Topic

Overview of Mandibular Condyle Fracture

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The mandibular condyle is a region that plays a key role in the opening and closing of the mouth, and because fracture causes functional and aesthetic problems such as facial asymmetry, it is very important to perform accurate reduction. Traditionally, there has been disagreement on how to manage fracture of the mandibular condyle. This review explores the misunderstanding of mandibular condyle fracture treatment and modern-day treatment strategies.

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Mandibular condyle fracture occurs so frequently that they account for approximately 30% to 40% of all mandibular fracture cases, and patients between 25 and 34 years old who have a busy social life account for one third of all the cases. Furthermore, about 40% of child injury patients have mandibular condylar fracture [1]. The mandibular condyle is a region that plays a key role in the opening and closing of the mouth, and because it causes functional and aesthetic problems such as facial asymmetry, it is very important to perform accurate reduction. While various treatment techniques have been investigated for the recovery of basic functions, occlusion, with regard to the treatment of mandibular condylar fracture, arguments on the course of its treatment continue to this day. Mandibular condylar fracture can generally be treated with open reduction, or conservatively with closed reduction.

Ever since MacLennan [2] advocated closed reduction for 180 cases of mandibular condylar fracture patients in 1952, stating that "complications arising from mandibular condyle fractures are conspicuous by their absence," closed reduction has been the "conventional wisdom" of mandibular condylar fracture reduction for several decades. Blevins and Gores [3], however, after performing conservative treatment in 140 patients, saw good prognosis in only 13% of the patients, whereas 36% of the patients were observed to have some problems, and 50% had a mouth opening measuring only 28 mm. In 1994, Silvennoinen et al. [4] observed limitations in mouth opening in 15% of the 92 patients in the study that they conducted, and in 17% of the patients, malocclusion and persistent mandibular deviation occurred during mouth opening. In numerous studies that compared the prognosis of closed reduction with that of open reduction, Eliis et al. [5-7] reported that mild complications such as scarring or partial paralysis of the facial nerve were observed in open reduction while relatively serious complications, including chronic pain, malocclusion, facial asymmetry, and limited mobility, were observed in closed reduction. Based on these recent research findings, open reduction is currently regarded as having

a better prognosis under appropriate indications and conditions, and the development of radiological diagnosis and surgery techniques is seen as playing a role in viewing such results.

In the early and mid-1900s, when the radiological diagnosis technology was still inadequate, Brophy classified fractures as "through the neck, from above and in front, or backward and downward" according to their location and direction, and Thoma classified them, according to the displacement and the extent of dislocation, as "fracture with/without displacement, dislocation, or dislocation and complete displacement." MacLennan [2] created a classification system based on deviation, displacement, and dislocation, and this system classified mandibular condylar fracture as "high or low, with deviation and displacement, dislocation, no displacement, or avulsion." The classification devised by Lindahl [8] is currently generally used, and it classifies fractures as "head, neck, or subcondyle" depending on the fracture level; as "medial, lateral, no overlap, or fissure" according to the extent of dislocation; and as "no displacement, slight displacement, moderate displacement, or dislocation" according to the location of the condylar head and articular fossa.

Archer [9] made an extreme claim, saying that there is no indication for open reduction because it causes the problems of trismus or ankylosis and sterile or suppurative resorption. Through ongoing research, however, Zide and Kent [10,11] classified the cases requiring open reduction by indication in a relatively objective manner, and this has been useful up to the present. According to Zide [12], in cases with displacement and ramus height instability, either of these two actually become indications of open reduction. In general, if a patient has an acceptable range of motion, good occlusion, and minimal pain, it is ideal to perform observation or closed reduction and maxillomandibular fixation. In the case of displacement or unstable low condylar fracture or subcondylar fracture according to the Lindahl classification, it is ideal to perform open reduction.

The approaches to open reduction include the intraoral, preauricular, submandibular, retromandibular, and rhytidectomy approaches. Although the intraoral approach has the advantage of having no visible scars and minimizing the damage to the facial nerve, it has the drawbacks of having limited access and the inability to sufficiently secure the visual field of the operative site, and using the trocar system for fixation [13]. The preauricular approach is mainly used in high-condylar-fracture cases and is useful for reducing an anteromedially distracted condylar segment, but it poses a risk of nerve injury (3.2% to 42.9%), and access to the mandibular angle and ramus is restricted. The submandibular approach is a method of inserting a 1.5- to 2-cm incision below the inferior border of the mandible. Although it is useful in lower condylar fracture, there is a risk of nerve injury and a high likelihood of scars with incision lengths up to 4 to 5 cm, and because there is a considerable distance between the skin incision site and the fracture site, proficient skills are required on the part of the surgeon. To complement these drawbacks, the retromandibular approach is sometimes used. The rhytidectomy approach was devised by Zide and Kent [10] in 1983. While it has the advantages of having a very good visual field and addressing the problem of facial scarring to some extent, it has the disadvantage of very long closure. Although extracorporeal fixation has the advantage of being capable of condyle height control and of enabling relatively accurate reduction even in complex fractures, there is a risk of developing complications such as avascular necrosis, resorption, and arthrosis. The endoscopic approach is also currently being attempted. Thus far, however, its cost is relatively high, and its surgery time is longer than that of the conventional methods. Moreover, there is not much difference in patient morbidity between this method and the others. Therefore, more research is needed on this matter.

With regard to the method of fixation, while wire was used by ligating it or using a long screw or lag screw, the method of using a plate and a screw is often utilized at present, for better stability. After examining the studies that had been conducted on the use of a plate and a screw for open reduction, Choi et al. [14] published the following results: in a study where a load was applied by fixing one or two miniplates on the *in vitro* model, the group with two fixed miniplates was more stable than the group with only one fixed miniplate. Throckmorton and Dechow [15] reported that in the experiment that they conducted to measure the *in vitro* mandibular model, tensile force was applied to the anterior condylar head, and compressive force to the posterior condylar head. In a clinical study on miniplate fixation, Haug et al. [16] compared the zygomatic dynamic compression plate, locking adaptation plate, mini dynamic compression plate, and adaptation plate systems and concluded that mini dynamic compression is the most stable.

The direction of mandibular condylar fracture treatment is to perform active open reduction as often as possible rather than conservative closed reduction, in order to obtain better results. This is significantly due to the advancement of surgery techniques. In the future, further studies must be conducted on how to acquire good prognosis while reducing the complications with regard to open reduction of mandibular condylar fracture.

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