

A retrospective study of using removable occlusal splint in the treatment of condylar fracture in children



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ABSTRACT

Background: Although the concept of conservative treatment for paediatric condylar fracture is well understood, there is still a lack of a recognized method for treating child patients with a condylar fracture. The purpose of this study was to investigate the effect of the removable occlusal splint in treating condylar fractures in children and adolescents.

Materials and methods: Forty children and adolescents with condylar fracture, aged 3–16, were included in this study. A removable occlusal splint with varying thickness was fabricated according to the age, developmental stage of the mandible, and degree of condylar dislocation. This was worn for 1–3 months, accompanied by functional exercises. Follow-up was carried out by clinical observation and panoramic X-ray.

Results: Clinically satisfactory results with good occlusion were obtained in all the patients, along with unimpaired function and normal growth and development of the mandible. The panoramic image showed remodelling and reconstruction of the fractured condyles.

Conclusions: Our results confirm that conservative treatment has a satisfactory clinical outcome in treating condylar fracture in children. The removable occlusal splint is a promising approach for treating condylar fracture in children and adolescents.

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1. Introduction

Fracture of the mandibular condyle is reported to be the most common type of fracture of the mandible in children (Iida and Matsuya, 2002). Its frequency ranges from 28% to 62% (Posnick et al., 1993). It is suggested that, if not properly managed, condylar fractures in children may give rise to serious problems (eg. malocclusion, temporomandibular dysfunction, disturbed mandibular growth and ankylosis of the temporomandibular joint [TMJ]) (Dimitroulis, 1997).

For condylar fractures, there are two principal therapeutic approaches: functional and surgical. In adult patients, mandibular function and condylar remodelling was better improved after operative treatment (Sforza et al., 2011; Eckelt et al., 2006). However, it is widely accepted that conservative or functional treatment is the first choice in the management of condylar fractures in children (Dahlstrom et al., 1989; Crean et al., 2000). This is

because condylar regeneration and remodelling with adaptive changes will lead to functional restitution of the TMJ. Also, surgeons are concerned that surgery will cause a growth disturbance either from the surgical manipulation of the fracture segments or from the placement of rigid hardware across the condylar process (Zide, 1989).

The recommended non-surgical treatment is the re-establishment of normal occlusion, with a short course of maxillomandibular (MMF) fixation, followed by physiotherapy (Norholt et al., 1993). Some surgeons have found no benefit in using MMF because of its many disadvantages: deterioration in oral hygiene secondary to MMF leading to tooth decay, injury to the dentition by fixation methods, malnutrition, and weight loss. It is also reported that longer periods of MMF can lead to bony ankylosis or fibrosis and severely limited mouth opening (de Amaratunga, 1987). For children, the treatment of condylar fractures with MMF is complicated by poor patient compliance, difficulty in applying MMF, and, in the case of mixed dentition, lack of sufficient support. Therefore, until now there has been a lack of an agreed protocol for conservative, functional methods. The purpose of the present study was to evaluate the clinical and radiographic effect of functional treatment in children and adolescents with condylar fracture.

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2. Material and methods

From Sept 2004 to Oct 2010, 48 children with mandibular condylar fracture aged between 3 and 16 were treated conservatively at the Department of Paediatric Dentistry, Peking University School and Hospital of Stomatology. Of these patients, 40 (83.3%) were followed up for more than 1 year and included in this retrospective study. Before treatment, the children were assessed by clinical and radiographic examination. Facial asymmetry, occlusal relationships, reduction in mouth opening, and shift of the chin during mouth opening were recorded. Definitive diagnosis of condylar fracture was based on radiological investigation, including panoramic radiograph or computed tomography. Fracture location, displacement of the fragments, and associated mandibular fractures were identified. Fractures were classified as unilateral or bilateral and according to the Spiessl and Schroll classification (Spiessl and Schroll, 1972): (1) undisplaced fracture, (2) low-neck fracture with displacement, (3) high-neck fracture with displacement, (4) low-neck fracture with dislocation, (5) high-neck fracture with dislocation, and (6) head fracture.

Patients were treated non-surgically. Under parental supervision, the children were instructed to have a soft diet and wear the removable semihard occlusal splint (Fig. 1) for 1–3 months, 24 h per day until restoration of the occlusion relationship. The thickness of the splint and the duration of wear were determined according to the age, the developmental stage of the dentition, the level of the fracture and the degree of dislocation. Mouth-opening exercises began on the third week after injury and included vertical opening, contralateral excursions, and protrusive movements in front of a mirror. Exercises continued for more than 6 months. Patients were recalled at 1, 3, and 6 months after treatment, and then once a year. Physical complaints, facial asymmetry, anteroposterior position of the mandible, joint pain on palpation, maximal mouth opening, deviation from the midline during opening, protrusive and lateral movement and occlusion were recorded. Panoramic radiographs were taken to evaluate the remodelling and development of the condyle after 6 months.

The criteria of clinical success were as follows: satisfactory occlusion, maximal interincisal distance was more than 35 mm; deviation from the midline during mouth opening was less than 3 mm; no sign of ankylosis; no functional and growth disturbance; radiographs showed no condylar deformity.

3. Results

Among the 40 children reviewed in this study, 10 were under 6 years and in the primary dentition, 20 were aged 6–11 and in the mixed dentition, and 10 were from 12 to 16 and in the permanent dentition. There were 17 boys and 23 girls. Twenty-seven patients sustained unilateral fractures of the mandibular condyle, and 13 had bilateral fractures (Table 1). The distribution of fracture

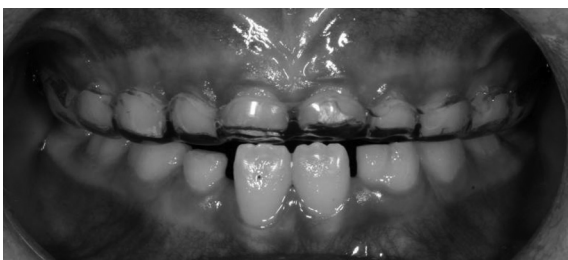


Fig. 1. Removable occlusal splint fabricated and worn by child patient with condylar fracture.

according to the Spiessl and Schroll classification showed Type 5 (42.5%) to be the predominant followed by Type 3 (22.5%), Type 6 (20%) and 4 (10%). Only 2 (5%) patients were diagnosed as Type 2 fractures, and no Type 1 fracture was observed (Table 2). Associated mandibular fractures in the anterior region were found in 6 patients.

Most patients received treatment within 3–7 days after injury, except one 8-year girl with a unilateral condylar neck fracture who came to our hospital after one and a half months due to craniocerebral injury. The removable occlusal splint was well accepted by the children. They all reported symptomatic relief after wearing the splint. The longest follow-up period was 4 years and the shortest period was 14 months after removable occlusal splint treatment. Complete clinical and functional recovery was observed in all patients, and there were no sex differences in clinical outcomes. There were no complaints of pain or subjective restriction of mouth opening. One 5-year-old boy with bilateral condylar neck fracture recorded TMJ clicking at 3 months' follow-up.

Clinical examination showed no instance of ankylosis, malocclusion, functional disturbance, or facial asymmetry after the respective follow-up periods. No patients who had a bilateral condylar fracture developed anterior open bite. There was no tilting of the occlusal plane in patients with a unilateral fracture. Maximal mouth opening was more than 35 mm in all children at 3 months' follow-up. No lateral deviation was observed at maximum mouth opening in patients with bilateral condylar fracture, while patients with unilateral condylar fracture showed some degree of lateral deviation during mouth opening. After 1 year, deviation to the affected side during mouth opening was less than 3 mm in all but two patients with unilateral condylar neck fracture (Table 3). Of these two patients, one was the 8-year-old girl (8 mm) accompanying with craniocerebral injury who received treatment one and

Table 1

Age and gender distribution of 40 child patients with condylar fracture.

Fracture pattern	3–5-year old		6–11-year old		12–16-year old		Total
	Male	Female	Male	Female	Male	Female	
Bilateral	2	1	1	5	1	3	13
Unilateral	3	4	6	8	4	2	27
Total	5	5	7	13	5	5	40

Table 2

Distribution of fracture types in 40 child patients.

Fracture type	3–5-year old	6–11-year old	12–16-year old	Total
Type 1	–	–	–	0
Type 2	1	1	–	2
Type 3	2	3	4	9
Type 4	1	3	–	4
Type 5	5	9	3	17
Type 6	1	4	3	8
Total	10	20	10	40

Table 3

Clinical analysis of TMJ function at follow-up.

Clinical findings	Unilateral fracture (N = 27)	Bilateral fracture (N = 13)
Maximal opening >35 mm	27	13
Lateral deviation during max. opening >3 mm	2 (7%)	0
Articular noise	0	1 (8%)
Articular pain	0	0
Malocclusion	0	0
Facial asymmetry	0	0

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