

Review Article

Condylar Fracture in Children: Current Knowledge and Considerations

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Abstract

Condylar fracture in children may lead to serious sequelae if not properly managed. Early and comprehensive diagnosis based on detailed history collection and careful examination is essential. Except panoramic radiograph and CT, MRI could provide additional information on the injury of surrounding soft tissues. Conservative treatment including reestablishment of the normal occlusion is the first choice for children with condylar fracture. While open reduction is indicated in old children, especially those with severe dislocations. Conservative treatment could achieve good clinical results and acceptable bone remodeling in most child patients. Functional and radiographic complications are inevitable and need further analysis. Targeting therapeutic approaches for children of different age and injuries are required to improve long-term outcomes.

INTRODUCTION

Mandibular fractures are the most common type of maxillofacial fractures in children. And condylar fractures account for 28% to 80% of all the mandibular fractures according to different studies [1,2], with boys more commonly affected than girls [3]. As children especially young children could not express their feelings properly and the condylar fractures are usually caused by an indirect blow to the chin or mandibular angle, they are easily overlooked and not diagnosed until complication arisen. Delayed and improper treatment may lead to serious problems including malocclusion, growth disturbances and facial asymmetry, and in some instances ankylosis [4]. The purposes of this review are to introduce the current situation of the diagnosis, treatment and outcome evaluation of condylar fracture in children, and to analyze future research directions.

Diagnosis of condylar fracture in children

For early diagnosis, detailed history collection and careful examination for disturbed dental occlusion, restricted mouth opening, and pathologic signs in the preauricular region (swelling, tenderness, and lack of movement of the condylar head) are very important [5]. Definite diagnosis of condylar fractures is only possible with radiological examinations. The panoramic radiograph remains the basic diagnostic tool and is the most accessible X-ray available to dentists. While Computerized Tomographic (CT) scan provides more accurate information,

including the location of fracture line, the degree of fragment dislocation and displacement [6].

The temporomandibular joint consists of condyles, articular surface of the temporal bone, capsule, articular disc, ligaments, and lateral pterygoid muscle. Condylar fracture is inevitably accompanied by the injury of surrounding soft tissues, and those injuries inevitably affect the healing of fracture and the remodeling of the condyle. Some authors have suggested that a bifid condylar (Figure 1) might be caused by an abnormal of growth generated



Figure 1 Bifid condylar of a 10-year old boy suffered unilateral fracture of left condylar 3 years ago.

by the position of the articular disc [7]. Furthermore, the damage to the disc is one of the possible risk factors of TMJ ankylosis [8]. Therefore, in addition to radiographic examination on bone structure, methods such as Magnetic Resonance Imaging (MRI) assessing the damage of surround tissues, especially articular disc, are necessary for accurate diagnosis, treatment decision and prognosis evaluation. Wang et al. recently used MRI to assess and compare TMJ soft tissue changes after dislocated and nondislocated condylar fractures, and found significant differences of disk displacement and signal intensities of retrodiskal tissues between both fractures [9]. It was reported that soft tissue changes were in direct proportion to the severity of the condylar injury and might affect the outcome of functional treatment [10,11], suggesting MRI examination is necessary for child patients with condylar fractures.

Treatment option for children with condylar fracture

The goals of condylar fracture treatment in children are to maintain the normal integrity of the joint and promote mandible growth in normal way. The management of condylar fractures in children depends on several parameters, such as the extent of injury (unilateral or bilateral fractures), level of the fracture, degree of displacement or dislocation together with the size and position of the fractured condylar segment, dental malocclusion and mandibular dysfunction, age of the child and development stage of the dentition, presence of concomitant mandibular or other facial fractures [12]. Though in certain cases, open reduction may be selected such as severe dislocation of the condylar fragment and restricted mouth opening, multiple facial injuries and failed conservative treatment [13], most surgeons recommend conservative treatment/close reduction in children for restitutive remodeling potential and possible growth disturbances caused by surgical management [14]. But the indication for open reduction increases with age. The study of Eskitascioglu et al. showed a high incidence of complication in 12-16-year olds [15]. This is because the craniofacial skeleton becomes more adult-like in its form at about 12 years old of age and the remodeling capacity of the condyles decreases. Therefore some people suggested that open reduction and fixation may be more appropriate in children from the age of 12 years [16].

Conservative treatment usually consists of analgesia, soft diet, reestablishment of the normal occlusion followed by physiotherapy. As we know that the growth of the mandible condyle is essential for normal mandible growth, especially of the ramus. And interference in the growth of the mandible can influence the growth of the maxilla because of the occlusal plane. The intercusp occlusal and the occlusal plane provide the accompanying growth of the maxilla and mandible. Therefore restoration of a normal occlusion plane is essential for conservative treatment in children with condylar fracture [17]. There are many measures reported in the literature to help occlusal reestablishment and maintenance, e.g. Maxillomandibular Fixation (MMF), occlusal splint and orthodontic appliance [18-20]. Each has its own advantages according to the authors. MMF is the classic method of close reduction in adult patients. But in child patients, the application of MMF is complicated by poor compliance, and in the case of primary and mixed dentition, lack of sufficient support due to the short crown and root of primary

teeth and partial eruption of young permanent teeth [18]. Tabrizi et al. found similar effect of rigid intermaxillary fixation and guiding elastic, but guiding elastic was more tolerable and acceptable for children as they could have function during treatment [21]. Occlusal splint and orthodontic appliance could avoid the shortcomings of MMF. But it takes time to fabricate the splint or appliance in the laboratory and requires impression taking which is painful in young children [22].

Comprehensive assessment of treatment outcomes

So far, there is still no definite treatment guideline on conservative management of condylar fracture in children. Functional exercises including mouth opening and lateral excursion are beneficial to ankylosis prevention and fracture healing promotion [23]. But the mode, intensity, and duration of mandibular exercises varied in different institutes. No available guideline could be followed by clinicians. Treatment standards need to be developed based on the age and the severity of the injury.

Treatment results of condylar fracture are usually evaluated by clinical and radiographic examinations. It is difficult to establish a standard evaluation system for growing children. Based on criteria for adult patients, some general indicators were used for clinical assessment: (1) normal interincisal opening, (2) acceptable occlusion, (3) normal mandibular movement without pathologic deviation, and (4) no subjective symptoms (no pain and normal function) [23]. The shape of condyle and mandibular growth are usually assessed by panoramic radiographs and CT scanning. The prognosis of condylar fracture in children depends on several factors, such as the type and intensity extent of the fractures, age at the time of injury and growth activity, timely and proper treatment.

In the literature, good clinical results and acceptable bone remodeling were achieved in most child patients after conservative treatment [18,23,24]. TMJ clicking, deviation in wide mouth opening toward the fractured site, mandibular retrognathia and reduced maximum protrusion and lateral movement were not rare, but these did not lead to functional or esthetic problems [25,26]. However, some long term sequelae were also reported such as temporomandibular dysfunction (TMD), disturbed mandibular growth, and temporomandibular joint ankylosis [7,27]. Lekven et al. showed that compared to bilateral fractures, unilateral fractures had increased risk of unfavorable clinical outcomes [24]. In contrast, Gupta et al. found complications are more severe after bilateral condylar fractures [28]. Unilateral condylar fracture treated by closed methods may develop facial asymmetries with shortening of the face on the side of injury, while bilateral fractures tend to develop mandibular retrognathia [29]. Radiological examination showed complete remodeling in up to 87% children patients after conservative treatment [24]. However moderate and poor remodeling were also reported, such as irregular shaped condyles, bifid and bony exostosis of the condyle head, asymmetric condylar angles, flattening of the mandibular fossa and reduced ramus height [30,31]. Radiographic complications were more often encountered in dislocated and low condylar fractures [31]. Some authors believed that radiologic results depended on the patients' age at the time of injury. Kahl-Nieke

and Fischbach reported that patients under 10-year old showed greater variation and greater differences in mediolateral and anteroposterior condylar dimension than younger children [32]. Strobl et al. found satisfactory remodeling in 2-6-year-olds, and incomplete condylar regeneration in the 7-10-year-old children, including condylar deformities and reduction in condylar neck height [33]. While Thorén et al. showed that outcome of fractures did not depend significantly on the age of the patient at the time of the injury but on the type of fracture [31].

It is well accepted that some parameters may affect the outcomes, such as unilateral or bilateral fractures, type and level of the fracture, degree of fragment displacement or dislocation, age of the child, developmental stage of the dentition, presence of other facial fractures [23]. But the relativity between sequelae and these parameters are still unclear. Large sample and long-term studies are required to clarify the relationship.

Traditionally when evaluating the treatment results, people are mainly focused on bone remodeling of the joint. Nowadays, more attention has been paid to functional recovery of masticatory muscles as they may further affect joint structures and cause TMD in the future. In fact, several studies have used mandibular kinematics and surface Electromyography (EMG) of masticatory muscles to evaluate the functional outcomes after treatment of condylar fractures in adult patients [34-36]. For children, especially young children, complicated measurements and invasive procedures such as needle electrodes for measuring the EMG activities of medial pterygoid and lateral pterygoid muscle are not suitable. Therefore, simple and noninvasive methods for functional evaluation in children are required to gain more information on long-term prognosis.

CONCLUSION

Taken together, conservative treatment of condylar fracture in children has satisfactory clinical results though radiographic examination is unfavorable. Randomized multicenter studies help to establish a comprehensive evaluation system, and develop targeting treatment plans for children of different age and injuries to improve long-term outcomes.

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