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Long-term results of early condylar fracture correction: case report

CASE REPORT

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Abstract – Condylar fractures in childhood occur frequently, often with minimal pain and discomfort and therefore the diagnosis is not made at the time of injury. Management may be surgical or non-surgical. Non-surgical therapy in children is the method of choice if the condyle can translate normally. In fact, there is an excellent chance of regeneration and continued normal development after fracture in growing patients. The purpose of this article is to describe the long-term clinical and radiological evaluation of a conservatively treated unilateral condylar fracture, a result of trauma, in a 6-year-old patient. In addition, she presented a congenitally missing lower incisor ipsilateral to the fracture and a class II malocclusion. She was treated with functional jaw orthopedics using a splint and an activator and subsequent orthodontic treatment with fixed appliances [*J Orofac Orthop* **5** (2002) 429]. The remodeling process of the condylar head and neck is clearly observed in the panoramic radiographs of the 12-year follow-up records presented.

Condylar fractures occur relatively frequently in children and adolescents. Although the condyle is well protected in the glenoid fossa, its neck is a relatively fragile area (1). The proportion of condylar fractures among all mandibular fractures is between 17.5% and 52% (2). While some studies report an equal distribution between genders, a 9:1 male predominance has been reported (3). Two types of fractures, intracapsular and extracapsular, and three anatomical sites, the condylar head (intracapsular), the condylar neck (extracapsular), and the subcondylar region, are described in the literature (2, 4).

The etiology of condylar fractures cited includes motor vehicle accidents, falls, work-related fractures, and fractures cuased by recreational and sporting activities, and personal violence (2, 3). The most common causes of trauma in children are falls from bicycle, on steps and sports (2).

Most fractures are caused by indirect forces transmitted to the condyle from a blow elsewhere while others by direct trauma (2). Traumas are extrinsic factors, capable of influencing extrinsic (caused by external environment) and intrinsic (genetically determined) factors leading to severe growth disturbances (5–7). If condylar fractures occur in children prior to completion of growth and are not properly managed, growth disturbances and asymmetry at multiple facial levels may result (2, 8, 9).

Some studies demonstrated that after fracture of the mandibular condyle in children, there is an excellent chance that the condylar process would regenerate to approximately its original size and a small chance that it would overgrow after the injury if proper function can be obtained (1, 10, 11). Therefore, it may be assumed that a guidance system exists to rebuild the condylar process in children sustaining fractures (2). The presence of the articular disc and capsule seems to play an important role in this process (2, 12, 13).

Two main therapeutic treatments for condylar fractures are described in the literature: (i) conservative treatment with intermaxillary immobilization followed by functional therapy; and (ii) surgical intervention to reposition and stabilize the fragments. The conservative functional approach is generally preferred in childhood rehabilitation (14, 15). Clinical studies and experience confirm that there would be little if any advantage from surgical reduction of a condylar fracture in children because the additional scarring produced by surgery could impede translation of the mandible and restrict normal growth (1).

The purpose of this article is to describe the treatment of a patient who suffered a condylar fracture as a result of trauma at the age of 6 years. Twelve-year follow-up records are presented.

Case report

The patient was a 6-year-old female in good health with facial asymmetry and limited mouth opening. Her medical history indicated trauma with a laceration to the chin as a result of an accident during leisure-time activity 1 month before.

Fig. 1. Frontal facial photograph of the patient at the age of 6 years showing a latero-deviation of the mandible to the left and a mandibular retrusion.

Fig. 2. Intraoral frontal photograph of the patient at the age of 6 years showing a dental class II malocclusion, increased overbite, and deviation of the lower midline to the left; also notice the absence of the lower left central incisor.

Fig. 3. Pretreatment facial photograph during mouth opening. Examination reveals deviation on the left side during opening. Chewing and speaking were affected.

Facial examination displayed a lateral deviation of the mandible to the left side resulting in facial asymmetry. Her lips were competent. A slight deficiency of the lower third of face with mandibular retrusion was observed (Fig. 1).

Intraoral examination revealed a bilateral dental class II malocclusion, increased overbite, and deviation of the lower midline to the left because of the absence of the lower central left incisor (Fig. 2). Limited mouth opening and mandibular deviation during opening and closure were observed, and both mastication and speech were affected (Fig. 3).

Cephalometric findings included an increased ANB angle, mandibular retrusion, and a decreased anterior vertical dimension. The frontal teleradiography underlined the deviation of the mandible to the left side while the axial one pointed out a condylar dislocation fracture of the left temporomandibular joint (TMJ), with condylar head displacement (Fig. 4). The cephalometric landmark ANB evaluates the relationship on the sagittal plane. Its normal value is 2 ± 2°. It represents the difference between SNA angle [which evaluates the relationship on the sagittal plane between the cranial base and the maxilla. V.N. 82 ± 2°] and SNB angle [which evaluates the relationship on the sagittal plane between the cranial base and the mandible. VN 80 ± 2°]. The panoramic radiograph clearly confirmed the condylar head fracture and displacement. The congenitally missing lower left central incisor was evident (Fig. 5).

Treatment

As the fractured condyle could translate normally, an acrylic splint was fitted in the lower arch for functional repositioning of the mandible. Then splint's height was gradually increased on the side of the fracture to obtain a fulcrum and to avoid skeletal deformity. The fulcrum represents a bite block that stimulates growth on the deficient side so that the vertical component of the asymmetry can be addressed. The splint was worn 24 h per day, and during meals. Mouth-opening exercises were performed several times a day. The bite block was increased monthly on the deficient side. Using this appliance, the patient was able to maintain function,

Fig. 4. Pretreatment frontal cephalometric radiograph underlined the deviation of the mandible to the left.

Fig. 5. Panoramic radiograph of the patient at the age of 6 years confirming left condylar head fracture and distal displacement and showing the congenitally missing lower left central incisor.

this being the best way to combat ankylosis of the joint structures following injury.

The clinical exploration included assessment of signs and symptoms related to the temporomandibular disorder, including mandibular range of motion, joint pain on palpation, and pain on mandibular function. Once mandibular movements were restored, the splint was worn at night only, until the ideal time for growth modification treatment, just before puberty, to perform a second-phase functional appliance therapy.

The construction bite was taken with more advancement on the deficient side than on the normal side with the aim of correcting the mandibular retrusion and obtaining the remodeling process of the condylar head and neck (7, 16, 17). The functional appliance restored symmetry through better growth and function on the affected side by forcing the patient to function with the mandible in a symmetric position. This procedure stretched the associated musculature and soft tissue and translated the mandibular condyle. Translation, opening and closing movements are necessary for the normal growth of the mandible.

It was decided to close the space of the congenitally missing lower left central incisor. The midline was corrected by shifting the mandible to the right. The appliance components were used to guide the eruption of teeth in the posterior region while differential growth of the condyles corrected the asymmetry.

Eighteen months after functional orthopedics the panoramic radiograph showed complete healing of the bony fragments with the ramus of the mandible. The left condylar head was cylindrical, thickened and distally inclined. The bone trabeculae were oriented toward the vectorial direction of the condylar stimulation. The right condyle was more vertical. The lateral headfilm showed a skeletal class I, with increased vertical dimension and correct overbite. The midlines were coincident. The mandibular deviation to the left side was totally corrected.

Once all permanent teeth erupted, fixed appliance therapy using a low-friction technique (Speed System, The Speed System Strite Industries, Ontorio, Canada) was performed for 12 months to stabilize the occlusion. Facial examination displayed a more symmetrical face

Fig. 6. Post-treatment frontal cephalometric radiograph showing mandible's mandibular symmetry and the restoration of the condyle.

Fig. 7. Twelve-year follow-up. Post-treatment lateral facial photographs showing the esthetic result and good proportions among facial structure.

Fig. 8. Twelve-year follow-up. Post-treatment frontal facial photographs showing the esthetic result and good proportions among facial structure.

with good proportions, a natural lip posture and a more harmonic profile. Intraoral examination revealed a bilateral dental class I and the coincident midline obtained through zeroing of the tip of the lower left canine bracket and the mesialization of the posterior teeth of the same side. The overjet and overbite were within the norm. The TMJs were pain-free and there was no displacement during jaw opening and the masticatory function was restructured.

The final panoramic radiograph showed that the originally dislocated fragment was further aligned toward the joint space, with the condyle having moved to a central position. The full health of the TMJ on the opposite side could also be observed. Lateral teleradiography confirmed the presence of a skeletal class I with normal vertical dimension while from the frontal view it is possible to observe the symmetry and the restoration of the left condyle (Fig. 6). The retention appliance consisted of a positioner to be worn at night for 8 months. The patient was satisfied with her facial and dental esthetics. She was scheduled for a maintenance program with periodic recalls. The 12-year follow-up examination confirmed unlimited and pain-free functioning of the TMJ with excellent masticatory performance. There was no instance of ankylosis, and no disturbance of mandibular or facial growth was detected as the patient was followed up through the growth period. A stable relationship with good alignment of dental arches and correct overbite was maintained (Figs 7–9). The TMJ radiograph shows the remodeling process of the condyles (Fig. 10).

Fig. 9. Twelve-year follow-up. Intraoral photograph showing good alignment of dental arches and stable results.

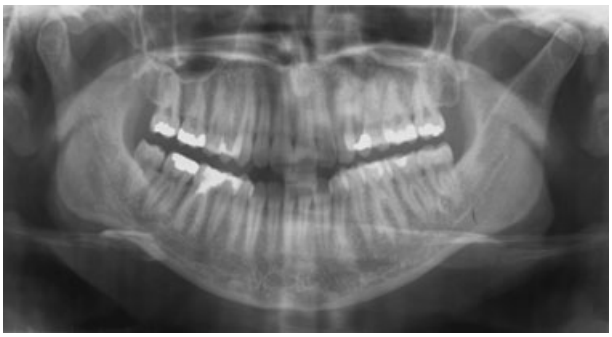

Fig. 10. Twelve-year follow-up. Panoramic film showing the remodeling process of the condyle.

Discussion

Therapeutic procedures adopted after condylar fractures in children are essential for minimizing consequences on occlusion and facial development. Condylar fractures should be addressed as early as possible to restore optimal function, as any disturbance to the condylar cartilage will result in alteration of mandibular development (18, 19).

The growth at the mandibular condyles is analogous to reactive growth of the suture of the maxilla (1). In fact, the mandible seems to be pulled forward by the soft-tissue matrix in which it is embedded (1). After a unilateral condylar fracture, growth problems arise when there is scarring in the area, restricting the growth movements so that the mandible cannot be pulled forward on one side and consequently, growth will be asymmetric. Unilateral TMJ ankylosis during active growth develops into an asymmetric malocclusion with chin deviation to the affected side, because the unaffected side grows normally (20).

The treatment of condylar fractures depends on the level of the fracture, the extent of the injury, the degree of displacement and dislocation, the size and position of the fractured condylar segment, the malocclusion and mandibular dysfunction, the completeness of the dentition, the presence of concomitant facial fractures, and the age of the patient (2, 21). In growing patients when a unilateral condylar fracture occurs, it is sufficient to restore mandibular movements to obtain facial growth preventing the development of facial asymmetry. Surgery is not indicated in the vast majority of pediatric patients with condylar fractures (1–3, 6, 11). Treatment is aimed at restoring a normal joint function, occlusion and symmetry (22, 23).

It is important to evaluate if the affected condyle can translate normally. If it can, functional therapy should be helpful. It has been demonstrated that bone trabeculae in the head of the condyle follows the stress line. In fact, the internal architecture of bones represents the stress pattern (1). Remodeling may be interpreted as a process directed to meet the demands of function and growth (2). Histomorphometric studies find that, during active growth, trabecular bone remodeling with successive enchondral ossification occurs in the healing of condylar fractures (24).

According to Strobl et al. (24), Tewson et al. (25), and Yasuoka et al. (26) such remodeling continues at the fracture site even after clinical healing producing adaptive changes in the TMJs. Functional restitution of the TMJ will lead to condylar regeneration and remodeling with adaptive changes.

When the amount of displacement of the condylar process is significantly greater, open treatment is usually preferred. If translation of the condyle is restricted, management should include surgical intervention with reduction and fixation (27, 28). The case report described in this paper demonstrates the positive healing potential and prognosis that can be obtained with functional therapy after condylar fracture in growing patients.

Conclusions

Non-surgical management of condylar fractures in childhood is the method of choice to prevent distortion in subsequent growth. The results obtained in this case demonstrate that early controlled mobilization using functional therapy resulted in remodeling with functional adaptation of the condyle to the fossa. The positive results of this study, consistent with long-term findings of other authors, confirm the success of the non-surgical functional approach in children presenting unilateral fractures of the mandibular condyle (24).

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