One patient had anterior mandibular fracture with concomitant angle fracture on one side and ramal fracture on the

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<sup>1</sup> lag screw ©2011 Stryker Leibinger GmbH & Co. KG. Boetzingen Strasse 4. D-79111 Freiburg. Germany. [www.stryker.com](http://www.stryker.com)

other side. One patient had anterior mandibular fracture with concomitant angle fracture.

clinical results:

Post operatively non of the cases showed clinical manifestation of infection form the anterior mandibular segment. only one case showed angle infection. However three cases showed post healing infection which was explored and found to be around the head of the screw urged it's removal.

Stability of the fractured segments: Bimanual mobility test of the anterior fractured segments showed stability of all cases. Done post operatively after the surgery, after one month from the surgery and after 3 months from the surgery.

There are different techniques of internal mandibular fixation, each of which is based on specific principles that reflect one's philosophy of treatment. The 2.0 miniplate system originated from the work of Champy et al 1978. The Compression plate osteosynthesis Luhr 1968. An alternative to the plate and screw system is osteosynthesis using only lag screws. It has been shown that mandibular fractures in both the anterior and angle regions can be successfully treated using metal screws Niederdellmann 1976.<sup>2,3,4</sup>

The Lag Screw osteosynthesis provide a lot of merits in comparison to compression plates. It is more rapidly applied, more

Occlusion: pre operative occlusion was observed. Corrected occlusion intra operatively was monitored in the post operative phase. The corrected occlusion was maintained in all cases.

Assessment of sensory function: No sensory dysfunction was reported or detected in any of the patients except one case who had numbness of the lower lip. This numbness was already present pre operatively.

Results showed eventful healing of all fractured. With post healing infection in three cases only which necessitating their removal. No injury to any vital structures such as mandibular nerve or teeth roots or perforation of lingual cortex.

### **Discussion:**

accurate anatomical reduction, cheaper than bone plates, lack of stress shielding, less implant material, no need for post treatment removal and stronger and stiffest in comparison to mini and compression plates. <sup>5-10,11,12</sup>

Although lag screws provided a lot of merits yet the technique suffered from a lot of draw backs. Technical complications such as breakage of the drill bit and inability to use in comminuted fractures. The technique is partly blind which caused injury to vital structures such as mental nerve and teeth roots or lingual breach.

<sup>13,14</sup>

This drawbacks rendered the technique to be highly sensitive, requiring a skilful operator. This limited it's use and pushed some to abandon the technique. <sup>5,7,8</sup>

The advancement of computer assisted surgery was used to provide a surgical stent guide to facilitate and make accurate insertion of the lag screw easier and avoid injury to vital structures, hence reducing the blind drawback character of the technique.

Ellis 1991 <sup>5</sup> disagreed with Niederdellmann et al 1976 <sup>4</sup> who stated that "lag screw osteosynthesis is not meant to replace osteosynthesis with plates." This study coincide with Ellis that lag screw osteosynthesis could replace plates and screws and it should be considered the first choice in treatment of linear fractures in anterior mandibular fractures. And the use of computer guided technology tremendously reduced the drawbacks of the lag screw technique, rendering more feasibility in application of the lag screw technique.

Conclusion Fixation of anterior mandible fracture using this technique can achieve good stability and appropriate compression. The technique is simple and easily performed, reducing the surgical time, reducing the chances of vital structures injury due to computer guided placement.

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