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Remodelling following condylar fractures in children

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SUMMARY. Purpose: **In this study, 18 children with 21 subcondylar fractures sustained during their growth period (age at trauma from 4–11 years, mean 7.7 years) have been followed-up.** Material and Methods: **All patients were treated by custom-made arch bars and intermaxillary fixation for 12–17 days, then kept on a liquid diet for 15 days without fixation. The mean follow-up was 4.7 years. The conservative treatment has been evaluated with clinical, radiographic, and functional parameters.** Results: **Remodelling of the condylar head was good in 17, whilst moderate remodelling occurred in the other four condyles. In four patients, a slight deflection (less than 2 mm) to the side of the fracture on wide mouth opening was seen. There was no malocclusion or ankylosis.** Conclusion: **Conservative treatment of condylar fractures during growth resulted in good function and good remodelling of the condyle. Functional treatment after intermaxillary fixation for 12–17 days proved to be quite acceptable.** © **2001 European Association for Cranio-Maxillofacial Surgery**

INTRODUCTION

Maxillofacial fractures in children are less common than in adults. However, condylar fractures are the most common site as reported by many authors (*Reil* and *Kranz*, 1976; *Amaratunga* and *De*, 1988; *Güven*, 1992; *Oji*, 1998).

The management of mandibular condylar fractures in children has long been a matter of controversy. Some authors suggest open reduction (*Khosla* and *Boren*, 1971; *James* et al., 1981) or short term intermaxillary fixation. Following displacement and even dislocation with conservative treatment, an 'uprighting' of the condylar process and re-establishment of the temporomandibular joint (TMJ) function was said to have been observed; this is termed as remodelling (*Sahm* and *Witt*, 1989). Functional treatment of condylar fractures with or without short term (1–3 weeks) intermaxillary fixation resulting in good healing and condylar remodelling has been reported previously (*Boyne*, 1969; *Leake* et al., 1971; *Khosla* and *Boren*, 1971; *Schettler* and *Rehrmann*, 1975; *Hotz*, 1978; *Brady* and *Leake*, 1978; *Profitt* et al., 1980; *Gundlach* et al., 1991; *Wiltfang* et al., 1991; *Kellenberger* et al., 1994; *Kahl-Nieke* et al., 1995; *Kellenberger* et al., 1996).

This paper presents the results of conservative treatment of condylar fractures in 18 children.

MATERIAL AND METHODS

Eighteen patients who sustained subcondylar fractures were included in the study. The patients were treated during the period of 1980–1995 and were between 4 and 11 years of age at the time of trauma (mean 7.7 years). There were 11 boys and seven girls; 15 patients had unilateral (83.3%) and three had bilateral fractures (16.7%; Fig.1), so that altogether 21 condylar fractures were followed-up. The fractures were classified according to *Spiessl* and *Schroll* (1972; Fig. 2).

Three of the 18 patients suffered additional fractures of the body of the mandible. Falls were the most common cause (50%), followed by traffic and bicycle accidents (28%); play accidents being the third most common aetiologic factor (22%; Table 1).

All patients were treated by custom made arch bars and intermaxillary fixation for 12–17 days. This was followed by a liquid diet for 15 days without fixation. Each patient then underwent a functional treatment consisting of passive mouth-opening exercises.The follow-up period ranged from 3 to 6 years with a mean of 4.7 years. Clinical follow-up examination included palpation, auscultation of both TMJs, assessment of gape (interincisal distance when opening the mouth) and measurement of the maximal lateral excursions of the mandible. Orthopantomograms and posterior-anterior skull films were available for evaluation of morphologic changes of the condyles. In some patients CT scans were available for radiographic evaluation.

RESULTS

The maximal interincisal distance on mouth opening ranged from 34 to 43 mm with a mean of 38.3 mm. The average lateral movement to the side of fracture and to the contralateral side were 8.4 mm and 7.8 mm respectively. Clicking of the joint was noted in one case. There was a slight deflection (less than 2 mm) to the side of the fracture on wide mouth opening in four patients with unilateral condylar fracture. Malocclusion was not observed in any patient. Figure 3 reveals a low condylar fracture on the right side of a 10-year-old girl, 3 months later beginning of remodelling is evident. After 3 years the condyle

has a totally normal configuration. The face was symmetrical and there was no tilting of occlusal plane 3 years postoperatively.

Post-traumatic radiographic follow-up often revealed a gradual return to the normal position. Figure 4 depicts a fractured left condyle of an 11-year-old girl, and the same condyle 5 years later. Figure 5 illustrates a 7-year-old girl with an intracapsular impressed fracture at the left condyle and the same condyle 4 years postoperatively. Remodelling of condylar head was considered as very good in 17 condyles. In the remaining four condyles, function was very good although there was only partial adjustment of the condylar head (Table 2). The deformity of these condyles was considered to be moderate to severe before treatment.

DISCUSSION

Fractures of the mandible in children occur infrequently when compared with their incidence in the adult population. This can be explained by parental supervision, more resilient bone, and well-padded facial soft tissues plus lower impact forces.

In this study, sex distribution of patients with condylar fractures show a high male predominance. A probable reason was that boys are generally more boisterous than girls and spend more time outdoors (*Al Aboosi* and *Perriman*, 1976; *Güven*, 1992).

Falls were the main causative factor for maxillofacial trauma just as in adults in the same population, in whom falls were the third most often aetiologic factor (*Güven*, 1988).

The anatomy and physiology of the condylar region varies with age. This dictates to a great extent the location and type of fractures in each age group and also the way they need to be treated. Up to the second year of life there are many vascular channels within the condylar head, but they vanish soon afterwards. Active movement of the jaw is particularly important in combating ankylosis in this highly vascularized and osteogenic environment. There is an enormous potential for regeneration and reshaping in the group aged 3–12 years when compared with adults and even adolescents (*Myall*, 1994).

Experimental and clinical studies have shown the great capacity of compensation (*Baume* and *Derichsweiler*, 1961; *Waite*, 1973) and remodelling of the condyle (*Boyne*, 1969; *Brady* and *Leake*, 1978;

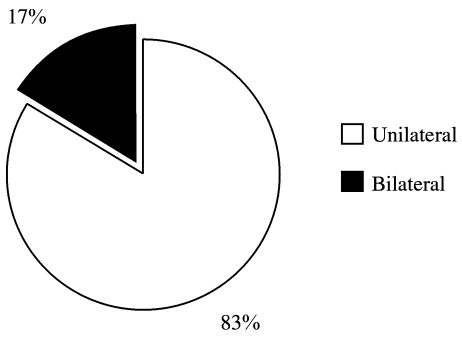

Fig. 1 – Types of fractures.

Table 1 – Aetiology of condylar fractures in children

	Number of cases	%
Fall	9	50
Traffic and bicycle accident	5	28
Play accident	4	22
Total	18	100

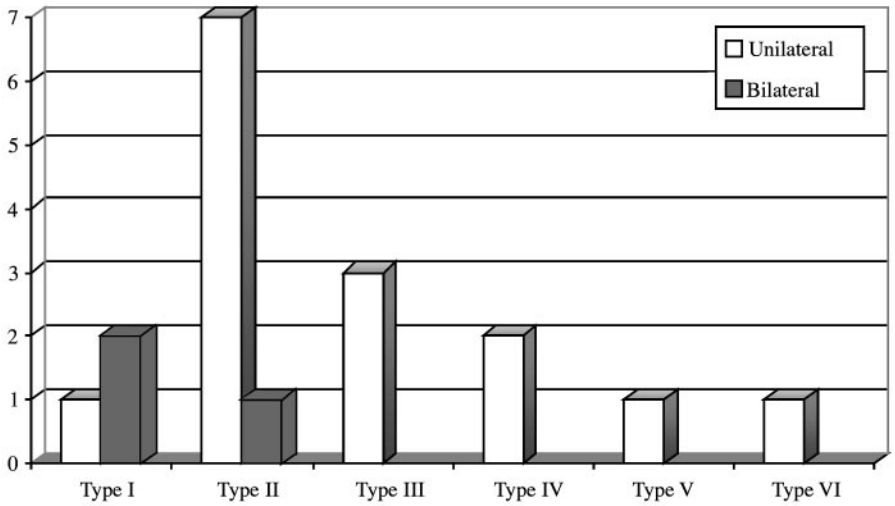

Fig. 2 – Distribution of fractures according to the classification of *Spiessl* and *Schroll* (1972). Type I: fracture of condylar neck with no or only minimal displacement. Type II: low fracture of condylar neck with displacement – mostly there is contact between the fragments. Type III: high fracture of condylar neck with displacement (ventrally, medially, or dorsally) – mostly no contact between fragments. Type IV: low fracture dislocation of condylar neck. Type V: high fracture dislocation of condylar neck. Type VI: (intracapsular) fracture of condylar head.

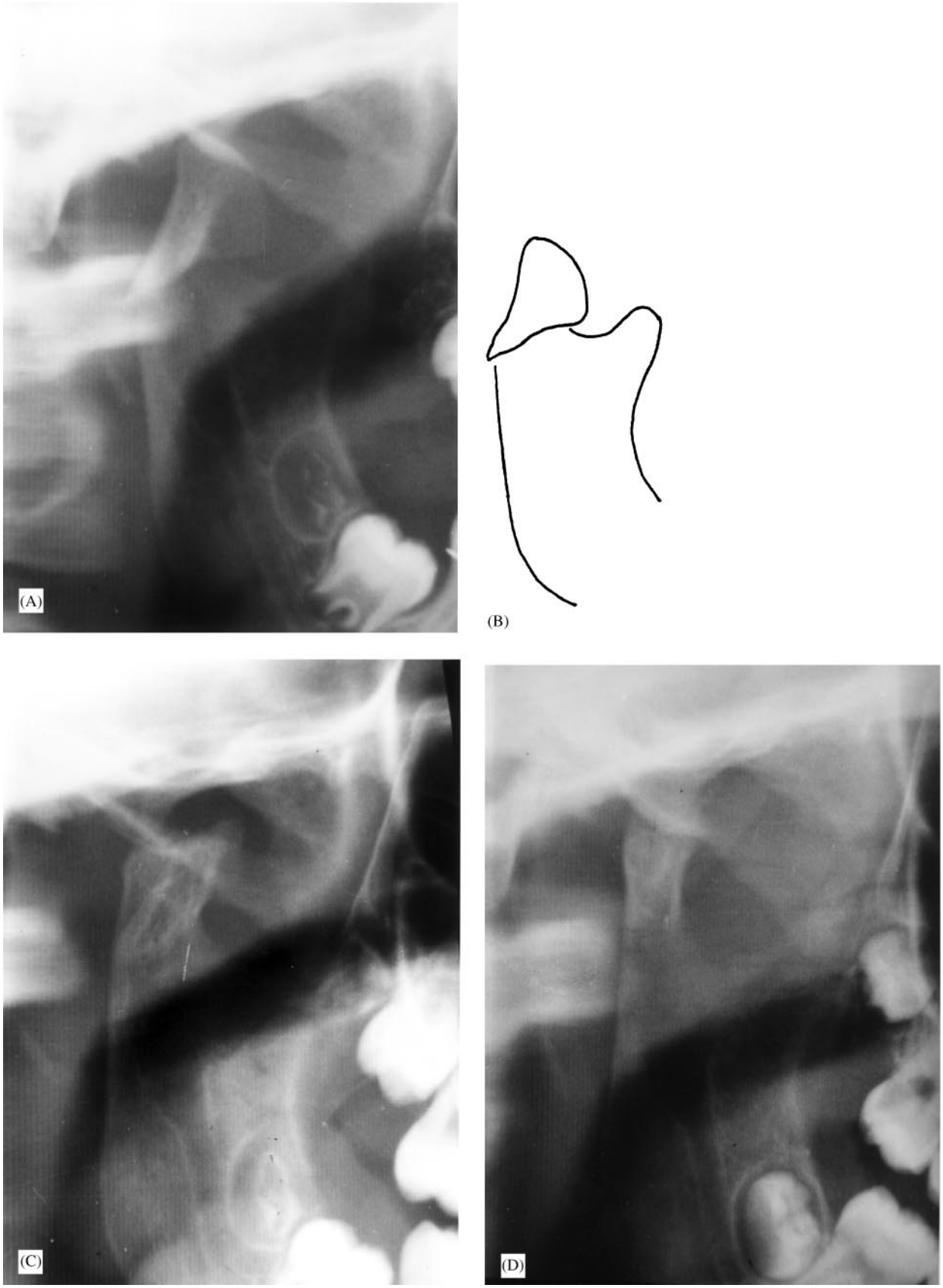

Fig. 3 – (A, B) Low fracture of condylar neck with displacement. (C) Remodelling after 3 months. (D) Remodelling after 3 years. (E) Mouth opening after 3 years. (F) Symmetrical face, no tilting of occlusal plane after 3 years.

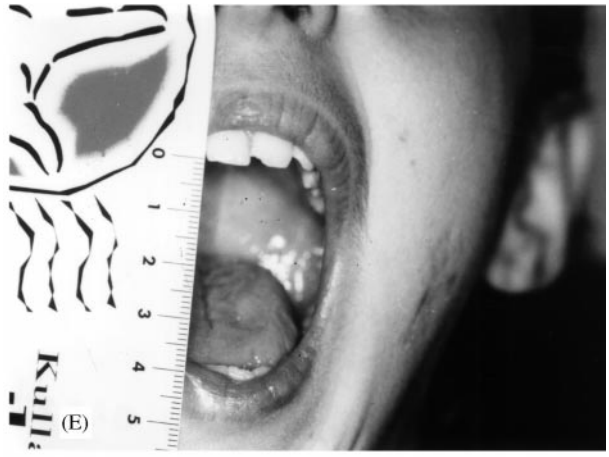

Fig. 3 – (*continued*)

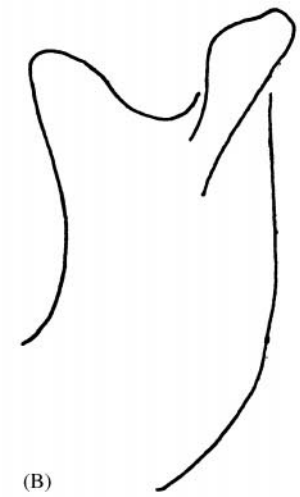

Fig. 4 – (A, B) Low fracture of condylar neck with minimal displacement. (C) Healing after 5 years.

Spence, 1982; *Miller* and *McDonald*, 1986; *Yasuoka* and *Oka*, 1991; *Feifel* et al., 1992; *Kahl-Nieke* et al., 1994; *Luz* and *Chilvarguer*, 1996; *Kellenberger* et al., 1996; *Teixeira* et al., 1998) in growing individuals who experience fractures of the condyle. Conservative or surgical treatment of condylar fractures is still debated among various authors. Condylar process fractures are surgically treated in cases of severe dislocation especially in adults (*Tasanen* and *Lamberg*, 1976; *Petzel*, 1982; *Zide* and *Kent*, 1983). However, most cases are treated conservatively with subsequent favourable outcomes (*Miller* and

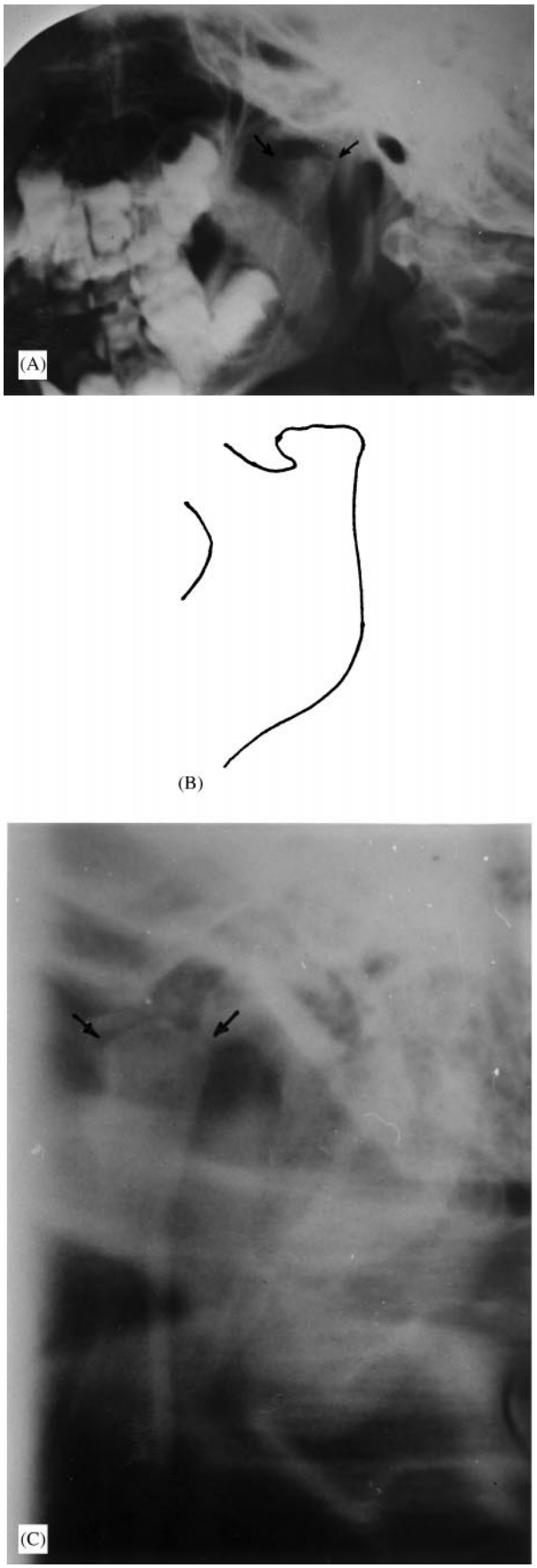

Fig. 5 – (A, B) Intracapsular fracture of condylar head. (C) Remodelling after 4 years.

Table 2 – Healing of condyle after treatment

	Number of condyles	%
Complete remodelling	17	81.0
Short condylar neck	2	9.5
Deformed condylar head	2	9.5
Total	21	100

McDonald, 1986; *Güven*, 1992; *Feifel* et al., 1992; *Kahl-Nieke* et al., 1995; *Kellenberger* et al., 1996). *Myall* (1994) stated that the only indications for surgical intervention and fixation are interference with mandibular movement or gross lateral displacement. There was no interference with mandibular movement in our cases, hence no surgical treatment was necessary. Surgery has some disadvantages including damage to the internal structures of the joint and facial nerve, and scar formation.

TMJ ankylosis is a serious and disabling complication of trauma particularly in childhood. *Raveh* et al. (1989) showed that all cases of ankylosis in their series had dislocated condylar fractures which had been treated non-surgically. They therefore recommended surgical treatment in this type of fracture. This may be different for children. Firstly, in the case of rigid fixation, plates should be removed promptly and, secondly, avoidance of scar tissue in childhood is essential. In contrast to the study of *Raveh* et al. (1989), *Güven* (2000) concluded that the reason for ankylosis in children was probably inadequate or late treatment of TMJ fractures (26.2% of his study patients were below 10 years of age).

The measurement of the maximal interincisal distance is a very good indicator of TMJ function. With reduced maximal interincisal distance, the disability is greater. Difficulty in opening the mouth is accompanied by other TMJ dysfunctions such as limited lateral, anterior and posterior excursions of the mandible and poor mastication (*Avrahami* et al., 1993). The results of our follow-up evaluation showed that maximal mouth opening ranged from 34–43 mm and the average lateral movement was 7.8 mm. These figures are similar to those of some other studies (*Feifel* et al., 1992; *Kellenberger* et al., 1994; *Kahl-Nieke* et al., 1995). *Kahl-Nieke* et al. (1995) stated clinical criteria for follow-up evaluation. On the basis of their criteria, our clinical results are favourable and satisfactory.

In our study, morphological evaluation based on panoramic/tomographic films revealed that remodelling of 17 of the condylar heads was very good. Although there was some incomplete adjustment in the four remaining condyles, the outcome still seemed favourable functionally. In addition, malocclusion and ankylosis were not observed.

CONCLUSION

Treatment of condylar fractures in children needs particular attention. Many techniques have been

proposed such as open reduction with intraosseous fixation, immobilization with intermaxillary fixation, or non-immobilization and early mobility (*Strobl* et al., 1999). In this study it was found that conservative treatment of condylar fractures in growing individuals resulted in good functional results and good remodelling of the condyle. Functional treatment after intermaxillary fixation for 12–17 days is a highly acceptable procedure. There seems to be no indication for surgery except perhaps with interference during mandibular movements and/or severe dislocation of condyles. None of the reported cases were treated by open surgery. We believe that non-surgical treatment avoids external scars and abnormal posttraumatic growth, and provides better results. Surgical management should not be the first choice.

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