Oral & Maxillofacial Surgery

Chapter 2

Condylar Fractures

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1. Introduction

Fractures of the condyle can involve the head (intracapsular), neck, or subcondylar region. The head of the condyle may be dislocated outside of the fossa. The most common direction of displacement is in an anteromedial direction because of the pull from the lateral pterygoid muscle, which inserts on the anterior portion of the head of the condyle. No other type of mandibular fracture is associated with as much controversy regarding treatment as those involving the condyle. Factors considered in deciding whether to treat a condyle fracture open or closed include the fracture level, amount of displacement, adequacy of the occlusion, and whether the patient can tolerate maxillomandibular fixation. Those who advocate open treatment cite advantages including early mobilization of the mandible, better occlusal results, better function, maintenance of posterior ramal height, and avoidance of facial asymmetries [1]. The ramal height shortening can be assessed on panoramic radiograph [**Figure 1**] and can be restored by open treatment of condylar fractures [**Figure 2**].

Others prefer closed reduction mainly because of the possible complications associated with open reduction including damage to branches of the facial nerve and a cutaneous scar. Recently endoscopic subcondylar fracture repair has been described with encouraging results [2]. Nonsurgical management (closed reduction) includes MMF with elastics for a variable period followed by guiding elastics so as to maintain the occlusion while allowing jaw physiotherapy during healing [**Figure 3,4**]. Measurable criteria should be assessed whether treating by closed or open methods. These should include pain-free movement, mouth-opening, jaw movement

in all excursions, preinjury occlusion and radiographic assessment of deviation of the fractured fragment, shortening of the ascending ramus [3].

Zide and Kent described the absolute and relative indications for open reduction of condyle fractures [4]. Absolute indications include

(1) displacement of the condylar head into the middle cranial fossa;

(2) impossibility of obtaining adequate occlusion by closed reduction;

(3) lateral extracapsular displacement of the condyle; and

(4) invasion by a foreign body (e.g.gunshot wound)

Relative indications include

(1) bilateral condyle fractures in an edentulous patient;

(2) unilateral or bilateral condyle fractures when splinting is not recommended for medical reasons;

(3) bilateral condyle fractures associated with comminuted midface fractures; and

(4) bilateral condyle fractures and associated gnathological problems (e.g. lack of posterior occlusal support).

The degree of displacement of the condylar fracture has been used in deciding between open or closed treatment. Mikkonen et al. and Klotch and Lundy recommended open reduction if the condylar displacement was greater than 45 degrees in a sagittal or coronal plane and Widmark et al. recommended opening such fractures if the displacement was greater than 30 degrees [5-7]. The author proposed a new classification of subcondylar fractures of the mandible based on ramal height shortening and degree of fracture angulation [8]. The classification is as follows:

2. Fracture Classification

On the basis of Towne's and panoramic radiograph, the fractures are categorized into 3 classes:

1. Class 1 (minimally displaced)—fracture with ramal height shortening; < 2 mm and/or degree of fracture displacement; <10°.

2. Class 2 (moderately displaced)—fracture with ramal height shortening; 2 to 15 mm and/or degree of fracture displacement; 10 to 35°

3. Class 3 (severely displaced)—fracture with ramal height shortening; >15 mm and/or degree of fracture displacement; >35°.

This new classification based on ramal height shortening and degree of fracture displacement can better guide clinical treatment. Class 1 fractures should be treated by closed method, while open reduction is recommended in Class 2 and Class 3 cases.

Intracapsular fractures involving the condylar head are difficult to treat and most recommend close treatment of these fractures to avoid damage to adjacent structures. Fractures involving the condylar neck and subcondylar region can be approached with less morbidity. Many surgical approaches have been described with the most common being the retromandibular, submandibular, and preauricular approaches [9]. A nerve stimulator can be helpful in identifying branches of the facial nerve during the dissection.

A prospective study compared the effect on facial symmetry after either closed or open treatment of mandibular condylar process fractures [10]. It was found that treatment by closed methods led to asymmetries characterized by shortening of the face on the side of the injury. The loss of posterior height on the side of fracture is an adaptation that helps re-establish a new temporomandibular articulation. Loss of facial height on the affected side can lead to compensatory canting of the occlusal plane. Treatment of condylar process fractures should be individualized. Many factors, including the patient's own preference, should be considered. Whether surgical or nonsurgical treatment is chosen, we recommend early mobilization during the healing process.

Reports by Ellis and Dean [9] describe using an extraoral vertical ramus osteotomy with removal of the posterior ramus for access to severe medial dislocations of high condylar fractures. This technique allows for improved visualization of and access to the proximal segment for adequate reduction. The only major concern with this technique is the theoretical risk of avascular necrosis of the condylar head. However, both studies reported minimal dysfunction and no radiographic evidence of irreversible changes of the condyle.

3. Surgical Approaches to the Condylar and Subcondylar Regions

3.1. Submandibular Approach

First described by Risdon [11] in 1934, a submandibular approach can be used for fractures involving the mandibular angle, ramus, or subcondylar region [**Figure 5**]. The incision is approximately 4 cm long and is placed 1.5–2 cm below the angle and inferior border of the mandible. Placing the incision in an existing skin crease allows the scar to be hidden. The skin and subcutaneous fat are incised until the platysma muscle layer is identified. The platysma is sharply dissected to reach the superficial layer of the deep cervical fascia. The mar¬ginal

mandibular branch of the facial nerve lies just deep to this layer, so it is important to know its course. Dingman and Grabb [12] dissected out the nerve in 100 cases. In 81% of patients, the nerve passed above the inferior border of the mandible proximally to where the facial artery crossed the inferior border. In 19% of patients, the nerve took a downward course, with the lowest being 1 cm below the inferior border.

The dissection to bone is carried through the deep cervical fascia by the surgeon, carefully using a nerve stimulator. The dissection is continued beneath the fascia to the inferior border of the mandible. The submandibu¬lar gland and its capsule will become evident, and the lower pole of the parotid may be encountered. The capsules of both should be avoided during dissection. Disruption of gland paren¬chyma may lead to sialoceles or salivary fistulas. The dis¬section is carried to the masseter muscle, with the surgeon taking care to retract the nerve fibers superiorly. Once the muscle is encountered, it is sharply divided at the inferior border to expose the bone. The muscle, perios¬teum, and soft tissue are retracted superiorly to expose the body, ramus, and fracture site.

3.2. Retromandibular Approach

Hinds and Girotti [13] first described the retromandibular approach in 1967. This approach was basically a modification of the submandibular approach. The incision begins approximately 1 cm below the lobe of the ear and 1 cm posterior to the ramus of the mandible [**Figure 6**]. The dissection is carried down to the parotid gland, which is retracted anteriorly, providing access to the vertical fibers of the masseter muscle overlying the ramus. These fibers are not stripped but instead are separated bluntly along their vertical course, allowing access to the underlying ramus. Access can easily be gained to relatively high subcondylar fractures through this approach.

3.3. Other extraoral approaches

The preauricular [**Figure 7**] and endaural approach are used for the exposure of condylar neck and head fractures.

3.4. Intraoral approach

Indications. This approach is indicated for low sub¬condylar fractures. Axial anchor screws or miniplate fixation may be used.

Advantages:

A visible scar avoided and damage to the facial nerve is minimized.

Disadvantages:

Intraoral Approach without Endoscope. There is limited access, the poorest access of all the approaches, it is dif¬ficult to ascertain the adequacy of reduction and fixation, and there is a high rate of complications.

Endoscope-Assisted Intraoral Approach. This is more time-consuming, with a steep learning curve, poor visibil¬ity of the posterior ramus, and difficulty in reducing certain fracture types

4. Complications of Condylar Fractures

Early complications

1. Fractured tympanic plate

2. Fractured glenoid fossa with or without displacement of the condylar head into middle cranial fossa

3. Injury to cranial nerves V or VII

4. Vascular injury

Late complications

1. Malocclusion

2. Growth disturbances

3. Internal derangement of TMJ

4. Ankylosis

5. Asymmetry

6. Dysfunction or Degeneration.

7. Condylar Resorption

8. Chronic Pain

5. Physiotherapy for Condylar Fractures

When the fracture site is stable and the patient is cleared for active motion, the patient should be motivated for physiotherapy of temporomandibular joint. Typical postimmobilization findings include pain with mandibular movement, decreased range of motion in all planes, soft tissue adhesions, and decreased muscle strength.

Pain experienced during initial attempts at active and passive movement normally decreases with successive attempts at motion. However, pain may inhibit the patient's willingness to move, so the application of adjunctive modalities is helpful during the initial stages of rehabilitation. Moist heat prior to range of motion exercises helps in improving the outcomes. In the presence of capsular fibrosis, ultra¬sonic diathermy can provide deep heating of the connective tissue to prepare it for successive stretching with passive and/or active movements.

Visual feed¬back with a mirror is critical to enable the patient to perform early exercises properly. When the fracture site is healed enough to handle stress, active-assisted opening is performed by the patient by placing her or his thumbs on the maxillary canines and/or premolars and the middle fingers on the central mandibular incisors. The patient is encouraged to chew on both sides of the mouth equally.

When the patient demonstrates good control without pain, the mouth opening and laterotrusive exercises are performed against resistance to improve mouth opening and deviation.

6. Figures

Figure 1: Panoramic Tomogram showing displaced right subcondylar fracture and left parasymphysis fracture. Note that there is loss of ramal height on the right side.

Figure 2: Panoramic Tomogram of fixation of subcondylar fracture using two miniplates; the vertical ramal height is restored by ORIF of subcondylar fracture

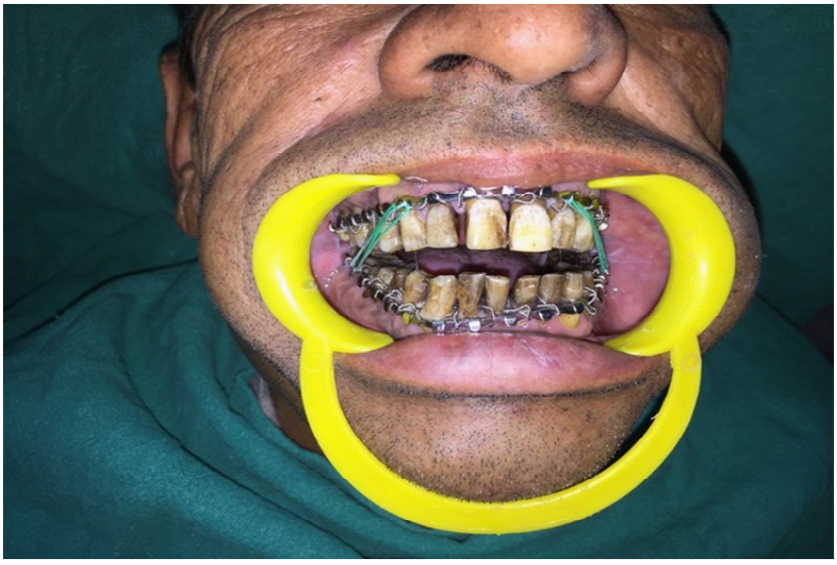

Figure 3: Photograph of patient with subcondylar fracture managed by closed treatment and now on guiding elastics allowing jaw physiotherapy during healing.

Figure 4: Photograph of patient with subcondylar fracture managed by closed treatment and maintaining occlusion with guiding elastics

Figure 5: Marking of incision for submandibular approach

7. Summary

Condylar fractures of the mandible are difficult to manage, however early diagnosis and proper treatment planning can minimizes the complications associated with such fracture. The treatment of every patient of condylar fracture should be individualized. Treatment should be chosen for the patient keeping in mind the various factors such as age, level of fracture, displacement, association with other fractures, ability to achieve occlusion, edentulism, patient compliance and surgeon expertise. Surgeon should provide the best treatment option to the patient depending on the clinical and radiographic assessment and should not rely solely on any specific protocol. Till date no universally accepted protocol which can address all the issues related to mandibular condylar fracture is available.

8. References

1. Ellis E, Throckmorton G. Facial symmetry after closed and open treatment of fractures of the mandibular condylar process. J Oral Maxillofac Surg. 2000; 58(7): 719–728.

2. Martin M, Lee C. Endoscopic mandibular condyle fracture repair. Atlas Oral Maxillofac Surg Clin North Am. 2003; 11(2): 169-178.

3. Singh V, Bhagol A, Goel M, Kumar I, Verma A. Outcomes of Open Versus Closed Treatment of Mandibular Subcondylar Fractures: A Prospective Randomized Study. J Oral Maxillofac Surg. 2010; 68(6): 1304-1309

4. Zide MF, Kent JN. Indications for open reduction of mandibular condyle fractures. J Oral Maxillofac Surg. 1983; 41: 89.

5. Mikkonen P, Lindqvist C, Pihakari A, et al: Osteotomy–osteosynthesis in displaced condylar fractures. Int J Oral Maxillofac Surg. 1989; 18: 267.

6. Klotch DW, Lundy LB. Condylar neck fractures of the mandible. Otolaryngol Clin North Am. 1991; 24: 181.

7. Widmark G, Bagenholm T, Kahnberg KE, et al: Open reduction of subcondylar fractures. Int J Oral Maxillofac Surg. 1996; 25: 107.

8. Bhagol A, Singh V, Kumar I, Verma A. Prospective Evaluation of a New Classification System for the Management of Mandibular Subcondylar Fractures. . J Oral Maxillofac Surg. 2010; 68(6): 1304-1309

9. Ellis E, Dean J. Rigid Fixation of mandibular condyle fractures. Oral Surg Oral Pathol. 1993; 76: 6.

10. Ellis E, Throckmorton G, Palmieri C. Open treatment of condylar process fractures: assessment of adequacy of repositioning and maintenance of stability. J Oral Maxillofac Surg 2000; 58: 27–34.

11. Risdon F. Ankylosis of the temporomandibular joint. J Am Dent Assoc. 1934; 21: 1933.

12. Dingman RO, Grabb WC: Surgical anatomy of the mandibular ramus of the facial nerve based on the dissection of 100 facial halves. Plast Reconstr Surg. 29: 266, 1962.

13. Hinds E, Girotti W: Vertical sudcondylar osteotomy: A reappraisal. Oral Surg. 24: 164, 1967.