

## Microplate Osteosynthesis in Pediatric Mandibular Fractures

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### Abstract

The aim of this study was to discuss the significance of microplate osteosynthesis in pediatric mandibular fractures. **Patient and methods:** Ten patients with age ranged between 1-10 years were collected from those attending the outpatient clinic of Oral and Maxillofacial Surgery Department, Al- kawait Hospital, Sana'a University. All patients that have mandibular trauma associated with either single or multiple fracture lines in the mandible were included in this study. Diagnosis of the mandibular fracture was achieved through history, clinical and radiographic examinations. All patients were treated by open reduction and internal fixation by 1.2mm microplate. **Results:** No signs of infection in or around the incision during fracture treatment were observed, and the soft tissue healing progressed normally. Clinical follow up was done every other day for two weeks and after three months postoperatively. **Conclusion:** Management of mandibular fracture in children by open reduction and microplate is an acceptable method for treatment with least morbidity and increase stability of displaced segment.

**Keywords:** microplate osteosynthesis, mandibular fractures, radiographic examinations, skeletal facial structure.

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### INTRODUCTION

The mandible is the only mobile facial bone within the skeletal facial structure. This mobility and prominence of the mandible makes it to be the most frequently involved in facial fractures, approximately 57% of all facial fractures. It is bounded to skull by bilateral joints [1, 2].

Achievement of diagnosis and treatment plans was determined from analysis of the epidemiology of mandibular fractures reveals the incidence, etiology, patient gender and oral health, time between injury and treatment, types and the most common site of fractures, patterns of treatment, complications, and long-term follow-up of mandibular trauma. Most of the patients are male, and with age between 2-10 years are the most affected [3, 4].

The mandibular fractures are classified according to the location, the condition of teeth, the direction of the fracture, and its favorability for treatment, and the characterization of the anatomic area and fracture pattern [5]. Moreover, the displaced or non-displaced fracture depends on the amount of energy

transmitted to the facial skeleton and the vector in which such force is directed [6].

Most facial fractures in children can be treated conservatively; this should be the goal due to the anatomical complexity of the developing mandible [7]. The flexibility of immature bone in children reduces the rate of mandibular fractures. However, the fracture is due to high energy strength [8].

The open versus closed treatment is still controversially. However, the open reduction and internal fixation as the preferred option, with a resin splint installed in order to maintain tooth alignment on the upper border of the mandible in inappropriately displaced fractures [7]. The aim of this study is to discuss the significance of Microplate osteosynthesis in pediatric mandibular fractures.

### PATIENTS AND METHODS

Ten patients with age ranged between 1-10 with a mean of 5 years were participated in this study. Patients of the present study were collected from those attending the outpatient clinic of Oral and Maxillofacial Surgery Department, Al- kuwait Hospital, Sana'a University. Patients that have mandibular trauma

associated with either single or multiple fracture lines in the mandible were included in this study. Ethical approval was obtained from Sana'a University, Faculty of Dentistry prior to the study under No. 17/ 15-7-2020 and all of the participants provided written informed consent before they were enrolled in this study. Diagnosis of the mandibular fracture was achieved through history, clinical and radiographic examinations. Patients were divided into two groups according to number of fracture line in the mandible. Group I: patients having one fracture line. Group II: patients having more than one fracture line. Each of both groups was consisted of 5 patients (Table1), scheduled for reduction and fixation of fracture line by microplate. The bridle wire was used as a tension band by ligating the teeth around the fracture line. The fractured site wound healing was followed up clinically twice a week for two weeks. While the bone healing was followed radiographically at intervals of two weeks and three months using orthopantomographs.

All surgical procedures were performed under general anesthesia using nasoendotracheal intubation. The operative field was scrubbed and draped to isolate surgical site in routine way. Fracture site was accessed through intraoral vestibular incision. Using scalpel No.15, the vestibular incision was made below the mucogingival junction. Then the flap was reflected by periosteal elevator down to the inferior border of the mandible. When the fracture line was exposed, any fibrous tissue found between the fractured segments was removed through curetting the bony edges. Then after the microplate was bent to adapt the contour of the underlying bone. The fracture was fixed with 1.2 mm microplate [<sup>1</sup>] and screws with length range between 4 to 5 mm according to the bone thickness of the surgical site. The surgical wound was then closed in two layers using interrupted 4-0 vicryl [<sup>v</sup>] suture material for the muscle layers, followed by closure of mucosa.

Patients were recalled every other day in the first week to follow healing of the wound. Then by the end of this week sutures were removed. The oral hygiene and patient care were followed up postoperatively to detect any postoperative complication. Panoramic radiographs were carried out postoperatively at two weeks and three months to assess the healing of fractured segments the microplate removal after bone healing.

<sup>1</sup> Stryker Leibinger GmbH and Co. KG.

<sup>v</sup> vicryl (undyed polyglactin-910), braided, absorbable suture, Ethicon, Inc., U.K.

**Table 1: Showing age, number, site and etiology of fracture line in both Groups**

No	Age	Fracture line	Site of fracture	Etiology
1	1	One line	Symphyseal	fall
2	5	One line	Right parasymphyseal	fall
3	2	One line	Left body	Road traffic accident
4	2	One line	Symphyseal	Fall
5	6	One line	Symphyseal	Road traffic accident
6	7	Two lines	Left angle and symphyseal	Road traffic accident
7	6	Two lines	Bilateral parasymphyseal	fall
8	9	Two lines	Right parasymphyseal and Left angle	Road traffic accident
9	2	Two lines	Bilateral parasymphyseal	Road traffic accident
10	10	Two lines	Bilateral body	Road traffic accident

## RESULTS

This study was carried out on 10 patients. According to number of fractures, the patients were classified into two groups. Group I: patient having one fracture line. While Group II: patient having more than one fracture lines. In this study, the patients were encouraged for early discharge from the hospital. All patients were responded to the recalls till the end of the study. The postoperative course was uneventful and patients returned to their normal activities very well. The outcomes of changes that could affect the healing process of fractured mandible for all patients were evaluated using either qualitative or quantitative clinical parameters. No signs of infection in or around the incision during fracture treatment were observed, and the soft tissue healing progressed normally. Clinical follow up was done every other day for two weeks and after three months postoperatively.

In group I, at the first postoperative visit the wound was inflamed reddish, and tender due to careless of oral hygiene. The patient was instructed for dental care. And during the second postoperative week all intraoral wounds healed uneventfully. Minimal degree of swelling was observed postoperatively that started too resolved at the fourth day. While the wound was completely resolved by the end of the first week. At this time the stitches were removed. During the whole postoperative period no swelling or any of the inflammatory changes was reported by any patient. The majority of patients reported mild pain at the first postoperative visit. This was completely resolved after one week. During the remaining period of follow up no pain was reported by any patient. Bimanual examination of the fractured segments immediately postoperative revealed stable fixation across the fracture site, the occlusion of the cases was satisfactory

postoperatively. Palpation of the inferior border showed no step deformity in all cases. No cases of infection or dehiscence and numbness were noticed during the follow up period.

In group II, the intraoral soft tissue healed uneventfully in the second week, only one case showed slight inflammation at the suture line in the seventh day. The patient was instructed to start with antibiotic for three days after which complete resolution of the operative site was noted. Minimal degree of swelling was observed postoperatively that started too resolved at the second visit and completely resolved at the end of the first week. During the whole postoperative period no swelling was reported by any patient. The majority of patients reported mild pain at the first postoperative visit. This was completely resolved after one week. No pain was reported by any patient during the remaining period of follow up. Immediately during the postoperative visit, the fracture segments were stable across the fracture site. Palpation of the inferior border showed no step deformity in all cases. No case of infection or dehiscence was noticed during the follow up period.

Panoramic radiographs were done at preoperatively, and at intervals of two weeks and three months postoperatively to evaluate the healing of mandibular fracture in both groups. In group I, the patients were checked radio- graphically at two weeks interval for accuracy of reduction, position of plate and screws, in relation to teeth buds and progress of bone healing. The mandibular fracture line was still visible. By the third month, the fracture line was not visible and looks like normal surround bone (fig.1). In group II, the radiographic examination of all the patients at the end second week postoperatively revealed properly reduced fracture segments without inter-fragmentary gap and correctly aligned inferior border in orthopantogram. At the third month interval the mandibular fracture lines were completely disappeared.

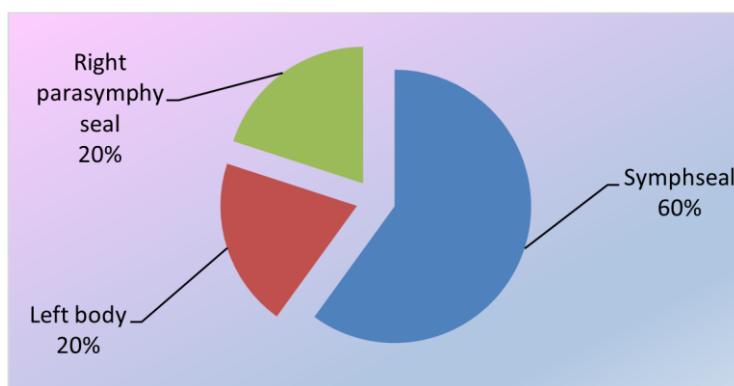
In Group I, the fall and road traffic accident represent the causes of mandibular trauma. In Group II, the road traffic accident, and fall respectively were the causes of mandibular trauma. There was statistically significant difference between causes of trauma in the two groups.



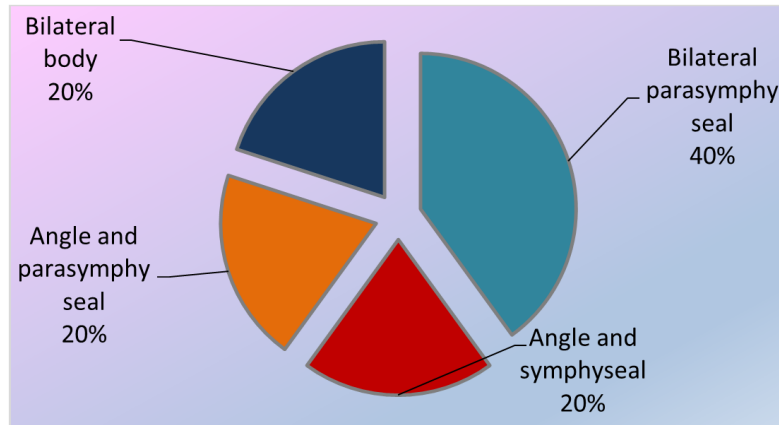
**Fig. 1: Panoramic radiograph of group I at 3 months**

Group I, comprised 3 (60%) symphyseal fractures, 1 (20%) body fracture and 1 (20%) parasymphyseal fracture (fig. 2). While, in Group II, comprised 2 (40%) bilateral parasymphyseal fractures,

1 (20%) symphyseal and angle fractures, 1 (20%) parasymphyseal and angle fractures and 1 (20%) bilateral body fracture (fig. 3).



**Figure 2: Pie chart representing the sites of fracture in Group I.**



**Figure 3: Pie chart representing the sites of fracture in Group II.**

## DISCUSSION

The mandibular fractures are the most common facial bone fracture in children. This priority of the mandibular fracture is probably because of that bone is mobile and therefore has less bone support than the bones of the middle third [9].

Road traffic accident is the predominant cause of the fractures in the current study. This was in accordance with Khaled S [10]. However, fall-down and interpersonal violence were the most common causes of fractures [3, 5].

According to the fracture site in the current study, in group I the symphyseal fractures represent 60%, the body fracture 20% and the parasymphysis fracture 20%. While, in group II the bilateral parasymphysis fractures represent 40%, symphyseal and angle fracture 20%, parasymphysis and angle fractures 20% and bilateral body fractures 20%. This was in opposition to Verma *et al.*, [5], who reported different percentage distribution of mandibular fracture.

The use of open reduction and internal fixation with microplates in this study allowed for direct visualization of the fracture site. It enabled returning the displaced fragments to the proper position and maintaining them with great security. Moreover, microplate were applicable through an intraoral approach this provide advantage of simultaneous visualization of the fracture and occlusal relation. This was in agreement with Sebastian *et al.*, [11, 12]. In addition, this study is in accordance with Sheta *et al.*, [13] who concluded that the Titanium microplates provide adequate stability for fracture segments in treatment of pediatric mandibular fracture. Low profile and malleability of microplates allow adaptation to mandible easily and minimize the possibility of trauma to teeth buds.

This study agreement with (Renato M *et al.*,) [14], who conclude the surgical treatment of symphysis region by anatomic reduction and minimally invasive rigid internal fixation, restoring occlusion with a

maximum of fixation while preserving the tooth germs by means of smaller functional monocortical screws, and according to (Nathalie H, Ian J, and Rabindra S) the metal plate is preferred than biodegradable systems because of their increased strength, lower volumes and ease of adaptation of plates [15].

## CONCLUSION

Management of mandibular fracture in children by open reduction and microplate is an acceptable method for treatment with least morbidity and increase stability of displaced segment.

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