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Endoscopic Treatment of Subcondylar Fractures

Yadranko Ducic, MD, FRCS(C), FACS

Objectives/Hypothesis: To evaluate the effectiveness of endoscopic treatment of subcondylar fractures, highlighting an improved technique of repair that facilitates ease of repair.

Study Design: A retrospective review.

Methods: All subcondylar fractures treated by the author with the improved endoscopic technique from 2001 to 2007 were reviewed.

Results: A total 34 subcondylar fractures were initially treated with the outlined technique. Thirty-three of 34 were successfully managed with the endoscopic technique alone. There were no instances of facial nerve paralysis or palsy noted. There were two instances of malocclusion that were believed to be minor in the 27 of 34 patients who made themselves available for 6 week follow-up. Both of these patients had associated multiple maxillofacial fractures repaired. Average operative time from ramus incision start to completion of plate fixation for the subcondylar fracture was 32 (range, 21–49) minutes.

Conclusions: The outlined technique results in improved ease of rigid endoscopic fixation of subcondylar fractures in the majority of patients.

Key Words: Condyle fracture, mandible fracture, endoscopic.

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INTRODUCTION

Significantly displaced fractures of the maxillofacial skeleton causing functional or esthetic deformity should be repaired unless medically contraindicated. Such fractures of the midface and frontal bar are approached with standard open reduction and internal rigid fixation techniques. There is no argument that fractures of the mandible that lead to malocclusion, sensory neurologic deficit, or visible deformity likewise should be repaired with rigid or semirigid (Champy) techniques. However, treatment of subcondylar fractures has been wrought with controversy. Initial enthusiasm for treatment of these injuries in the 1920s was replaced by decades of nontreatment.

In the classic, often quoted study by Zide and Kent[1] in 1983, an empiric basis for the treatment of these injuries was proposed. Over the past decade, there has been an increasing recognition that long-term sequelae of inadequately treated or untreated subcondylar fractures leads to increased rates of visible deformity, chin point alterations, temporomandibular problems, and malocclusion. These are all seen in untreated displaced mandible fractures in general. Standard preauricular, submandibular, or retromandibular approaches to these injuries are associated with significant risk of injury, albeit usually temporary, to the facial nerve, generally arising as a result of traction neuropraxia during the exposure. The rate of facial nerve injury is in the range of 15% in most studies on the subject.[2,3] This has discouraged many surgeons from pursuing appropriately aggressive open treatment of these injuries and instead pursuing a course of less predictably favorable outcomes by closed "reduction." Into this decades old debate, minimally invasive approaches to the maxillofacial skeleton have been made possible with improvements in instrumentation, particularly endoscopic techniques.[4–6] Endoscopic fixation of subcondylar fractures may be technically challenging and occasionally frustrating. In this paper, I review my favorable experience with endoscopic repair of these injuries using simple techniques to improve the ease of surgical intervention.

TECHNIQUE

Once a decision has been made for open reduction and internal fixation of a subcondylar fracture and adequate informed consent has been obtained, including the possible need for conversion to an open approach, the patient is placed on the operating table in a supine position. General anesthesia and local infiltration of 1% lidocaine with 1 in 100,000 epinephrine solution are administered. Arch bars are applied in the usual fashion to both the upper and lower dentition. I prefer to rigidly fixate any subcondylar fractures endoscopically after approaching other associated fractures of the mandible. A generous vertical incision is made following the anterior border of the ascending ramus of the mandible. It is important to

From Otolaryngology and Facial Plastic Surgery Associates, Fort Worth, Texas, U.S.A.; and the Department of Otolaryngology–Head and Neck Surgery at the University of Texas Southwestern Medical Center, Dallas, Texas, U.S.A.

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Send correspondence to Yadranko Ducic, MD, FRCS(C), FACS, 923 Pennsylvania Avenue, Suite 100, Fort Worth, TX 76104. E-mail: yducic@sbcglobal.net

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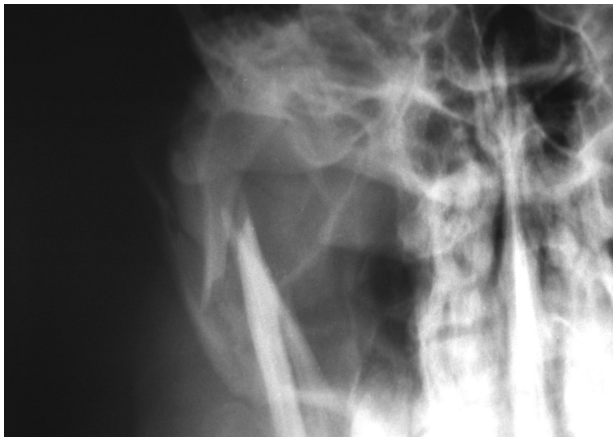

Fig. 1. Preoperative radiograph demonstrating adequate proximal bone stock to allow for placement of two screws. Displaced, overriding subcondylar fracture is noted.

err in this incision on the lingual aspect of the ramus because this will facilitate later retraction of soft tissues laterally. Even a relatively small amount of soft tissue in this area will be traumatized repeatedly with insertion of instrumentation to access the fracture, leading to edema and bleeding, both of which are unnecessary. The lateral tissue will be protected by a standard Army-Navy retractor that is left in position only during the soft tissue elevation. Next, subperiosteal dissection is performed widely to allow for an optical cavity to be created. In addition to completely exposing the fracture, the dissection should pass around the posterior edge of the mandible. A curved elevator (at least 90 degree bend on tip) is invaluable in this regard. This will improve mobilization of the fractured segment.

The degree of overlap of the proximal segment on the distal mandible is estimated from the preoperative Panorex. Next, a sterile silastic block wedge is cut to this vertical dimension (Figs. 1 to 5). The patient is placed in heavy elastics across the entire occlusal plane except on the ipsilateral molar region where this precisely cut silastic block is wedged while the distal segment is distracted

Fig. 2. Classic anterior open bite deformity on patient with subcondylar fracture.

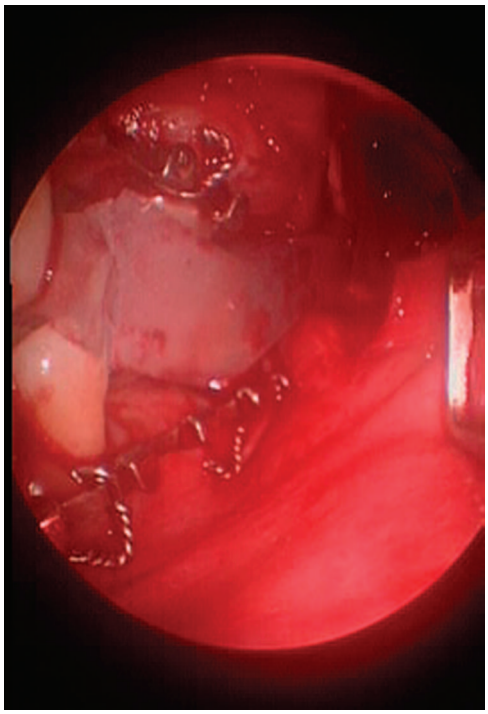

Fig. 3. Endoscopic view of wedge placement between posterior ipsilateral molars.

inferiorly. At this point, the adequacy of the reduction is judged with the standard 30 degree endoscope with irrigating sheath. Generally, the fracture will be well reduced or easily reducible at this juncture. If there is still some overlap present, the silastic block wedge is resized. This wedge will completely eliminate the need for inferior traction on the distal segment and the need for another incision in this region. In my experience, this likewise eliminates the need for an extra assistant who would otherwise be required for this procedure.

Next, the fracture is plated with a 2.0 mm minilocking screw plate, with two screws on either side of the fracture line. Screws are placed through a single transcutaneous stab incision (4–5 mm) centered in the skin overlying the fracture line. The screws are placed first on

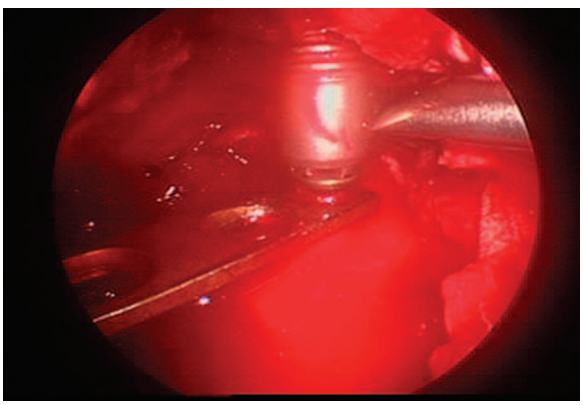

Fig. 4. Endoscopic view of screw placement.

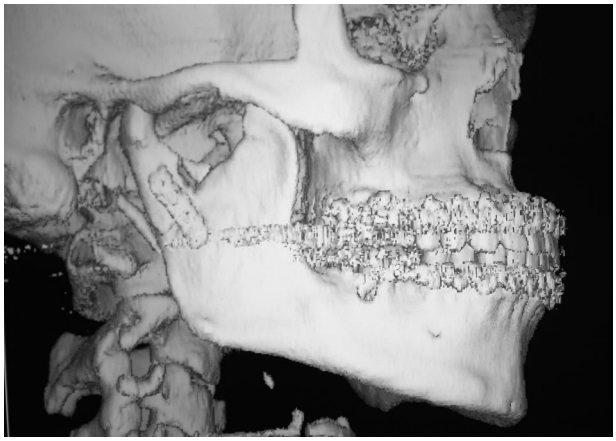

Fig. 5. Postoperative three-dimensional computed tomography scan demonstrating adequate screw placement and accurate fracture reduction.

either side of the fracture line (proximal segment screw first), the occlusion verified, and then the outside screws placed. The incision is closed with a single running layer of 3.0 Vicryl suture. Postoperatively, the patient is mobilized with physiotherapy exercises as soon after fracture fixation as his or her other injuries will allow. The patient is maintained on a no-chew diet for a period of 6 weeks.

METHODS

All patients initially treated with endoscopic fixation of subcondylar fractures from June 2001 to June 2007 by the author were included in this retrospective review. Institutional review board approval was obtained for this study.

RESULTS

A total of 34 patients with subcondylar fractures were initially treated with the outlined technique. The average age was 29.2 (range, 18–52) years, with a male-to-female ratio of 28:6. Eight fractures were isolated unilateral injuries. The remainder had associated mandible fractures. Four patients had bilateral subcondylar fractures, only two of which were amenable to bilateral rigid fixation because of the height of the fracture line. Thirty-three of 34 patients were successfully managed with the endoscopic technique alone. A single patient had to be converted to an open approach to control bleeding that was encountered from the internal maxillary artery during fracture reduction. No other immediate complications were noted. There were no instances of facial nerve paralysis or palsy. There were two instances of malocclusion that were believed to be minor in the 27 of 34 patients who made themselves available for 6 week follow-up. Both of these patients had associated multiple maxillofacial fractures (both had severe midfacial fractures, and one had a palatal split) repaired. Average operative time from ramus incision start to completion of plate fixation for the subcondylar fracture was 32 (range, 21–49) minutes.

DISCUSSION

Traditional approaches to fractures of the subcondylar region have included direct, open preauricular, transparotid, retromandibular, and submandibular approaches. Although these techniques are reliable, the presence of visible scars, technical challenges, and significant incidence of facial nerve palsy have led to the relatively recent development of endoscopic approaches to these injuries. In addition, it has become apparent that the traditional "absolute" indications for performing open reduction and internal fixation of these injuries have been applied by many surgeons as the only indications for repairing these injuries. Thus, it is not surprising that long-term follow-up of patients who have undergone closed reduction of displaced subcondylar fractures has revealed the presence of significant facial asymmetry, particularly on mouth opening, and chronic temporomandibular joint dysfunction.[7]

Endoscopic approaches have the advantage of avoiding long facial scars and decreased risk of facial nerve injury because there is generally much less retraction of the facial nerve with this technique. The use of specialized equipment and the "long learning curve" have been reported to be significant disadvantages of this technique.[8] Endoscopic equipment is currently available in most modern operating rooms because of the ubiquity of its use in multiple areas of head, neck, and rhinologic surgery.

Previously noted controversy regarding the need for open treatment of subcondylar fractures has generally been laid to rest with a preponderance of well-executed studies clearly favoring the open approach to these injuries. Ellis et al.,[9] in a review of 137 patients, found a significantly greater rate of malocclusion in patients treated with less predictable closed techniques. Haug and Assael,[10] in a small comparative study of only 20 patients, found no significant differences between open and closed techniques in terms of malocclusion. This is not supported by other prospective trials demonstrating a significantly lower rate of malocclusion and other abnormalities including temporomandibular joint dysfunction in fractures treated with open techniques.[11] Macarthur et al.[12] questioned the use of open techniques to the condyle in general because of the high incidence of condylar head problems encountered in their series postoperatively, as well as the high incidence of malocclusion. This has not been my experience with either open approaches to the condyle or endoscopic approaches. Irrespective of the method of fixation that is used, there appears to be a lower rate of complications and improvement in outcome when an open approach to the condylar region is used, rather than closed technique.[13] Hidding et al.,[14] in comparing the 5 year outcomes of closed versus open reduction, noted 64% of the patients who were treated with closed reduction had deviation on opening compared with only 10% treated by open reduction and internal fixation. In a related finding, anatomic reduction was noted in 93% of the open reduction and internal fixation group but only 7% of the closed management group.[14]

Oezemen et al.[15] examined magnetic resonance images obtained during long-term follow-up of patients treated with closed techniques and compared them with an openly treated group. Imaging revealed increased displacement (30% vs. 10%), increased disk remodeling (70% vs. 10%), and increased condylar deformation (80% vs. 0%) when comparing closed versus open treatment of these

fractures.[15] Worsae and Thorn[16] reviewed 101 dentate patients, followed for a mean of 2 years after condylar treatment, and noted a complication rate of only 4% in the open treatment group as compared with a complication rate of 39% in the closed group, including malocclusion, reduced interincisal opening, and persistent headaches.

Ellis et al.[9] reviewed occlusion for 136 patients with unilateral subcondylar fractures using digitized radiographic images and found that patients treated with open reduction and internal fixation had greater postoperative mobility than those treated with a closed technique. Ellis and Throckmorton[17] compared mandibular and facial morphology postoperatively and found that patients whose condylar fractures were treated in a closed fashion had a shorter posterior facial and ramus height than those treated by open reduction and internal fixation.

In summary, closed treatment of displaced subcondylar fractures is associated with an increased rate of complications. Open treatment has been avoided by many surgeons because of its technical challenges. In this paper, I reviewed my technique of endoscopic repair, highlighting the greatly simplified overall procedure. The procedure is technically relatively simple to perform and is used whenever there is a significantly displaced subcondylar fracture in adults and there is enough room in the proximal segment to place two screws.

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