

Establishing a Protocol for Closed Treatment of Mandibular Condyle Fractures with Dynamic Elastic Therapy

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Summary: Treatment of mandibular condyle fractures is controversial. Open treatment achieves anatomic reduction with occlusal stability and faster functional recovery but risks facial nerve injury and jeopardizes joint capsule circulation which can lead to bone resorption. Traditional closed treatment avoids these issues but requires prolonged fixation and risks subsequent facial asymmetry, occlusal disturbance, and ankylosis. Rather than wires, closed treatment with elastics allows for customizable management of a healing fracture with ability to alter vector and degree of traction to restore vertical height and occlusion with less discomfort and decreased risk for ankylosis. In this protocol, unilateral condylar fractures were treated with class II elastics ipsilateral to injury and class I contralaterally. Class III elastics were used contralaterally if additional traction was required and Class II elastics were placed bilaterally for bilateral fractures. Patients were sequentially advanced from fixating to guiding to supportive elastics by titrating elastic vector to any dental midline incongruity or chin deviation. Six patients were treated with this protocol with six-month follow-up. Fracture patterns included displaced and dislocated fractures as well as intracapsular and extracapsular condylar fractures. All patients at completion of the protocol had objective centric occlusion with no subjective malocclusion, chin deviation, facial asymmetry, or temporomandibular joint pain. These early data demonstrate a safe and efficacious innovative protocol for closed treatment of mandibular condylar fractures with dynamic elastic therapy. (*Plast Reconstr Surg Glob Open* 2019;7:e2506; doi: [10.1097/GOX.0000000000002506](https://doi.org/10.1097/GOX.0000000000002506); Published online 20 December 2019.)

INTRODUCTION

Management of mandibular condyle fractures is controversial.¹ Open treatment achieves anatomic reduction with occlusal stability and faster functional recovery but risks facial nerve injury and jeopardizes joint capsule circulation which can lead to bone resorption.²⁻⁶ Traditional

closed treatment avoids these issues but requires prolonged fixation and risks subsequent facial asymmetry, occlusal disturbance, ankylosis, and degenerative changes.⁶⁻¹¹

Traditional closed treatment employs rigid wired arch bars to achieve maxillomandibular fixation.^{1,12-16} Rather than wires, closed treatment with elastics permits functional movement and allows customizable management of a healing fracture with ability to alter vector and degree of traction potentiating better healing, decreased discomfort, and decreased risk for ankylosis (**see figure, Supplementary Digital Content 1**, which details vector design, <http://links.lww.com/PRSGO/B261>).^{9,10,16,17} Prior studies on elastics are limited to case reports,¹⁸⁻²² pediatric studies,^{16,18,20-22} or describe it as an adjunct to open therapy.^{23,24} Furthermore, there is significant variation in methodology.^{18-20,22-25} The aim of this study was to present

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a novel elastics protocol for closed treatment of condylar fractures.

METHODS

A 1-year single-center prospective study of patients with radiographic evidence of condyle fracture and malocclusion at presentation was conducted (those younger than 16 years of age or edentulous status were excluded). All patients with extracondylar fractures (eg, symphyseal or parasymphyseal) underwent open reduction and internal fixation of those injuries. Condyle fractures (including condylar head, neck, and subcondylar) were managed with patients being placed in arch bars and elastics in three protocol phases (see figure, [Supplementary Digital Content 2](#), which details elastic classification, <http://links.lww.com/PRSGO/B262>). Elastics nomenclature is per orthodontic convention (see figure, [Supplementary Digital Content 3](#), which details elastic classification, <http://links.lww.com/PRSGO/B263>).

Protocol

Phase I: Fixating Elastics

For patients with unilateral condyle fractures, class II elastics were placed ipsilateral to injury and class I contralaterally. Figure-of-eight 6 oz ¼ inch bands were placed to maintain sufficient vector to reestablish maximal intercuspation, midline congruency, and fully restrict mouth opening. In patients with severe displacement or dislocation of the condyle, class III elastics were used in place of class I on the contralateral side to further increase yaw and traction. Patients with bilateral condylar fractures received class II elastics bilaterally. Patients were maintained on a liquid diet. At 2-week follow-up, patients were evaluated for malocclusion or chin deviation and advanced to phase II if clinically eligible.

Phase II: Guiding Elastics

In phase II, patients were transitioned to guiding elastics with 6 oz ¼ inch bands placed in the same orientation as phase I. Elastics were no longer placed in a figure-of-eight configuration which thus permitted limited (<1 cm) mouth opening. Patients were instructed on replacement of their elastics and advanced to a blenderized diet. After 2 weeks, patients were evaluated for malocclusion or chin deviation and advanced to phase III if clinically eligible.

Phase III: Supportive Elastics

In phase III, 6 oz ¼ inch bands were again used but with class I orientation bilaterally. Patients were advanced to soft diet. After 2 weeks, patients were assessed for malocclusion or chin deviation and arch bars were removed if clinically eligible.

Patients with malocclusion or chin deviation at any phase of protocol were not advanced, but rather maintained in phase or reverted to a prior phase as appropriate. These patients underwent weekly assessment and advancement held until maximal intercuspation and midline congruency were achieved.

RESULTS

Patient demographics (n = 6) and fracture characteristics are shown in [Table 1](#). Five patients advanced successfully through the protocol without issue. One patient demonstrated chin deviation and subjective malocclusion at two-week follow-up. This was corrected by maintaining fixating elastics for an additional 2 weeks and replacing class I elastics on the right side with class III and then advancing to supportive elastics.

At conclusion of therapy, all patients demonstrated maximal intercuspation without chin deviation, facial asymmetry, or TMJ pain. Average number of postoperative visits was four. Duration of therapy was six weeks. Mean follow-up was sixty-six days (range: 39–133).

DISCUSSION

There are advocates for both open and closed treatment of adult condylar fractures. Al-Moraissi and Ellis⁶ championed open treatment citing superior functional outcomes. Some have claimed open techniques are preferable for treatment of displaced or dislocated fractures due to concern that traditional closed methods impart insufficient traction to reduce fracture segments.^{25–31} Others have advocated avoiding open treatment when possible to avoid operative risks including bleeding, infection, nerve damage, and scarring.³² Along with these considerations, fracture location is important to selection of therapy as intracapsular fracture exposure is more difficult and bears increased risk for facial nerve injury.^{31,33} Therefore, subcondylar and extracapsular condylar neck fractures or those that are significantly dislocated or displaced are

Table 1. Characteristics of the Study Population

Age (y)	Sex	BMI	Smoking Status	Fracture Location	Fracture Laterality	Fracture Alignment*	Secondary Fracture Location	Duration of Follow-up (d)
17	F	19.7	Never	Subcondylar	Right	Mild displacement and no dislocation	Symphysis	47
51	F	19.0	Active	Condylar neck	Left	Moderate displacement and no dislocation	—	133
28†	F	25.2	Never	Subcondylar	Left	Moderate displacement and no dislocation	—	59
24	M	20.4	Former	Subcondylar	Left	Mild displacement and no dislocation	Parasymphysis	39
26	M	23.6	Active	Subcondylar	Left	Mild displacement and no dislocation	Parasymphysis	53
48	M	19.9	Former	Condylar head	Bilateral	Severe displacement bilaterally and dislocated bilaterally	Symphysis	65

*Severity of displacement was graded based on the following scale: mild displacement (>50% cortical overlap between fracture segments), moderate displacement (<50%), and severe displacement (no cortical overlap).

†This patient presented with subjective malocclusion and leftward chin deviation at 2-week follow-up. She was therefore retained in fixating elastics for an additional 2 weeks and had the class I bands on the side contralateral to her fracture replaced with class III bands. Malocclusion and chin deviation were resolved at 2-week follow-up, and she was advanced to guiding elastics per protocol.

arguably more amenable to open treatment, whereas intracapsular fractures of the condylar head and fractures that are minimally dislocated or displaced are more suited to closed methods. Despite this rationale, limitations to each method remain.^{34,35}

The ideal treatment would combine the safety of closed treatment with the ability to achieve anatomic alignment afforded by open treatment while avoiding the need for prolonged maxillomandibular fixation. Treatment with elastics avoids open procedure while permitting customizable vector design with ability to actively traction fracture segments out to length and permitting functional movement that avoids rigid fixation, limits discomfort, and permits better bone healing.^{9,10,16,17} In the present study, all patients were successfully managed with elastics and were able to avoid rigid immobilization. Preinjury occlusion and midline congruency were reestablished regardless of the degree of displacement and all avoided open procedure.

Although more superior condyle fractures should require shorter fixation than those that are anatomically inferior, in this study we implemented a standardized 6-week protocol with each phase requiring at least two weeks of treatment based on experience from preliminary work.

In this study, two active smokers followed this protocol and achieved good functional outcomes without deviation or malocclusion. Given the negative effects of smoking on osseous healing,^{19,20} our recommendation for active smokers is to maintain supportive phase until resolution of tenderness at the fracture site.

After the fixating phase, patients are permitted to replace their elastics at home, but must demonstrate understanding and application of elastics. Patient selection is therefore important to avoid treatment inaccuracies.

CONCLUSION

This study demonstrates a safe and effective protocol for closed treatment of mandibular condyle fractures with dynamic elastic therapy.

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