

TMJ fractures in children: clinical management and follow-up

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The mandible is the facial structure that is the most affected by trauma and the most common fracture site is the condyle. New perspectives for this problem are due to the fact that often TMJ fractures in children are undiagnosed and consequently untreated. This becomes evident when growth disturbances show up a year or two. These types of trauma must be focused not only as a cause of direct damage to osseous structures, but also of future disturbances of the dentofacial development. Three cases of particular significance for the requested therapeutic approach are reported.

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INTRODUCTION

The goals of treating condylar fractures include the restoration of joint function, occlusion, and facial symmetry. Trauma must be focused not only as a cause of direct damage to osseous structures, but also of future disturbances of dentofacial development.

Maxillo-facial fractures in general and mandibular fractures in particular, seem to be less common in children than in adults. The reason for that could be found in the difference between facial osseous structures of children and adults. The resilience of the developing mandible and the smaller size of the mandible to the cranium and the forehead in infants could account for this.¹⁻³ A lower prevalence of mandibular fractures in children than in adults has been found in several studies reporting similar data varying 1-5%⁴⁻⁷ depending on the age determined. The incidence seems to increase gradually from birth up till 16 years of age. The sex distribution shows a dominance of boys in all age groups: this trend increases with age.^{3,4,6,8,9} The most common fracture site is the condyle: the higher incidence of condyle fractures in children than in adults may be explained by the higher proportion of medullar bone with only a thin rim of medullar cortex.^{10,11}

Nowadays statistics seem to uncover new perspectives for this problem, as this data might have been

influenced by the fact that often TMJ fractures in children are undiagnosed and so they are likely to be higher than reported in literature.

Since surgical intervention for condylar fractures in young children appears to worsen rather than improve the tendency towards growth disturbance^{7,12} closed reduction combined with physiotherapy is the advocated treatment. In fact normal development of the mandible, as well as some portions of the upper jaw and face, is related to function since the mandible is a single bone and changes in one joint are reflected in the opposite one and alterations in function due to bone fractures may result in disturbances on dentofacial development in children and youth which become more and more evident during growth.

The follow-up of these patients becomes a key point in their treatment: they should be controlled clinically and radiologically not only during the period of healing of the osseous structures, but for a longer time, until facial growth is over and permanent dental occlusion is stable.

The aim of this paper is to describe three case reports which will clearly underline some of the problems connected with the growth management of the TMJ fractured children.

CASE REPORTS

CASE 1

A healthy three-year old girl was referred for clinical and radiological examination following a facial trauma. The child had fallen while running at home and had cut her chin with apparently no disturbances to her dental and facial structures. She was examined three hours after the incident. She had shown relatively little pain after the injury, she hardly cried and then continued playing again with no further reactions. The girl's aunt, a pediatrician who was present at the moment of the

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Figure 1. The postero-anterior cephalometric radiograph showing a bilateral fracture and the medial dislocation of the condyles (arrows).



Figure 2. The postero-anterior cephalometric projection made three months after the trauma: a decrease in medial angulation of both condyles is evident, particularly on the left side (arrows).



Figure 3. The postero-anterior projection made eight months after injury: the progressive decrease of medial angulation of both condyles is even more evident (arrows).

fall, advised for her to undergo an immediate dental and facial check up.

The clinical examination showed little change in occlusion, mandibular movements seemed to be reduced a little with moderate pain referred during mouth opening and while gently palpating the area of the condyles. The postero-anterior cephalometric pro-

jection showed a bilateral dislocated fracture of both the condylar necks (Figure 1).

The patient was treated with a conservative method and immediately scheduled for a functional appliance. A liquid diet for 20 to 30 days was recommended.

The immediate result was a reduction of pain and an improvement in jaw movements. The patient underwent periodical clinical and radiological monitoring. After three months the cephalometric postero-anterior projection showed a marked improvement in condylar dislocation (Figure 2), which became more evident after another five months (Figure 3). Occlusion is now normal and stable and mandibular movements are within normal limits. She is still under observation to evaluate facial development.

CASE 2

A healthy six-year-old boy was referred by his pediatrician for an examination because of a developing facial asymmetry. The mother stated that the asymmetry had become more evident in the last year. She reported that gestation and delivery of the child had been uneventful. Delivery was vaginal and with no forceps been used. There was a history of trauma to the mandible, which occurred at the age of three resulting from a bike fall. On that occasion the boy cut his chin and was brought to his pediatrician, but as he apparently had a relatively minor pain without any disturbances to other structures, neither dental nor facial, no radiographic examination was advised. The slowly developing asymmetry went unnoticed for three years and then suddenly perceived as a problem.



Figure 4. Frontal photograph: a light developing faccial asymmetry is evident.



Figure 5. The postero-anterior cephalometric projection show a medially dislocated condyle and an undeveloped ramus on the right side of the mandible. The teeth are situated high up.

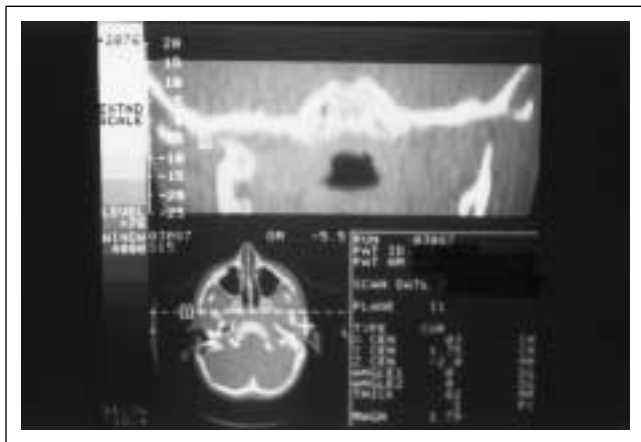


Figure 6. TC scan of the patient: the angulation of the condyle due to a previous undiagnosed fracture is evident.

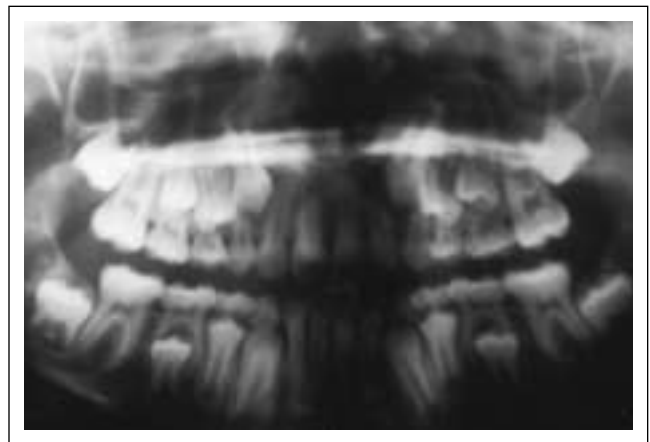


Figure 7. The remodeling of the right condyle fossa (more flat compared to the other one) is evident.

Clinical examination disclosed a deficiency in the mandible on the right side (Figure 4), with some apparent effect on adjacent areas of the maxilla and a shift of the chin towards the right side during mouth opening. The intraoral examination showed a mixed-dentition stage, with a developing class II malocclusion. A postero-anterior cephalometric projection (Figure 5) showed a unilateral decreased vertical height of the mandible on the right side. The TC showed more clearly a unilateral dislocated fracture of the right condylar neck, a consequence of a previously undiagnosed and untreated TMJ fracture (Figures 6, 7). Luckily the post injury growth of the mandible was good. Its proportions were maintained, the asymmetry was not

too important and so a conservative treatment was planned. The patient was then scheduled for an approach with a functional appliance and is still under observation.

CASE 3

A healthy nine-year old girl was referred by her pediatrician. The main complaint was an occasional pain on the left TMJ during mouth opening with intermittent noises. Eight months before she had fallen off her bike hitting her chin. The day after the accident she was brought to the family dentist for a clinical examination, but at that time no radiographs were taken and no facial examination was advised. In the following

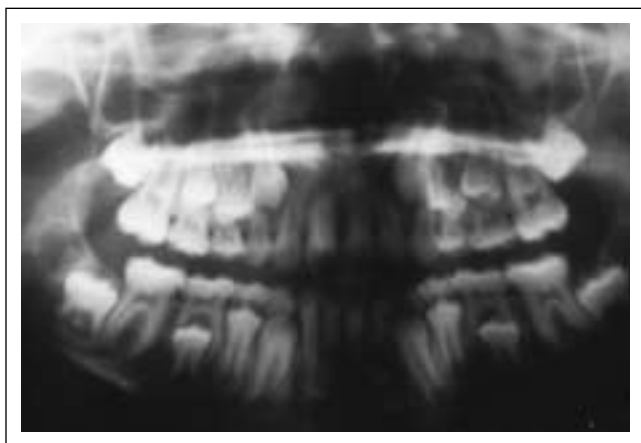


Figure 8. The panoramic radiograph and the postero-anterior projection show a fracture of the left condyle (arrow).

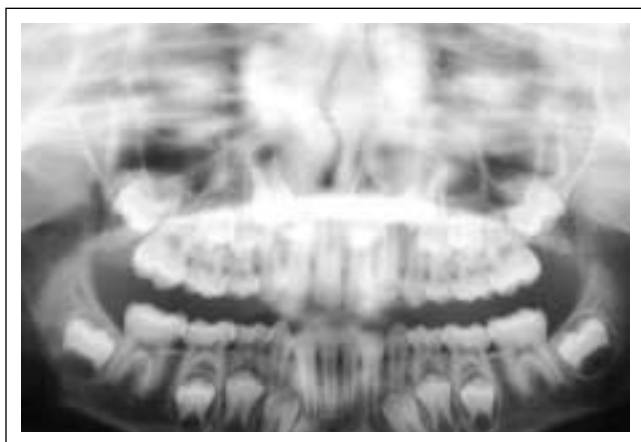


Figure 10. The panoramic radiograph made nine months after the beginning of the functional therapy: a remodeling of the left condyle is evident (arrow).

months, occasional pain to the left TMJ was referred, at first occasionally, and then more and more frequently. The girl was then brought to her pediatrician who advised her to do a panoramic radiograph and a postero-anterior cephalometric projection which confirmed the existence of a left TMJ fracture (Figures 8, 9).

The clinical examination of the girl confirmed the existence of a mixed-dentition stage with a first molar class; a shift of the chin towards the left side during mouth opening was present (Figure 10).

A functional approach to this case was planned, but the co-operation of the girl was very poor: many of the appointments made were cancelled and very often she refused to use the appliance regularly each day. After nine months a new panoramic radiograph was made: a moderate remodeling of the left condyle was evident (Figure 11) and a clinically light facial asymmetry began to develop. The shift of the chin towards the injured side became more evident (Figure 12) and a reciprocal click in the left TMJ appeared.



Figure 9. Frontal photograph: mouth opening is within normal limits with a light shift of the chin towards the left side.



Figure 11. Frontal photograph: the facial asymmetry is becoming more evident and during mouth opening a shift of the chin towards the left side is evident.

DISCUSSION

If a condylar fracture is documented radiographically, but the occlusion remains normal, close observation and exercises to maintain good function are all that is required. If occlusal relationships are controlled and, when necessary, restored with functional appliances, which help the mandible to keep the normal position where stimulating continuous “normal” functions, the

articulating surfaces will regenerate and remodel and the position of the mandible will be maintained.¹³ The use of functional appliances immediately during the post injury treatment allows the mandible to be properly related to the maxilla and stimulates continuous mandibular movements. This therapy aims at providing stimulation to the muscles within the painful limits and to wash away the metabolites resulting from the muscle spasm. Further more the use of the appliance offers comfort while hematomas are resolving and the tissues are recovering.

The appliance must be used as many hours in a day as possible and, in our experience, results are more effective than those obtained with traditional physiotherapeutic exercises, which are not always easy to perform, particularly for children.

In cases of undiagnosed and untreated fractures in children, consequences of the trauma become evident during growth when the child begins to develop facial asymmetry. In these cases the maintenance of good proportions in mandibular growth, the seriousness of facial asymmetry, and limitations in mandibular movements must be taken into consideration to evaluate a proper treatment. If the post injury growth is good, occlusal relationships are correct and the mandibular movements are within proper limits, with just a moderate deviation during mouth opening, a conservative treatment can be planned. In this situation the mandible should be encouraged to function in a forward position, as this favors a catch-up growth at the condyles.¹⁴ A functional appliance to dictate a forward position of the mandible in a proper occlusion is indicated not only for a few weeks during healing, but also during the following years when bone regeneration and compensatory growth are to occur. At a later stage of development, when mandibular growth is nearly completed and all permanent teeth have erupted, conventional fixed appliance therapy may be useful to obtain a final tooth position.

If a true or a functional ankylosis exists, a surgical intervention is necessary. Interestingly, functional ankylosis may be more likely to develop if the fractured condyle is partially displaced. The severity of injury to the joint structure, also may play a role.⁷

Unfortunately an unknown percentage of people affected by traumatic lesions of the TMJ (fractures, contusions etc.) develop a TMJ internal derangement with symptomatic alterations in mandibular functions and movements.¹⁵ Two are the possible causes of a growth deficiency following injury to the condyle a loss of stimulus to normal growth and a growth deficiency due to the mechanical restrictions created by scarring and loss of motion. These patients, and also those who have been correctly treated with a functional approach, but for a too short period, develop quite frequently an arthropathy and/or a facial dysmorphogenesis; the development of a TMJ internal derangement and

degeneration depends on the severity of the trauma. In these cases, functional therapy is essential: in fact, the mobilization of tissues within and around the joint, frees restraints of fibroses capsular components and the lateral eminence, increases disk mobility and thereby reduces load concentration. This may improve condylar remodeling.¹⁵

Recent clinical MR investigations of different patient groups demonstrate a causal relationship between TMJ derangement and degeneration, and secondary facial skeleton remodeling or disturbed growth.^{16,17} Patients have been observed longitudinally to develop retrognathia, unstable occlusion disturbances and mandibular asymmetry after the development of TMJ derangement and osseous degeneration.¹⁷ Joint injury sustained during impact trauma to the face or mandible was found to be the single most frequent cause of subsequent TMJ internal derangement. Other clinical studies support this observation.^{18,19} Once a TMJ is internally deranged, adaptive or degenerative osteo-cartilaginous process take place in the mandible, temporal bone and masticatory muscles.^{17,20-22}

CONCLUSIONS

All fractures are normally accompanied by a more or less severe damage to the capsule and the disk: in the acute phase, this invariably causes traumatic arthritis. The further course of the acute stage depends on the patient's age, the nature of the fracture, associated lesions, if any, of the joint tissues and the treatment given. That is why the first clinical and radiological examination of the patient must be very accurate. Unlikely sometimes these traumas are neither diagnosed nor treated as they can apparently occur with relatively little pain, no clinical evidence and without enough reaction by the child to get any adult's attention regarding the seriousness of the injury. It is not uncommon to obtain a history of a child, who fell off a bike, cut the chin, cried a bit and carried on playing. Very often the patient is not either clinically examined or treated and only when growth disturbances show up a year or two later, a TMJ undiagnosed fracture become evident.

At one time we thought that fracture of the condyle produced growth deficiency in proportion to the age at the time of injury: the younger the child was, the greater the potential growth problems could be. Nowadays we think that this is incorrect. For many years the cartilage of the mandibular condyle was viewed as having a primary growth potential, but many studies have shown in recent years that the condyle and its cartilage apparently grow in response to other growth rather than serving as a primary growth center. Any traumatism affecting the condyle will alter the normal progression of function and, consequently, progression of harmonic development of face structures²³ resulting in some type of TMJ and mandibular deformity. This may result in stimulating or depressing the activity of this zone with consequent alterations in the

development of the mandible and related structures. An early correct diagnosis and therapeutic treatment is essential to avoid or - at least - to limit consequences on face development. That's why clinical and radiological examination are highly recommended as a routine check in patients affected by dentofacial trauma, no matter how light symptoms are or how uncooperative the patient may be. Radiographic examination can be difficult, but effort should be made to do so, as later serious effects may be manifest. If clinically possible, we recommend obtaining TMJ radiograms or tomograms and - when necessary - MR or TC imaging. After a diagnosis has been made, a correct therapeutic program of the patient is essential complete regeneration of the condyle is not uncommon in young patients thanks to a remodeling process.

With no residual deficiency in function and growth following fractures, if occlusion is restored and normal function continues, the articulating surfaces will regenerate and remodel¹³ and the position of the mandible will be maintained. Changes in shape of the temporomandibular joint have been seen in patients following a condylar fracture of the mandible. A potential for remodeling processes of the TMJ after fracture exists in all individuals and at all ages. In children there is a remarkable remodeling capacity leading to a complete restitution of normal skeletal relations. The extent of remodeling in adults is much smaller, usually only adjusting the head and the fossa to the situation after the fracture. The remodeling activity of the teenagers is like that of children in the early teens and like adults in the late teens.²⁴ A light deviation of the chin towards the affected side is sometimes present indicating incomplete healing. Better regeneration occurs in actively growing patients under the age of twelve. This states that the follow-up of these patients must cover the entire period of growth during mixed dentition stage until permanent occlusion has become stable. Periodical clinical and radiological evaluations are recommended.

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