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EVALUATION THE LOCKING PLATE VERSUS 3D MINIPLATE IN TREATMENT OF PARASYMPHYSEAL FRACTURE

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ABSTRACT

Objective: the present study was performed to evaluate the locking plate versus 3D miniplate in treatment of Parasymphyseal fracture. **Subjects and Methods:** the present study was performed to evaluate the locking plate versus 3D miniplate in treatment of Parasymphyseal fracture (PF). Patients of the present study suffered from PFs and received treatment. All patients were clinically evaluated in systematic manner through two phases extraoral phases as well as intraoral phase and Radiographic evaluation was done. **Results:** All patients hadn't any infection, nerve injury, Graft exposure and /or loss, soft tissue dehiscence and facial edema throughout the study till 6 months. Patients experienced mild to moderate pain after surgery, at the surgical sites which decrease gradually during four days postoperatively then disappeared completely at the 7th day. **Conclusion:** The fixation of PFs with 3D miniplate effective, rapid, easily used and provides good stability of fracture fragments. The fixation by 3D miniplate is cheaper and significantly reduces the operating time rather than locking system and therefore the time of anesthesia.

KEY WORDS: Mandibular fracture; locking plate; 3D miniplate; treatment of Parasymphyseal fracture

INTRODUCTION

The mandible is one of the most commonly fractured bone in the facial skeleton. Symphyseal and parasymphyseal fractures of the mandible have been reported to occur with a frequency of 9% to 57% [1-3]. The treatment of mandibular fractures should be guided by several principles, reduction of the anatomical position, fixation, immobilization of the fracture to facilitate healing, optimal and early restoration of function (rehabilitation) [4-6]. Fixation of mandibular fractures has changed from maxillomandibular fixation (MMF) with or without internal wire fixation to internal plate and screw fixation without MMF [7,8].

Champy and co-workers described a zone of tension in the alveolar part of the mandible and a zone of compression on the lower border. This information allowed ideal lines for mandibular internal fixation to be identified along the physiological tension lines. The placement of monocortical miniplate high in the mandible has been considered to neutralize tension or spreading

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forces along alveolar border. Also, to distribute the compression forces along the inferior border of the mandible. Intraoral placement avoids external scars and potential injury to marginal mandibular branch of the facial nerve while allowing simultaneous fracture reduction and fixation and exact occlusal adjustment [9,10].

In the mandible a line drawn at the base of the alveolar process corresponds to the line of tension where monocortical plates and screws can be fixed. In the parasymphysis region, another line is drawn near the lower border to neutralize the tension forces [11,12]. Although tow plates have been used successful for fracture fixation anterior to the mental foramen. A modification occasionally used for fractures in close proximity to the mental foramen to avoid trauma to the nerve [13-19].

Instead of two locking miniplates VS only one 3D miniplatewhich include four holes on the fracture. This modification may reduce the surgical trauma that may affect the mental nerve as well as injury to the roots of anterior teeth [20,21]. Moreover, it could reduce the duration of surgery and finally, cheaper; these factors initiated the present study.

SUBJECTS AND METHODS

This study was performed to evaluate the locking plate versus 3D miniplate in treatment of Parasymphyseal fracture. Patients were selected from those attending the outpatient clinic of Oral and Maxillofacial Department at Sayed Galal Hospital, Al Azhar University. They suffered from PFs and received treatment.

To implement any patient in this study, inclusion criteria included: Non-comminuted, non-infected mandibular fractures in parasymphysis region, and fractures indicated to open reduction and internal fixation.

When the patient had any criteria of comminuted, infected mandibular fracture, pediatric patients below 14 years of age and geriatric patients with complete edentulous mouth, medically compromised, allergy to any drug, or on medication for any disease affecting bone and wound healing, or gunshot wounds, the patient was excluded.

The study was done on 20 patients, which were divided randomly to tow groups, each group had 10 patients. First group was treated with 3D miniplate while second group was treated with locking system.

Clinical evaluation:

All patients were clinically evaluated in systematic way through two phases extraoral phases as well as intraoral phase.

Extraoral phase:

a. Inspection: Was made for possible detection of lacerations, swelling, ecchymosis, and facial asymmetry.

b. Palpation: General palpation of the face was carried out with special care given to the area overlying the mandible which was palpated bimanually, beginning with the condylar region and proceeding down over the mandible to detect any areas of tenderness, deformities or bony crepitus. The lower lip was palpated to detect any evidence of nerve dysfunction, paresthesia or anesthesia.

Intraoral:

a- Inspection for the presence of lacerations, hematoma, ecchymosis, loose, broken and avulsed teeth. Fractured crown or missing teeth, presence of filling, and prosthetic crowns, were noted.

The status of occlusion was defined to be normal, slightly affected or severely affected, according to the ability of the patient to close his mouth in maximum intercuspidization and perform efficient mastication.

b- Palpation of the mandible intra orally for the presence of tenderness, bony crepitus, tooth or bone segment mobility.

Radiographic evaluation:

Panoramic radiograph was taken to define the location, type and number of fractures, presence of tooth in fracture line, and displacement of the segments.

Surgical procedure:

Preoperative antibiotic was administered orally 1-hour before procedure. All patients were treated under general anesthesia. General anesthesia was administered through induction, maintenance, and recovery phases.

Arch bars were used for maxillomandibular fixation to adjust reduction and occlusion. The incision line was marked by a marker pen. Mepicaine, with levonordefrin 1:20,000 was infiltrated into the surgical site submucosally 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 in a curvilinear pattern. 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. An amount of underlying muscles should remain on its origin for deep suturing at closure. A mucoperiosteal elevator was used for reflection of the flap to expose the fracture line down to the inferior border of the mandible. Controlled and Careful dissection and reflection of the mental neurovascular bundle was achieved in order to facilitate retraction of the soft tissue away from the mandible and clearly visualize the fracture. The periosteum was totally freed circumferentially around the mental foramen and nerve. Any entrapped tissues between fracture segments were removed using small surgical curette.

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 surgical field was irrigated, hemostasis achieved by compressing sterile gauze use of diathermy and the fracture line was exposed. The fractured segments were reduced using bone clamp. 3D Miniplate was seated over the fracture site, perpendicular on the fracture line and adapted along the outer cortex of the mandible in first group. While in another group the fixation of fracture was done by two locking miniplates parallel to each other one placed in compression zone and the other one in tension zone. Fig (1)

FIG (1) Showing two locking miniplates parallel to each other

The holes were drilled by using a 1.5 mm diameter drill bit loaded on power driven micromotor under copious irrigation with normal saline as a coolant. Then the miniplate was secured with monocortical screws (2mm diameter, 7mm length) by using the screw driver down.

Any bleeding point was controlled then the wound was thoroughly debrided, irrigated with warm saline solution and sutured back in layers with 3-0 resorbable sutures; The underlying muscles were firmly reattached to its origin. Then the overlying mucosa was closed in a running suture manner then interrupted sutures over it.

RESULTS

The patients' ages ranged from 18 to 40 years. In Group I (fixation done by 3D miniplate), the mean age at the time of surgery for group (I) was (25.4) minutes. While in Group II (fixation done by locking system), the ages ranged from 18 to 48 years with the mean age at the time of surgery was (30.8) minutes.

TABLE (1) Frequency of gender distribution in both groups.

F		Group 1		Group II		Test value*	P-value	Sig.
		No.	%	No.	%			
Gender	Male	6	60%	8	80%	0.476	0.490	NS
	Female	4	40%	2	20%			

There was no significant difference age mean values between both groups (p >0.05)

Clinical sign/symptoms of infection over the fracture site follow up in patients of two groups from 2 day to 6-month post operatively.

TABLE (2): Clinical sign/symptoms of infection from day 2 to 6-months post operatively.

Clinical sign/symptoms of infection		Group I		Group II		Test value*	P-value
		No.	%	No.	%		
2 days	Edema	10	100.0%	10	100.0%	0.000	1.000
1 week	Erythema	10	100.0%	10	100.0%	0.000	1.000
2week	Absent	10	100.0%	10	100.0%	0.000	1,000
1 month	Absent	10	100.0%	10	100.0%	0.000	1.000
2 months	Absent	10	100.0%	10	100.0%	0.000	1.000
3 months	Absent	10	100.0%	10	100.0%	0.000	1.000
4 months	Absent	10	100.0%	10	100.0%	0.000	1.000
5 months	Absent	10	100.0%	10	100.0%	0.000	1.000
6 months	Absent	10	100.0%	10	100.0%	0.000	1.000

Mobility of segments:

In all patients of two groups, there was no fracture segment mobility noted post operatively. Upper border or lower border splaying was not seen in either group.

Pain

Pain was evaluated by using a scale noting no pain, mild, moderate, or severe pain in the area of the plate. During of the first post-operative week, all patients of 2 groups suffered from the usual expected post-operative pain, which had decreased in severity within three to seven days, this pain was controlled by using of analgesics.

By the end of the second post-operative week spontaneous pain was disappeared in all cases of 2 groups. At the first post-operative month during function was noticed in on case of group (I) and two cases in group (II). Three months post operatively, this symptom gradually disappeared. Sixth month post-operatively, all patients showed normal painless function.

Radiographic assessment:

Postoperative radiography was taken for each patient at 2nd day, 3 and 6 months. The status of reduction and alignment of bone segments was observed for each patient. This was assessed using a score from 1 to 3.

TABLE (3) Showing the radiographic score at different intervals.

All cases		Pre.		2nd day		3rd month		6th month		Test value	P-value
		No.	%	No.	%	No.	%	No.	%		
Radiographic score	Score 3	20	100 %	0	0%	0	0.0%	0	0.0%	40.000	0.000
	Score 2	0	0%	0	0%	0	0.0%	0	0.0%		
	Score 1	0	0%	20	100%	20	100%	20	100%		

DISCUSSION

The mandible is the second most commonly fractured part of the maxillofacial skeleton. The anterior region of the mandible represents the central horizontal part of the mandible, it is bounded bilaterally by vertical lines just distal to the mandibular canine teeth, including those that run in the midline of the mandible. AMFs represent a considerable entity of mandibular injuries [22].

The intraoral application, of mono cortical miniplates to treat MFs. They showed that miniplates achieve the goal of osteosynthesis by neutralizing undesirable tensile forces while retaining favorable compressive forces during function [23].

The present study included patients with PFs. The edentulous patients, infection anywhere of the mandible, comminuted fracture, fractures with soft tissue loss, gunshot fracture, patient with multiple fractures were not included in our study as these fractures are indicated for closed reduction rather than open reduction and internal fixation using miniplates [24].

In this study we found that, the fixation of PFs by 3D miniplate proved to be a quicker and easier method, because the mean time required for placement was significantly less than that in group II which needs two miniplates for fixation [25]. And economical method, the patient provides the price of one3D miniplate and four screws so that the cost of the procedure little than that to group II. During the surgical procedure, two parameters were recorded, the degree of stability of the fractured segments after the fracture fixation and the operative time needed to establish the whole surgical procedures in the two groups, this time started from incision to closure, included the reflection of mucosal flap, reduction of the fractured segments to their normal position , placement of the miniplates and its fixation with screws, till the closure of wound .

We believe that placement of 3D miniplate could eliminate the need for two locking miniplates in the parasymphysis region. Do prove effective. Placing two locking miniplates potentially increases the chances of mental nerve injury, injury to teeth roots, chances of infection and exposure of osteosynthesis implants in fixation of PFs [26].

CONCLUSIONS

It can be concluded that: The fixation of PFs with 3D miniplate is effective, rapid, easily used and provides good stability of fracture fragments. The fixation by 3D miniplate significantly reduces the operating time and therefore the time of anesthesia. 3D miniplate has no deleterious effect on the healing of soft tissue wounds and is cheaper than fixation of locking miniplates.

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