



Assessment of Using 3D Miniplates Versus Lag Screws in Mandibular Parasymphyseal Fracture

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KEYWORDS

3D Miniplates, Lag screws,
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fracture, Mandible

ABSTRACT

Aim: This study was designed to evaluate of using 3D miniplates versus lag screws in mandibular parasymphyseal fracture **Subjects and Methods:** fourteen patients with parasymphyseal fractures were divided randomly into two groups and were treated with 3D miniplates and 2 lag screws. The outcome parameters recorded were infection, occlusion derangement, nerve affection, teeth related to fracture line. The data collected was be analyzed statistically using (SPSS) V21. **Results:** The results showed that 2 cases in group (A), 3 cases in group (B) had postoperative infection. Four patients in each group showed with slightly infection after one week this degree of malocclusion disappeared. One patient had paresthesia in group (A), while 2 patients in group (B) had paresthesia. There was no statistically significant difference between 3D miniplates and lag screw system in all recorded parameters at all the follow ups. **Conclusions:** 3D miniplates were found to be better than 2 lag screws in easy of surgery and operative time. However, the lag screws were favorable for cases where fracture line was oblique.

INTRODUCTION

The mandible is the one of the most common fractured bone of the maxillofacial skeleton because of its position and prominence. Treatment of mandibular fracture represent a unique challenge for surgeons because of its high percentage of postoperative complication.⁽¹⁻³⁾

Treatment modalities of mandibular fractures have been in a constant state of evolution.⁽⁴⁾ The main objective of the treatment of the fracture is to restore the anatomical shape of the jaw accompanied with aesthetic and function. Many studies have continues to focus on size, shape, number and mechanics of plate/screws systems to improve the surgical outcomes.⁽⁵⁾

The lag screw used in maxillofacial surgery is considered to be a rigid fixation mean. The use of 2 screws was necessary to prevent

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rotational movement of the fragments in oblique fractures of the mandible.

Additionally, three dimensional (3-D) miniplate system is one of the recent internal rigid fixation means for maxillary or mandibular surgeries.⁽⁶⁾ Their design is based on the principle of a quadrilateral shape as a geometrically stable configuration for support.⁽⁷⁾ Therefore advantages of 3D miniplates include easy adaptation to bone without distortion or displacement of the fracture, less operative time and improved stability. Moreover there is a simultaneous stabilization of the tension and compression zones.⁽⁸⁾

AIM OF THE STUDY

The aim of the present study was to assessment of using 3D miniplates versus lag screws in mandibular parasymphiseal fracture.

PATIENTS AND METHODS

This randomized controlled clinical trial study was conducted on fourteen adult patients with mandibular parasymphiseal fractures were selected from those attending the outpatient clinic of Sayed Galal Hospital complaining from fracture mandible and seeking treatment.

Inclusion criteria:

Parasymphiseal mandibular fracture, age ranged from 23 to 45 years with a mean range of 34 years, Patients who accepting surgery under general anesthesia, and patients with recent fracture.

Exclusion criteria:

Comminuted fracture, edentulous patient. Patient with soft tissue loss, previously treated fracture with mal-united bony segments, and Patients didn't accepting to return back for follow-up were excluded.

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Patients were be divided in two groups:

Group (A): fixation with 3D miniplate.

Group (B): fixation with 2 lag screws.

All patients informed about the details of the procedure and sign written consent.

Operative procedures:

Abroad spectrum antibiotic (unictam* 1500mg and dexamethasone+ 8mg were administered intravenously.

Under general anesthesia aseptic surgical technique was achieved as follow: The surgical field was disinfected by Betadine** and then the patient was draped with sterile towels secured by towel clips. Over-drape was used to cover the patient leaving only the prepared site exposed.

Surgical procedures:

Arch bars were used for maxillo-mandibular fixation to adjust reduction and occlusion. The incision line was marked by a marker pen, and injection of vasoconstrictor solution in the surgical site with adrenaline 1/100.000 without neglectation of aspiration aiming for achieving hemostasis during the surgical procedure.

An intraoral mandibular vestibular approach was utilized for wide exposure of the planned surgical site using blade No.15. The incision extended about one inch each side away from the fracture line location. Once the mucosa was incised, the underlying muscles were sharply incised with the blade perpendicular to the bone.

A mucoperiosteal elevator was used for reflection of the flap to expose the fracture line down to the inferior border of the mandible. The periosteum was totally freed circumferentially around the mental foramen and nerve.

The surgical field was irrigated, hemostasis achieved by compressing sterile gauze or use



diathermy and the fracture line was exposed. The fractured segments were reduced using bone clamp, then both the upper and lower jaws were closed and fixed to each other using the arch bar that was previously fixed on the teeth.

Once the reduction of the fracture and the maximum intercuspation of teeth were assured, the fracture segment was fixed with 3D miniplate or 2 lag screws. (Group A) we used 3D miniplates, (Group B) we used 2 lag screws. In (group A) for placement of 3D miniplate 2.0 mm diameter which seated over the fracture site perpendicular on line of fracture and adapted along the outer cortex of mandible. In (Group B) the planning for placement of the 2 lag screws with diameter 2.0mm but length was ranged from 22mm to 30mm according fracture line length, we starts by preparing the countersink using large round surgical bur in the outer cortex of the near segment away from the fracture line by about 2-3mm, Then we used along drill with diameter 1.5m.

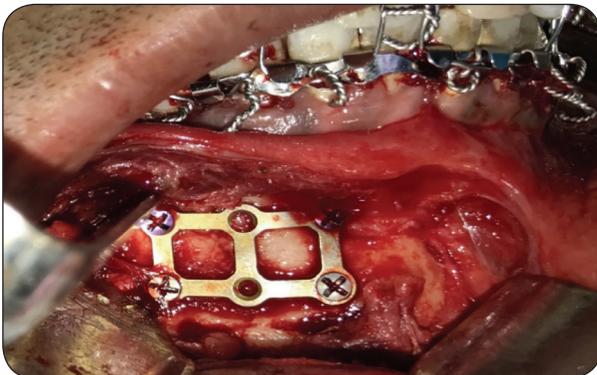


Fig. (1) Showing 3D miniplate in place



Fig. (2) Showing the 2 lag screws in their place.

I- Radiographic evaluation:

Postoperative radiograph was taken for each patient at 2nd day, 3 and months

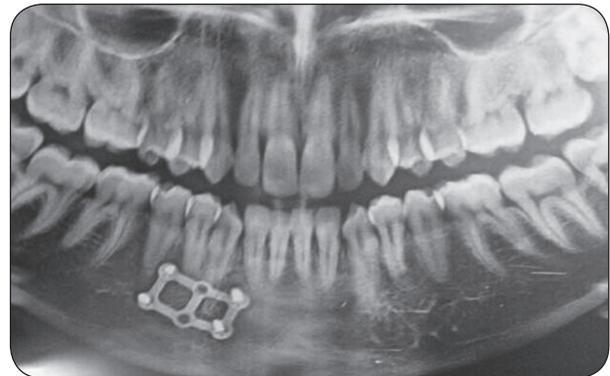


Fig. (3) Six month follow up group (A).

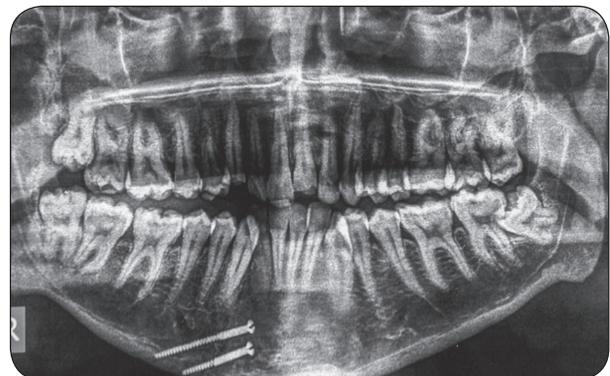


Fig. (4) Six month follow up group (B).

II- Statistical analysis of data:

Data management and statistical analysis. The collected data was be analyzed statistically using statistical Package for Social Science (SPSS) V21.

RESULTS

1. Infection:

In our study, there wasn't any statistically significant difference between Group (A) and Group (B) with respect to infection rates at end of 1st week. The incidence of infection for Group (A) was 2 cases, For Group (B) was three cases, all cases treated by antibiotics. Table (1)

| Infection | | Group A (3D miniplate) | Group B (lag screw) | Test value | P-value | Sig. |
|-----------|----------|---------------------------|------------------------|------------|---------|------|
| | | No. (%) | No. (%) | | | |
| 2 days | Negative | 5 (71.4%) | 4 (57.1%) | 0.311* | 0.577 | NS |
| | Positive | 2 (28.6%) | 3 (42.9%) | | | |
| 4 days | Negative | 5 (71.4%) | 4 (57.1%) | 0.311* | 0.577 | NS |
| | Positive | 2 (28.6%) | 3 (42.9%) | | | |
| 1 week | Negative | 7 (100.0%) | 7 (100.0%) | - | - | - |
| | Positive | 0 (0.0%) | 0 (0.0%) | | | |
| 3 months | Negative | 7 (100.0%) | 7 (100.0%) | - | - | - |
| | Positive | 0 (0.0%) | 0 (0.0%) | | | |
| 6 months | Negative | 7 (100.0%) | 7 (100.0%) | - | - | - |
| | Positive | 0 (0.0%) | 0 (0.0%) | | | |

2. Occlusion:

The occlusion of the patients was evaluated at 2nd day , 4th day ,one week, three month, six month post operatively, 4 patients in each group showed with slightly malocclusion, after one week this degree of malocclusion disappeared.

DISCUSSION

The objectives in the treatment of mandibular fractures are to re-establish normal occlusion and masticatory function with minimal disability and complications.^(9, 10)

Farmand et al in 1992 developed the concept of 3D miniplates. Since the stability achieved by the geometric shape of these plates not by thickness or length, surpasses the standard miniplates the thickness can be reduced to 1 mm. The 3D miniplates itself was a misnomer as the plates themselves were not 3-dimensional, but holds the fracture segments rigidly by resisting the 3-dimensional forces namely shearing, bending and torsional forces acting at the fracture site in function.⁽¹¹⁾

In this study, the 2 lag screws were used successfully in parasymphiseal fracture. The concept of lag screw osteosynthesis requires that compression of the fracture be achieved by the passage of the screws through a larger (gliding) to smaller (traction) hole on each side of fracture. The gliding hole allows for passive placement of the screw to traction hole that is engaged by the cortex.⁽¹²⁾

The present study was designed with an aim of evaluating the efficacy of 3D miniplate in parasymphiseal fracture and to compare it with 2 lag screws and to report the complications encountered during its use.

During the surgical procedure, the operative time was recorded to establish the whole surgical procedures including the incision and reflection of mucosal flap, reduction of the fractured segments to their normal position, In compared both groups makes the 3D plate a time-saving alternative to 2 lag screws.

The occlusion of patients was checked preoperatively and during the follow-up stages after surgery, preoperatively, as regard to clinical



stability, all patients showed mobility of the fractured segments in the present study. But after open reduction and internal fixation, no mobility of the fractured segments was found. The occlusion when detected postoperatively with slightly occlusal derangement but disappeared by instruction, occlusal grinding and return to their normal anatomic occlusion at end of 1st week follow up. Infection in current study showed in 2 patient in group (A), 3 patient in group (B), were treated adequately with antibiotic medication, daily irrigation. Mild paresthesia was present in both groups, one patient in group (A) and 2 patient in group (B), due to the close approximation of the fracture line to the mental foramen leading to paresthesia in the symphysis region postoperatively; decreased gradually on medication, and sensation was recovered 3 month follow up.

The results suggest that fixation of parasymphyseal fracture with 3D miniplate provides 3D stability, carries low infection rates and shorter operative time because of simplified adaptation to the bone and simultaneous stabilization at both superior and inferior borders.

CONCLUSION

It can be concluded that:

1. Fixation of parasymphyseal fractures with 3D miniplate provides 3D stability because of its design during fixation of fracture fragments.
2. The 3D miniplate when compared with 2 lag screws can reduced the operating time and therefore the time of anesthesia.
3. Fixation of parasymphyseal fracture using lag screw can achieve good stability.
4. Application of lag screws lied in providing adequate compression to the fragments so that primary bone healing can be achieved.

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تقييم استخدام الشرائح الدقيقه ثلاثية الابعاد مقارنة بالمسامير الشد في الكسور الأمامية للفك السفلى

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الملخص :

الهدف: تم تصميم هذه الدراسة لتقييم استخدام الشرائح ثلاثية الأبعاد مقابل مسامير متخلفة في الكسر الطرفي الأمامي بالفك السفلى

المواد والاساليب : تم تقسيم أربعة عشر مريضاً مصابين بكسور أمامية للفك السفلى بشكل عشوائي إلى مجموعتين وتم علاجهم بشرائح دقيقيه ثلاثيه الأبعاد واثنين من مسامير الشد. وكانت معايير النتائج المسجلة هي العدوى . وانحراف أطباق الاسنان. ومدى تضرر العصب . والأسنان المتعلقة بخط الكسر. تم تحليل البيانات التي تم جمعها إحصائياً باستخدام البرنامج الاحصائي اس بي اس اس .

النتائج: أظهرت النتائج أن حالتين في المجموعة (أ) ثلاث حالات في المجموعة (ب) كان لديهم عدوى ما بعد الجراحة. أظهر أربعة مرضى في كل مجموعة عدوى طفيفة واختفت هذه الدرجة من سوء الإطباق بعد أسبوع واحد. كان مريض واحد يعاني من تشوش الحس في المجموعة (أ) . بينما كان مريضان في المجموعة (ب) يعانيان من تشوش الحس. لم يكن هناك فرق يعدت به إحصائياً بين الشرائح الدقيقه ثلاثية الأبعاد ومسامير الشد في جميع المعلومات المسجلة في جميع المتابعات.

الخلاصة: وقد خلصت تلك الدراسة الى أن الشرائح الدقيقه ثلاثية الابعاد افضل من مسامير الشد في سهولة الجراحة والوقت الجراحي. ومع ذلك . كانت مسامير الشد مناسبة للحالات التي بها خط الكسر مائلا

الكلمات المفتاحية: الشرائح الدقيقه ثلاثيه الابعاد. مسامير الشد .كسر امامي للفك السفلى. كسر مائله، الفك السفلى

