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Treatment of condylar fractures with an intraoral approach using an angulated screwdriver: Results of a multicentre study

André Vajgel [a,*], Thiago de Santana Santos [b], Igor Batista Camargo [a], David Moraes de Oliveira [c], José Rodrigues Laureano Filho [a], Ricardo José de Holanda Vasconcellos [a], Sergio Monteiro Lima Jr. [d], Valfrido A. Pereira Filho [e], Andreas A. Mueller [f], Philipp Juergens [f]

[a] University of Pernambuco – School of Dentistry (FOP/UPE), Camaragibe, PE, Brazil
[b] Ribeirão Preto School of Dentistry (FORP/USP), Ribeirão Preto, SP, Brazil
[c] Maurício de Nassau University, Recife, PE, Brazil
[d] Cirurgia Buco-maxilo-facial Hospital das Clínicas, Universidade Federal de Minas Gerais, Belo Horizonte, Brazil
[e] Department of Oral and Maxillofacial Surgery, Dental School of Araraquara/UNESP, Araraquara, Brazil
[f] Dept. of Oral & Maxillofacial Surgery, University Hospital Basel, Faculty of Medicine University of Basel, Basel, Switzerland

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ABSTRACT

Background: This multicentre study aimed to investigate long-term radiographic and functional results following the treatment of condylar fractures using an angulated screwdriver system and open rigid internal fixation with an intraoral surgical approach.

Methods: Twenty-nine patients with a total of 32 condylar fractures were evaluated. The patients were investigated prospectively based on the following variables: age, sex, aetiology, side, location and classification of the fracture, degree of displacement, associated fractures, surgical approach, oral health status, type of osteosynthesis plate, duration of surgery, mouth-opening, complications, and duration of follow-up.

Results: The fractures were classified as subcondylar ($n = 25$) or condylar neck ($n = 7$). Mean patient age was 36.38 ± 16.60 years. The median duration of postoperative follow-up was 24.39 ± 13.94 months. No joint noise, weakness of the facial nerve, joint pain, or muscle pain was observed. An additional retromandibular approach was necessary to enable the treatment of one subcondylar fracture with medial displacement.

Conclusion: Subcondylar or condylar neck fractures with medial or lateral displacement can be treated using an intraoral approach with satisfactory results with the advantages of the absence of visible scarring, the avoidance of facial nerve injury, and the ability to obtain rapid access to the fracture.

1. Introduction

Fractures of the mandibular condyle are common, accounting for 25–35% of all mandibular fractures in reported series (Tasanen and Lamberg, 1976; Ellis et al., 1985). The topic of condylar fracture of the mandible has generated more discussion and controversy than any other issue in the field of maxillofacial trauma with regard to its classification, diagnosis, and therapeutic management (Ellis and Throckmorton, 2005; Ellis, 2009), as evidenced by the various schemes used to classify and subdivide these fractures (Spiessl, 1972; Yamaoka et al., 1994; Choi, 1997; Loukota et al., 2010). A simple classification based on the anatomic location of the fracture (condylar head, condylar neck, subcondylar region) seems adequate (Bos et al., 1999; Loukota et al., 2005), but a concomitant consideration of the degree of fractured segment displacement enriches management decisions (Villarreal et al., 2004; Ellis, 2009).

Mandibular condylar fractures are managed with open or closed treatment, but no consensus has been reached on the proper management of this injury (Hayward and Scott, 1993). The advantages of these two methods must be compared with regard to patient disability, complications, sequelae, and the risks involved (Zide and

* Corresponding author. University of Pernambuco, School of Dentistry – FOP/UPE, Department of Oral and Maxillofacial Surgery, Av. General Newton Cavalcanti, 1650, Tabatinga, 54753-220, Camaragibe, Pernambuco, Brazil. Tel.: +55 81 34582867.
E-mail address: avajgel@hotmail.com (A. Vajgel).

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Kent, 1983). Despite the suggestion that a prospective randomised trial may not be ethically possible (Bos et al., 1999), there are a few prospective randomised studies that compared closed versus opened treatment (Eckelt et al., 2006; Schneider et al., 2008; Singh et al., 2010). A previous systematic review (Hermund et al., 2008) and a meta-analysis (Nussbaum et al., 2008) attributed the impossibility of performing a reliable meta-analysis to the considerable variation in the reporting of study parameters. Thus, better standardisation of data collection procedures and patient randomisation are necessary for an accurate comparison of the two approaches. As always, however, the patient's best interest takes priority over simple convenience for the surgeon (Villarreal et al., 2004).

Different methods of osteosynthesis are currently used to achieve functionally stable results. A system that enables maximal stability while causing minimal trauma during insertion should be selected. Moreover, easy handling increases surgeons' acceptance of a procedure (Pilling et al., 2010). The intraoral approach is not routinely used for the treatment of subcondylar fractures because the management of dislocated fractures may be hampered by the limited visibility of the fracture site due to the location of the coronoid process. However, intraoral treatment can be facilitated by the use of endoscopic techniques with angulated scopes (Jacobovicz et al., 1998; Chen et al., 1999; Lauer and Schmelzeisen, 1999; Schon et al., 2003; Kokemueller et al., 2011). Clinical mirrors have also been used to check posterior border reduction and fixation (Pereira-Filho et al., 2011). The recent introduction of an angulated screwdriver system makes the use of the intraoral approach for the treatment of displaced subcondylar or condylar neck fractures feasible without the need for endoscopic instruments or mirrors.

The purpose of the present study was to assess the long-term outcomes of the open reduction of condylar fractures managed through an intraoral approach using an angulated screwdriver system and open rigid internal fixation.

2. Material and methods

Thirty consecutive patients (10 from each of the three departments: University of Pernambuco, Dental School of Araraquara/UNESP and University Hospital Basel) who were diagnosed with subcondylar fractures, with or without other associated mandibular fractures, and treated between 2008 and 2010 were included in this study. One patient with a combination of subcondylar and condylar head fracture was excluded, because the condylar head fracture could influence the clinical result. Therefore, 29 patients [21 male, eight female; mean age, 36.38 years; standard deviation (SD), 16.60 years] with a total of 32 condylar fractures (25 subcondylar and seven condylar neck) were evaluated. All subcondylar and condylar neck fractures were treated with an intraoral surgical approach and fixation with trapezoidal or straight plates using an angulated screwdriver system (MODUS; Medartis, Basel, Switzerland; Fig. 1) without endoscopic assistance. However, one subcondylar fracture with medial displacement required a retromandibular approach for reduction and fixation.

In all cases, computed tomography (CT) was used to detect fragment positions in the preoperative and postoperative periods. The following variables were recorded: age, sex, aetiology, side, location and classification of the fracture, degree of displacement, associated fractures, surgical approach, duration of surgery, complications, and duration of follow-up (Table 1).

2.1. Surgical approach

Under general anaesthesia, a local anaesthetic with a vasoconstrictor was injected at the anterior border of the mandibular ramus. Access was achieved in a manner similar to that used for sagittal osteotomy, with greater posterosuperior extension. The buccinator muscle and periosteum were incised by monopolar diathermy. The temporal muscle was detached from the anterior border of the mandibular ramus and the subjacent periosteum was detached from the masseter muscle, which was carefully dissected from the lateral surface of the mandible. Sufficient space was created to provide adequate access and enable passive placement of the retractors. Ramus retractors were then positioned to embrace the posterior border of the ramus, thereby providing an adequate field for the reduction of the subcondylar fracture.

Following fracture reduction, intermaxillary fixation (IMF) was performed with stainless-steel wire or heavy elastics and the fragments were aligned anatomically. The plates were fixed with the aid of an angulated screwdriver (Fig. 2). For this procedure, a perforation was made in the proximal segment and the plate was placed together with a screw adhering to the angulated screwdriver. Following the fixation of the first screw, the second screw was also fixed in the proximal segment. Fixation of the plate in the proximal segment allowed better handling, and pulling the plate with a hook facilitated fracture reduction. Screws were then fixed in the distal segment. The maxillomandibular fixing was removed, occlusion was checked, and the soft tissues were sutured (Fig. 3).

If necessary, the IMF screws and elastic bands can be used for postoperative exercises. However, this procedure was not performed in any of the present cases. In the patient with a condylar head fracture, an orthodontic appliance was installed after surgery and used for elastic band treatment in the postoperative period.

2.2. Clinical examination

The goal of treatment was the restoration of correct occlusion and mandibular kinetics as close to normal as possible. Patients

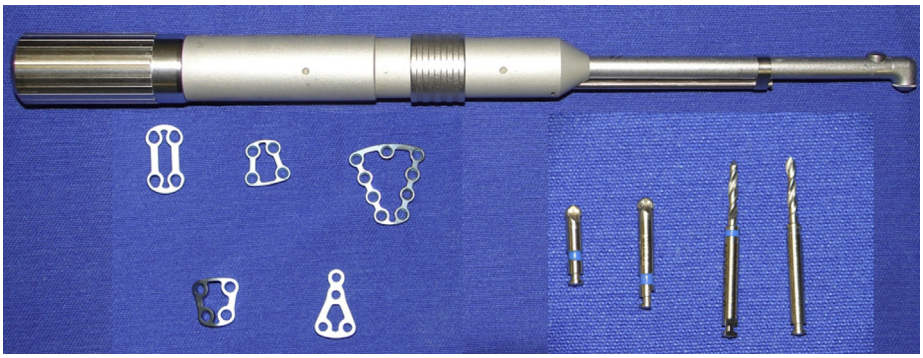

Fig. 1. Angulated screwdriver system and trapezoidal condylar plates.