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Original Article

Evaluation of trapezoidal-shaped 3-D plates for internal fixation of mandibular subcondylar fractures in adults



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ABSTRACT

Aims: The purpose of this study is to evaluate the clinical results and to assess the efficacy, stability, and rigidity of trapezoidal 3-D plates for osteosynthesis in adult mandibular subcondylar fracture patients.

Methods: This study included 15 cases of trauma having mandibular subcondylar fractures, in which open reduction and internal fixation are indicated. After selecting patient according to the inclusion criteria, all patients underwent open reduction and rigid fixation. Fracture was then stabilized using 4 hole, 2.0 mm trapezoidal-shaped 3-D titanium plates using retromandibular incision. Postoperative clinical examination was carried out on 3rd day; 1st, 2nd, and 4th weeks; and 3rd and 6th months.

Results: The results of this study suggest that the fixation of mandibular subcondylar fracture with trapezoidal-shaped 3-D plates provides three-dimensional stability and carries low morbidity.

Conclusion: Patients with gross displacement of condylar fragment, major reduction in posterior facial height, and deranged occlusion can be successfully managed by open reduction of condylar fracture and its fixation using 3-D plates.

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1. Introduction

Mandibular condylar fractures are the most commonly encountered mandibular fractures, being 17.5–52%¹⁻⁴ of all mandibular fractures. The most common unilateral fracture is subcondylar, and the most common bilateral fracture is of the condylar heads,⁵ mostly caused by direct trauma, but may also be due to indirect forces. Treatment of condylar fractures depends on physical and imaging evidence of the fracture, extent of injury (whether unilateral or bilateral), the level of fracture, the degree of displacement and dislocation, the size and position of the fractured condylar segment, and the dental malocclusion, etc.

In 1924, Perthes carried out the first surgical treatment of a condylar fracture. Surgical treatment has been advocated to reapproximate the fractured segments and to avoid complications like open bite, retrognathia, pain, reduced lateral or protrusive mobility, and deviation on opening.^{6,7} Open reduction aims at anatomical repositioning and rigid fixation of the fragments, occlusal stability, rapid return to function, maintenance of vertical ramus dimension, no airway compromise, and less long-term temporomandibular joint dysfunction.^{8,9}

Bilateral condylar fractures cause most malocclusions.¹⁰ It is believed that once condylar nonunion has occurred, conservative treatment is ineffective and joint is prone to arthritic sequelae.¹¹ Open reduction and internal fixation of condylar fractures is an acceptable method, as it prevents the complications associated with closed reduction like shortening of ramus, deviation of jaw on opening, occlusal discrepancies, formation of false joint, which functions for condylar movement in glenoid fossa, and late-term complications.

Stable fixation is very important as the interfragmentary mobility can lead to nonunion, fibrous union, or temporomandibular disorders. Fixation with very rigid miniplates provides more stability than transosseous wiring.^{12,13} Although single miniplates can be adequate if the fragments are aligned properly, functional forces actually exceed the rigidity of one miniplate, and therefore the use of two has been proposed. Alternatively, a single 2.4 mm plate or a single 2.0 mm mini-dynamic compression plate may be used for fixation of condylar fractures, as they offer more resistance to

rotation and 3-point bending.^{14,15} However, in the condylar neck, the amount of bone is not always adequate to permit placement of 2–3 screws per fragment. To overcome this problem, various plate designs have been put forward.

A single L, Y plate, or 3-D plate has been used in the treatment of condylar fractures,¹⁶ which confirm to the tensile stress pattern at the condylar neck region. Trapezoidal condylar plate (TCP) is such a 3-D plate shaped for adaptation in the anatomically constricted region of condylar neck. TCP is placed with one arm parallel to the condylar axis and second arm parallel to the mandibular notch. Hence, this plate meets the criteria of 2 single miniplates with reduced hardware, leading to a less infection rate.¹⁶

The aim of this study was to evaluate the efficacy of single trapezoidal 3-D miniplates in subcondylar fractures.

2. Materials and methods

This study included 15 cases of mandibular subcondylar fracture alone or in combination with fracture elsewhere in the mandible or midface, who reported to our Department of Oral and Maxillofacial Surgery. All these were treated by open reduction and internal fixation using 2.0 mm trapezoidal-shaped 3-dimensional titanium miniplate. The study was conducted after obtaining the approval of the ethical committee of college and informed written consent from the participants. Adult patients with mandibular subcondylar fracture, who consented for the surgical treatment and postoperative follow-up, were included in this study. Condylar head fractures (intracapsular fractures), pediatric patients, patients unfit for surgery, those who could not be followed up postoperatively over a minimum period of 6 months, and those who did not consent for surgery were excluded from the study. Miniplates, Orthomax, having a profile height of 2 mm were used (Figs. 1 and 2).

A thorough medical history was recorded to rule out any significant systemic conditions. Clinical examination was carried out as per protocol. Routine preoperative investigations included radiographs like ortho-pantomogram and PA view of mandible. Radiographs were assessed for the degree of displacement of the fracture fragments (Fig. 3). Erich's arch bar was fixed.



Fig. 1 – Armamentarium.

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