Management of mandibular condylar fractures (mcf)

Summary

This paper reviews the literature of evidence based studies and textbooks on the management of mandibular condylar fractures (MCF). It also provides a brief outline of the signs and symptoms as well as the classification system of MCF. Optimal management of MCF is a controversial topic and there is also no consensus on its associated classification system.

Overview

The mandibular condyle is an articular surface that is part of the temporomandibular joint which facilitates the rotational and translational movement of the mandible. The condyle varies in appearance between individuals and also by age group to accommodate developmental variations, and also due to malocclusions, trauma and diseases.

The condyle is a weak point due to its relatively low stiffness and as such is more prone to fractures than other parts of the mandible. The condyle acts as a buffer primarily to reduce intracranial injuries. Based on review of two studies, Boffano et al, 2015, reported that condylar fractures ranges from 35% to 43% of all mandibular fractures. According to Afrooz et al, 2015 condyle fractures represent 27. 4% of all mandibular fractures. Based on their review of the US National Trauma Data Bank records, they also conclude that mandibular fractures are primarily caused by external causative factors such as assault, motor vehicular accidents and falls. Internal causative factors of fractures can include osteomyelitis and tumors; but are not as significant as the external factors.

Signs of Mandibular Condylar Fractures

Condylar fractures can be unilateral or bilateral. A patient with condylar fracture can show the following signs (Peterson & Kruger, 2011):

Occlusal Prematurity – Reduction in vertical height of the mandible on the injured side as a result the injured side makes contact first; sometimes followed by rocking motion and then occluding to maximum intercuspation. Careful observation of the mandibular closure will show the alteration in the alignment

Inability to Achieve Maximum Intercuspation – In bilateral fractures, due to the fracture of both condyles there is a premature contact of the posterior teeth with a large anterior open bite. Bilateral condylar fractures along with symphysis fracture can cause posterior cross bites and anterior open bites

Ipsilateral Laterognathia- In unilateral fractures there is laterognathia on the side affected by the condylar injury. Due to retrodisplacement of the mandible on the injured side, there may be Class II molar malocclusion on that side.

Ipsilateral Deviation on Opening- In unilateral fractures, while opening the mandible gets deviated to the side of the injury

Balancing Side Occlusal Interference during Contralateral Mandibular Translation – Balancing side interferences may be present when performing contralateral jaw movements in unilateral condylar fractures

Limited Mouth Opening – This can be attributed to interferences of the fracture, displacement and/or rotation of the segments, coronoid impingement, bleeding, edema and pain from joint splinting.

Classification of MCF

There has been a lack of general consensus on the classification of the anatomical mandibular condyles which in turn has caused disagreement on the most effective way of management of MCF. There are a few systems used for classifying Condyle fractures.

In the earlier days, a number of classification systems were based on radiological X-rays and were not supported by surgical experiences and findings. These systems included those proposed by Kohler, Reichenbach and Wassmund.

The Lindahl system developed in 1977 is a popular method of classifying condylar fractures. In this method, the position of the fracture is the main determinant as to whether it falls in the condyle head, the condyle neck or the condyle base. These areas are delineated by specific landmarks and reference lines. This system was refined further by Loukota et al in 2005 by subdividing the condylar process more precisely and delineating defined anatomical landmarks[1]. However a drawback of this classification method is that the degree of displacement or dislocation which is essential to surgical intervention is not captured.

The Spiessl method categorises the condylar fractures according to the point of occurrence of the fracture (low or high) without displacement and with

displacement or dislocation as well as condylar head fractures. This classification system has been used in clinical and scientific use however there is still a limitation in that it does not define the degree of angulation nor clearly articulate the borderlines between low or high fractures.

Management of MCF

The management of mandibular condylar fractures has been a controversial subject. The options to management of condylar fractures include: do nothing (observation), closed reduction or open reduction techniques. With the do nothing option only practical in the simple and straight forward cases, the real debate is whether to pursue closed or open reduction. A number of variables must be taken into account to determine the treatment method. These variables include the patient’s age, presence of teeth, severity of fracture of the condyle and associated fractures of the mandible, fracture height, extent of malocclusion, patient’s adaptation, patient’s masticatory system and unilateral or bilateral occurrence.

A literature review of many evidence based studies was undertaken with advantages and disadvantages of both the closed reduction and the open reduction methods as postulated by researchers and clinicians. The summarised findings are outlined below.

Eckelt et al, 2006 undertook a study on 66 randomised patients and compared the results of open versus closed treatment of fractures of the mandibular condylar process. They stated that “ correct anatomical position of the fragments was achieved significantly more often in the operative group in contrast to the closed treatment group”. They also found that the

patients who had operative treatment reported less pain. In terms of mandibular function impairment, they reported that the persons who had operative treatment had less pain and discomfort. They also reported that there was significant differences in mouth opening/lateral excursion/protrusion between both groups (open 47/16/7mm versus closed 41/13/5mm).

They concluded that " both treatment options for condylar fractures of the mandible yielded acceptable results. However, operative treatment, irrespective of the method of internal fixation used, was superior in all objective and subjective functional parameters".

In a study conducted on 27 patients in India, (Ragupathy, K 2016) comparing the outcomes of surgical vs nonsurgical treatment of mandibular condyle fractures, he reported that no group had malocclusion. Of the 11 persons in the open reduction group one person had a post-operative infection and two had temporary facial nerve weakness. In the closed reduction group, nine patients had loss of vertical ramus height and six had reduced mouth openings (less than 35mm). He concluded that ".. nonsurgical treatment gives satisfactory clinical results, though the condyle is not anatomically normal in radiographs, whereas surgical treatment provided more accurate results clinically as well as radiographically".

Kysas, 2012 et al undertook a meta -analysis of 20 studies involving analyses of 1, 186 patient comparing closed reduction to open reduction in patients with condyle fractures. It must be noted that only 4 out of the 20 studies were randomised control trials (RCT). In addition, they noted that there was

significant variation between treatment protocols, follow-up periods, and outcomes measured. Kysas considered a number of post treatment functionalities such as status of the post-treatment occlusion, mouth opening, protrusion, facial height, pain and the presence of postoperative ankyloses. They also considered facial nerve weakness and scarring in the case of open reduction method. The 4 RCT studies reported statistically significant conclusions favouring open reduction method over the closed reduction method; however Kysas et al found some shortcomings in these studies methodologies. Kysas et al concluded based on their meta-analysis that open reduction method for condylar fractures may be as good as or better than closed reduction. In addition, they reported that morbidity associated with surgery is low. However, they caution that " available evidence is of poor quality and as such not strong enough to change clinical practice".

Choi et al, 2012 summarised the advantages and disadvantages of both open and closed reductions methods.

Advantages of Closed Reduction – No injuries to nerves or blood vessels. No post-operative complications such as scar or infection. No tooth germ injury occurs because there is no establishment of crown of permanent teeth; this is beneficial for pediatric patients.

Disadvantages of Closed Reduction – Because of the insufficient reduction of bone fragments, there can be disorderly or excessive growth of the mandible and displacement of the ramus or mandibular deviation can occur. In addition there can be " injury to the periodontal tissue and buccal mucosa,

poor oral hygiene, pronunciation disorder, imbalanced nutrition, mouth opening disorder, and respiration disorder".

Advantages of Open Reduction – Minimise the number of displaced bone fragments to the best location possible. Prevent future complications such as respiratory disorder, original pronunciation and minimise nutritional imbalance

Disadvantages of Open Reduction – Possibility of damage to blood vessels and nerves exists. There is potential for post-operative complications. A permanent scar is very likely.

Choi et al suggests that for pediatric patients, because of their elastic bone structure and thick soft tissue coverage, thin cortical bone and significant premature trabecular bone, no severe impact occurs upon receiving trauma. As such treatment methods can differ between pediatric and adult patients. They suggest that because most of the growing crown of the permanent tooth has not yet been completed, the ratio of bone tissue to the tooth is relatively low. In addition, in developing dentition, the teeth are in different stages of formation and maturation; they can also easily be in the line fracture which in turn can cause delayed eruption and ankylosis. Intermaxillary fixation of more than 2 weeks is not recommended for these pediatric patients and open reduction is not normally used since it is invasive and there is risk of facial nerve injury. They also report ", no significant difference in prognosis is found compared to closed reduction".

Conclusion

Management of MCF remains a subject area where there is a lack of consensus on whether open reduction or closed reduction method is more suitable. Where there are some convergence of ideas include that intracapsular fractures are better treated closed [6] , it is better to deal with pediatric patients with closed reduction where practical and that physical therapy post treatment is important.

Traditionally, closed reduction techniques were more prevalent; however with enhancement in tools available for surgical intervention, open reduction techniques are being practised more, with the added benefit of evidence based studies on such techniques becoming more available.

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[1](Neff, Cornelius, Rasse, Torre, & Audige, 2014)