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Treatment of Pediatric Condylar Fractures: A 20-Year Experience

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Abstract

Background—The purpose of this study was to define patterns of injury and treatment for condylar and subcondylar fractures and evaluate short-term outcomes in the pediatric population.

Methods—A retrospective chart review was performed on pediatric patients with mandibular condylar fractures who presented between 1990 and 2010. Computed tomographic imaging was reviewed for all patients to assess fracture characteristics. Mandibular fractures were codified using the Strasbourg Osteosynthesis Research Group and Lindahl classification methods.

Results—Sixty-four patients with 92 condylar fractures were identified. Of these patients, 29 had isolated condylar fracture and 35 had a condylar fracture associated with an additional mandibular arch fracture. The most common fracture patterns were diacapitular fracture in the Strasbourg Osteosynthesis Research Group system ($n = 46$) and vertical condylar head fracture in the Lindahl system ($n = 14$). Condylar fracture with additional mandibular arch fractures were treated with maxillomandibular fixation more often than patients with condylar fracture [$n = 40$ (74.1 percent) versus $n = 14$ (25.9 percent); $p = 0.004$]. No condylar fracture was treated in an open fashion. Forty-three patients returned for follow-up. The median follow-up period was 81 days (interquartile range, 35 to 294 days). Ten patients had complications (23.3 percent). The most common complication was malocclusion ($n = 5$). Nine of 10 patients with complications had condylar fracture with an additional mandibular arch fracture.

Conclusions—Closed treatment of condylar fractures yields satisfactory results in pediatric patients. Pediatric patients with condylar fractures combined with additional arch fractures experience a higher rate of unfavorable outcomes.

Facial fractures in children are rare, constituting only 1 to 15 percent of all facial injuries, a lower incidence compared with adults. Among pediatric facial fractures, fractures of the mandible are the most common, accounting for 20 to 50 percent of these facial fractures.¹

The condyle is the most commonly injured area within the pediatric mandible and is considered a primary growth center of the jaw in children. Direct trauma to the mandible can result in proximal transmission of force, leading to injury of the condylar process. This is in

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contrast to injuries in other areas of the mandible, which are often a result of direct trauma.² Injuries involving the temporomandibular joint can result in growth disturbance, facial asymmetry, malocclusion, limited mouth opening, and bony ankylosis.³ These potential complications make identification, appropriate treatment, and long-term follow-up of condylar fractures in the developing mandible essential.

As the pediatric condyle is a major mandibular growth center, specific fracture location is important, and several classification schemes have been proposed for condylar fractures. Lindahl developed a classification system based on prospective observation of 123 patients.⁴ Fractures were classified according to location, displacement, and dislocation relative to the temporomandibular joint. In 2005, Loukota et al. reported a simple, three-level classification scheme adopted by the Strasbourg Osteosynthesis Research Group.⁵

These classification systems provide for accurate description of fracture characteristics and rapid communication of injury details between practitioners. The Strasbourg Osteosynthesis Research Group and Lindahl classification schemes have been validated primarily in the setting of the adult patient.⁶ The utility of these systems has not been examined in the pediatric patient. The purpose of this retrospective study was to describe the distribution, patterns, and treatment of condylar and subcondylar fractures in the pediatric population and to evaluate short-term outcomes.

PATIENTS AND METHODS

Study Design

Institutional review board approval was obtained and a retrospective cohort study was conducted. Patients aged 18 years or younger who presented to our institution between 1990 and 2010 with mandibular fracture were identified. Patients without computed tomographic images or panoramic radiographs and patients who died as a result of their injuries were excluded. Our cohort was divided into two groups, patients aged 7 years or younger and patients older than 7 years. This corresponds to the period of primary dentition and the period of mixed dentition.⁷

Variables

Clinical data were reviewed to determine patient admission history and physical examinations, details of fracture treatment, operative procedure notation, follow-up, and complication details. Baseline characteristics gathered include age at admission, sex, mechanism of injury, Injury Severity Score, admission Glasgow Coma Scale score, and length of hospital stay. The primary predictor variable was the condylar fracture pattern as determined by the Strasbourg Osteosynthesis Research Group or Lindahl classification system. The primary outcome variable was complications as assessed during the follow-up period. Treatment of condylar fractures were classified as either conservative, maxillomandibular fixation, or open reduction and internal fixation. Conservative treatment entailed clinical observation, restriction to a soft diet, and mandibular physical therapy consisting of opening exercises. Conversely, maxillomandibular fixation treatment entailed fixation with circummandibular wires, acrylic splints, or application of arch bars to the

maxilla and mandible along with ivy loops. Open reduction and internal fixation involves open reduction of the fracture site and fixation with titanium plates.

Fracture Classification Using the Strasbourg Osteosynthesis Research Group and Lindahl Systems

The authors reviewed maxillofacial computed tomographic images and panoramic radiographs for all patients to confirm fracture characteristics. Condylar and subcondylar fractures were classified using the Strasbourg Osteosynthesis Research Group and Lindahl methods.^{4,5} Figure 1 illustrates and defines the Strasbourg Osteosynthesis Research Group and Lindahl classification systems. In both the Strasbourg Osteosynthesis Research Group and Lindahl classifications, it is possible for a condylar fracture to have involvement of multiple fracture sites within the condylar region. We have classified these fractures as “combination fractures.”

Statistical Analysis

Differences in categorical variables were determined using a chi-square or Fisher’s exact test. Continuous variables were analyzed using a two-tailed *t* test. Statistical analysis was performed using STATA/MP software, version 12 (StataCorp, College Station, Texas). A two-tailed value of $p = 0.05$ was considered significant.

RESULTS

Patient Demographics

From 1990 through 2010, 95 patients younger than 18 years treated for condylar fracture were identified. Thirty-one patients were excluded from our study because of inadequate craniofacial imaging. Sixty-four patients were included in our study with 92 mandibular condylar fractures by the Strasbourg Osteosynthesis Research Group classification and 104 condylar fractures by the Lindahl classification system. The distribution of fracture types seen in the Strasbourg Osteosynthesis Research Group classification was 46 (50 percent) diacapitular, 34 (37 percent) condylar neck, and 12 (13 percent) condylar base. In the Lindahl system, eight (7.7 percent) horizontal, 42 (40.4 percent) vertical, and 10 (9.6 percent) compression fractures of the condylar head, 32 (30.8 percent) condylar neck fractures, and 12 (11.5 percent) subcondylar fractures were seen.

Patient age at the time of injury ranged from 1.7 months to 14 years, with an average age of 8.2 years. No condylar fractures were identified in the 14- to 18-year-old demographic. Motor vehicle collision was the most common mode of injury, accounting for 59.4 percent ($n = 38$) of all fractures followed by falls [$n = 12$ (18.8 percent)] and injury by animal [$n = 6$ (9.4 percent)]. Most patients were white [$n = 45$ (70 percent)] or African American [$n = 16$ (25 percent)]. Male patients accounted for 64 percent ($n = 41$) of all injuries. Median Injury Severity Score was 6 (interquartile range, 4 to 14; range, 1 to 36) and median Glasgow Coma Scale score at presentation was 15 (interquartile range, 15 to 15; range, 3 to 15).

Fourteen patients had a total of 36 associated facial and neurologic injuries. Orbital blowout fractures ($n = 8$), nasoorbitoethmoid fractures ($n = 6$), and intracranial hemorrhage ($n = 4$)

were the most commonly seen injuries. Other injuries included the following fractures: temporal bone ($n = 3$), zygomaticomaxillary complex ($n = 3$), Le Fort III ($n = 3$), cranial bones ($n = 2$), Le Fort I ($n = 2$), nasal bone ($n = 1$), frontal sinus ($n = 1$), cervical spine ($n = 1$), and Le Fort II ($n = 1$). There was one patient that suffered facial nerve avulsion resulting in hemifacial paralysis.

Mean length of stay for all patients was 4.6 days. Patients that were treated conservatively had a shorter length of stay than patients treated with maxillomandibular fixation (3.4 days and 5.5 days, respectively; $p = 0.08$).

Fifteen patients (23.4 percent) presented with bilateral condylar fractures. Thirty-five patients (54.7 percent) had condylar fractures in association with other mandible fractures. Twenty-nine patients (45.3 percent) had isolated condylar fractures.

Isolated Condylar Fracture Patterns by Age

Figures 2 and 3 demonstrate the distribution of isolated condylar fractures according to Strasbourg Osteosynthesis Research Group and Lindahl classifications, respectively, by the age of the patient at the time of injury, excluding combination fractures. In both of our age groups, the most commonly seen fracture patterns by Strasbourg Osteosynthesis Research Group and Lindahl classification were diacapitular and vertical fractures of the condylar head, respectively [0- to 7-year-old group, $n = 20$ (58.8 percent) diacapitular and $n = 4$ [40 percent] vertical fracture of the condylar head; 8- to 14-year-old group, $n = 26$ (44.8 percent) diacapitular and $n = 10$ (38.5 percent) vertical fracture of the condylar head].

Combination Fractures of the Condyle

Details of the combined fractures are presented in Tables 1 and 2. Thirteen Strasbourg Osteosynthesis Research Group combination fractures and 19 Lindahl combination fractures were seen. The most commonly seen Strasbourg Osteosynthesis Research Group combination was concomitant diacapitular and condylar neck fracture [$n = 10$ (76.9 percent)]. Lindahl combinations of vertical condylar head and condylar neck fractures [$n = 4$ (21.1 percent)] and vertical and compression fractures of the condylar head [$n = 4$ (21.1 percent)] were seen most commonly.

Treatment of Isolated Condylar Fractures

In our clinical experience, pediatric condylar fractures have been managed exclusively with closed treatment. We define closed treatment as treatment that does not involve open surgical exposure of the fracture.⁸ Table 3 details the treatment of condylar fractures by Strasbourg Osteosynthesis Research Group category, Lindahl category, and patient age at the time of injury. Strasbourg Osteosynthesis Research Group fractures of the condylar neck and base were more often managed with a short course of maxillomandibular fixation as opposed to conservative therapy. Nine condylar neck fractures (81.8 percent) were managed with maxillomandibular fixation and two (18.2 percent) were managed conservatively. Eight condylar base fractures (88.9 percent) were managed with maxillomandibular fixation, and only one (11.1 percent) was managed with conservative treatment ($p = 0.019$). Diacapitular fractures were equally likely to be managed with conservative therapy or maxillomandibular

fixation. In the Lindahl classification system, subcondylar fractures, fractures of the condylar neck, and vertical fractures of the condylar head were more often managed with maxillomandibular fixation (88.9, 81.8, and 57.1 percent, respectively) compared with conservative therapy (11.1, 18.2, and 42.9 percent, respectively).

Fractures in all age groups were more often treated with maxillomandibular fixation compared with conservative therapy; however, this difference was not statistically significant ($p = 0.55$). In patients aged 7 years and younger, fractures were almost equally likely to have been managed with conservative therapy or maxillomandibular fixation (42.9 and 57.1 percent, respectively). Fractures in children older than 7 years were more likely to have been managed with maxillomandibular fixation rather than conservative treatment (66.7 and 33.3 percent, respectively). No condylar fracture was managed with open reduction and internal fixation.

Condylar Fractures in Association with Additional Mandible Fractures

Table 4 details condylar fracture pattern distribution according to Strasbourg Osteosynthesis Research Group and Lindahl categories by the presence or absence of additional fractures in the mandibular arch. There were 29 patients with only condylar fracture and 35 patients who had a condylar fracture associated with at least one arch (ramus, angle, body, parasymphysis, and or symphysis) fracture. By Strasbourg Osteosynthesis Research Group and Lindahl categories, fractures of the condylar neck were more prevalent among patients with condylar fractures associated with arch fractures compared with isolated condylar fractures. There were nine condylar neck fractures (25.7 percent) in the condylar fracture group compared with 25 (43.9 percent) in the condylar fracture associated with arch fracture group. In addition, Strasbourg Osteosynthesis Research Group diacapitular fractures were more prevalent in the condylar fracture group compared with condylar fracture with an additional mandibular arch fracture [$n = 23$ (65.7 percent) versus $n = 23$ (40.4 percent), respectively]. The differences in condylar fracture pattern by presence or absence of additional mandibular arch fractures were not statistically significant. Treatment of the condylar fracture differed significantly based on the presence of a mandibular arch fracture ($p = 0.004$). Condyles in the condylar fracture with an additional mandibular arch fracture group were managed with maxillomandibular fixation 70.2 percent of the time ($n = 40$) compared with only 40 percent ($n = 14$) of condyles in the condylar fracture group. Average age at the time of injury was 10 years in the condylar fracture group and 7.1 in the condylar fracture with an additional mandibular arch fracture group ($p = 0.0009$).

Table 5 details the treatment of patients in the condylar fracture with an additional mandibular arch fracture group ($n = 35$). Within the condylar fracture with an additional mandibular arch fracture group, management with conservative treatment, maxillomandibular fixation, or open reduction and internal fixation did not differ significantly by condylar fracture pattern.

Follow-Up and Complications

Follow-up, defined as at least one clinic visit after the initial patient presentation to the emergency department, was obtained in 43 of 64 patients (67 percent). Median follow-up

was 81 days (interquartile range, 35 to 294 days; range, 6 to 5388 days). In our follow-up cohort, complications were seen in 10 patients (23.3 percent). Patients who suffered complications and the details of their complication and associated noncondylar fractures of the mandible are presented in Table 6. The most common complication was malocclusion, seen in five patients (50 percent of all complications), followed by facial asymmetry, seen in two patients (20 percent of all complications). Nine of 10 complications had at least one concomitant fracture in the mandibular arch, and six of these patients were managed with open reduction and internal fixation of the associated arch fracture.

DISCUSSION

During the first 5 years of life, the developing cranium will reach 85 percent of its adult size.³ The mandible reaches adult size between 14 and 16 years in girls and between 18 and 20 years in boys. This leaves the mandible comparatively undersized and protected by the larger cranium in early childhood. It has been hypothesized that as the mandible assumes a more adult-like size and geometry, the typical fracture patterns become similar to those of adults.⁹ Differences in mechanism, fracture pattern, and capacity for remodeling when compared with the adult population obligate clinicians to pay special attention to the identification and management of condylar fractures in children.

Our findings agree with previous work showing the increased incidence of diacapitular fractures in younger children.¹⁰ In our sample, 58.8 percent of condylar fractures in children aged 7 years and younger were diacapitular or through the condylar head, whereas fractures of the condylar neck and base accounted for only 29.4 percent and 11.8 percent of fractures. Children older than 7 years had an increased prevalence of fractures of the condylar neck and decreased prevalence of diacapitular fractures (41.4 percent and 44.8 percent, respectively) compared with patients aged 7 years and younger. As the mandible grows, the condylar neck elongates and becomes thinner, which may account for the increased prevalence of condylar neck fractures in this age group. In children older than 7 years, most fractures were extracapsular and located in the condylar neck and condylar base. Condylar neck and base fractures accounted for 55 percent of fractures in the group of patients older than 7 years. This is in agreement with reports from other groups reporting that the majority of condylar fractures in older and teenaged children occur in the neck and base.^{10–12}

Treatment of pediatric condylar fractures has been a controversial topic. Three main treatment modalities have been described in the literature: mandibular physical therapy consisting of ranging exercises without maxillomandibular fixation, a short period of maxillomandibular fixation followed by mandibular physical therapy, and open reduction and internal fixation of the condylar fracture.¹³ The first two can collectively be called “closed treatment” and the last is “open treatment.” Closed treatment is favored by many authors in the literature.^{14–16} Their inclination toward closed treatment can be summarized with the following: (1) nonsurgical treatment yields satisfactory results in the majority of cases because of the remodeling capabilities of the pediatric mandible; (2) there is a paucity of long-term follow-up information on patients who have been treated surgically; and (3) surgery of the condyle can be challenging because of its anatomical location.¹³ Thorén et al. examined 18 patients over a median follow-up period of 8.6 years who had undergone

closed reduction for dislocated condylar fractures.¹⁵ Radiographically, they determined that 76.5 percent of patients had incomplete remodeling of the temporomandibular joint and 64.7 percent had mandibular asymmetry. However, it was noted that most of these symptoms were mild and had resulted in a satisfactory clinical outcome.

Open reduction and internal fixation of the pediatric condyle has shown inconsistent results. In a study of six children treated with open reduction and internal fixation for dislocated condylar fracture, four had objective and subjective signs of temporomandibular joint dysfunction.¹⁴ Recently, Schiel and colleagues demonstrated a transoral, endoscopic approach for open reduction and internal fixation of condylar neck and base fractures in children. At a median follow-up of 24.5 months, all patients displayed normal occlusion and pain-free unrestricted function of the temporomandibular joint.¹⁷

Satisfactory clinical results obtained by closed treatment in our patient population and the possible adverse effects of open reduction and internal fixation (including but not limited to facial nerve injury, scarring, and impediment of normal growth and development), along with the capacity for remodeling of the temporomandibular joint in children, lead us to advocate for closed treatment of condylar fractures whenever possible. In our patients, all fractures were managed with closed treatment. Fractures of the condylar neck and base were more often treated with maxillomandibular fixation instead of conservative therapy. Indications for open treatment include displacement of the condyle into the middle cranial fossa and medial dislocation of the condylar head such that it interferes with jaw movement. Relative indications for open reduction and internal fixation may include an inability to tolerate maxillomandibular fixation, severe upper airway obstruction, and facilitating oral and airway hygiene in the severely injured or disabled patient.¹⁶

Complications in our cohort were limited. Ten of 43 patients with adequate follow-up data experienced a complication. Overall, our follow-up cohort had a satisfactory clinical course, with 77 percent having a favorable outcome. The most common complication was malocclusion, which was seen in five patients. Nine of 10 patients with a complication had an associated fracture of the mandibular arch. In a cohort of pediatric patients treated with nonsurgical therapy, Lekven et al. found that all patients with an unfavorable outcome had a unilateral condylar fracture.¹¹ They speculated that bilateral fractures might have been treated more extensively, which protected against an unfavorable outcome. However, Levken et al. made no mention of the presence or absence of associated mandibular arch fractures with those injuries. Based on our findings, we hypothesize the presence of a concomitant mandibular arch fracture to be a risk factor for adverse outcome. Concomitant mandibular arch fracture may indicate a more severe injury and be a barrier to early mobilization of the condyle to promote restitutional remodeling. Among the nine patients with an unfavorable outcome and concomitant mandibular arch fracture, six had open reduction and internal fixation of the arch fracture. Open reduction and internal fixation of the arch fracture may be indicated to promote early mobilization of the condyle. Clinicians should be aware of the risk of unfavorable outcomes in condylar fractures with the presence of concomitant mandibular arch fracture.

Finally, we found the Lindahl classification to give more anatomically precise descriptions of fracture characteristics; however, it was burdensome to use in analysis because of its complicated and multifactorial nature. The Strasbourg Osteosynthesis Research Group classification was simpler and provided meaningful anatomical and functional information about the fracture characteristics and correlated well with the changing age of the patients. Changes in fracture nature with increasing patient age were more clearly visible with the Strasbourg Osteosynthesis Research Group classification compared with the Lindahl classification. The Strasbourg Osteosynthesis Research Group classification offers a simple tool for quickly defining condylar fractures in children and gaining an understanding of their severity.

We acknowledge some limitations that should be considered when interpreting our results. This was a retrospective study using data from the experience at a large, Level I pediatric trauma center. Therefore, referral patterns result in a patient population with more severe injuries than those that might be encountered at other centers. As with many trauma studies, follow-up data were incomplete and the interval was relatively short, thereby limiting conclusions about long-term complications. Despite these limitations, we believe that our study can serve as a descriptive measure of prevalent condylar fracture patterns among children of varying ages. In addition, all fractures were confirmed by author review of the craniofacial imaging studies and codified by established categorization systems to ensure accurate reporting. To our knowledge, this is the first study using the Strasbourg Osteosynthesis Research Group classification system in a pediatric population.

CONCLUSIONS

We observed in pediatric condylar fractures that fracture pattern changes with increasing age of the child. In addition, closed treatment of pediatric condylar fracture yields generally good results and adequate condylar remodeling with few major complications. Clinicians can anticipate seeing a higher rate of unfavorable outcomes in patients with concomitant fractures of the mandibular arch. Because of the increased risk of joint dysfunction and aberrations in mandibular growth, nonsurgical management should be considered the first-line treatment for pediatric condylar fractures.

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CODING PERSPECTIVE

This coding perspective provided by Dr. Raymund Janevicius is intended to provide coding guidance.

21450	Closed treatment of mandibular fracture; without manipulation
21453	Closed treatment of mandibular fracture with interdental fixation
21465	Open treatment of mandibular condylar fracture

- “Conservative treatment” of the condylar fractures described in the article is reported with code 21450.
- If maxillomandibular fixation (termed “interdental fixation” in the CPT book) is performed, code 21453 is reported.
- Open reduction of a mandibular condylar fracture is described with code 21465.
- A bilateral open reduction of a mandibular condylar fracture is reported:

21465	Open treatment of mandibular condylar fracture, right
21465-59	Open treatment of mandibular condylar fracture, left

- Even though this is a bilateral procedure clinically, the bilateral modifier 50 is not used, as code 21465 is not considered a “bilateral” code by CMS, nor by most other payers.

Fig. 1.

Description of the Strasbourg Osteosynthesis Research Group and Lindahl classification systems. (*Above, left*) Lindahl classification: (*first row*) fracture level is classified as condylar head (CH), condylar neck (CN), or subcondylar (SC). Condylar head fractures can be vertical (V), horizontal (H), or compression (C). *Second row*, fracture dislocation can be defined as angulation with lateral or medial override, angulation with no override, or fissure (no angulation). *Third row*, position of the condylar head relative to the articular fossa can be no displacement (0); slight displacement (1); moderate displacement (2); or dislocation (3). (*Above, right and below*) Strasbourg Osteosynthesis Research Group classification. (*Above, right*) Diacapitular fractures are those in which the fracture line starts in the articular surface of the temporomandibular joint and may extend outside the capsule.

(*Below, left*) Fractures of the condylar neck are those in which more than half of the fracture line is superior to a theoretical line perpendicular to the ramus and tangent to the inferior portion of the sigmoid notch (*line A*). (*Below, right*) Fractures of the condylar base are those in which more than half of the fracture line is inferior to *line A*. (Adapted from Lindahl L. Condylar fractures of the mandible: I. Classification and relation to age, occlusion, and concomitant injuries of teeth and teeth-supporting structures, and, fractures of the mandibular body. *Int J Oral Surg.* 1977;6:12–21; and Loukota RA, Eckelt U, De Bont L, Rasse M. Subclassification of fractures of the condylar process of the mandible. *Br J Oral Maxillofac Surg.* 2005;43:72–73, with permission from Elsevier.)

Fig. 2.
Types and distribution of isolated condylar fractures by Strasbourg Osteosynthesis Research Group classification and patient age at the time of injury.

Fig. 3.

Types and distribution of isolated condylar fractures by Lindahl classification and patient age at the time of injury.

Table 1

Combinations of Strasbourg Osteosynthesis Research Group Fractures and Their Frequency Seen among All Patients

SORG Combinations	Frequency (%)
Diacapitular and condylar neck	10 (76.9)
Diacapitular and condylar base	1 (7.7)
Condylar neck and condylar base	1 (7.7)
Diacapitular, condylar neck, and condylar base	1 (7.7)
Total	13

SORG, Strasbourg Osteosynthesis Research Group.

Table 2

Combinations of Lindahl Fractures and Their Frequency Seen among All Patients

Lindahl Combinations	Frequency (%)
Compression and neck	1 (5.3)
Horizontal, vertical	3 (15.8)
Horizontal, vertical, and neck	1 (5.3)
Horizontal, vertical, compression	2 (10.5)
Subcondylar and neck	1 (5.3)
Vertical and compression	4 (21.1)
Vertical and neck	4 (21.1)
Vertical, compression, neck	2 (10.5)
Vertical, neck, and subcondylar	1 (5.3)
Total	19

Table 3

Treatment of Isolated Condylar Fractures

	Treatment			
Variable	Conservative (%)	MMF (%)	Total (%)	<i>p</i>
SORG category				
Diacapitular	12 (57.1)	9 (42.9)	21	0.019*
Condylar neck	2 (18.2)	9 (81.8)	11	
Condylar base	1 (11.1)	8 (88.9)	9	
Total	15	26	41	
Lindahl category				
Condylar head				
Horizontal	1 (100)	0	1	0.094
Vertical	6 (42.9)	8 (57.1)	14	
Compression	1 (100)	0	1	
Extracapsular				
Condylar neck	2 (18.2)	9 (81.8)	11	0.094
Subcondylar	1 (11.1)	8 (88.9)	9	
Total	11	25	36	
Age at the time of injury				
0–7 years	6 (42.9)	8 (57.1)	14	0.548
8–14 years	9 (33.3)	18 (66.7)	27	
Total	15	26	41	

MMF, maxillomandibular fixation; SORG, Strasbourg Osteosynthesis Research Group.

* $p < 0.05$.

Table 4

Comparison of Condylar Fracture Patterns Seen in the Presence or Absence of Other Mandibular Fractures *

	Condylar Fracture (%)	Condylar Fracture Associated with Arch Fracture (%)	<i>p</i>
SORG category			
Diacapitular	23 (65.7)	23 (40.4)	0.061
Condylar neck	9 (25.7)	25 (43.9)	
Condylar base	3 (25.7)	9 (15.8)	
Total fractures	35	57	
Lindahl category			
Condylar head			
Horizontal	4 (9.5)	4 (6.5)	0.19
Vertical	20 (47.6)	22 (35.5)	
Compression	6 (14.3)	4 (6.5)	
Extracapsular			
Condylar neck	9 (21.4)	23 (37.1)	0.004 [†]
Subcondylar	3 (7.1)	9 (14.5)	
Total fractures	42	62	
Treatment of condylar fracture			
Conservative	21 (60)	17 (29.8)	0.0009 [†]
MMF	14 (40)	40 (70.2)	
Total fractures	35	57	
Age at the time of injury			
Average	10	7.1	0.011 [†]
0–7 years	6 (20.7)	18 (51.4)	
8–14 years	23 (79.3)	17 (48.6)	
Total no. of patients	29	35	

SORG, Strasbourg Osteosynthesis Research Group; MMF, maxillomandibular fixation.

* Twenty-nine patients had only condylar fractures and 35 had condylar fractures associated with other mandible fractures.

[†] $p < 0.05$.

Table 5

Treatment of Condylar Fractures in Association with Other Mandible Fractures

	Treatment			
Variable	Conservative (%)	MMF (%)	ORIF of Arch Fracture (%)	<i>p</i>
SORG category				
Diacapitular	3 (33.33)	8 (53.33)	12 (36.36)	0.35
Condylar neck	6 (66.67)	5 (33.33)	14 (42.42)	
Condylar base	0	2 (13.33)	7 (21.21)	
Total fractures	9	15	33	
Lindahl category				
Condylar head				
Horizontal	0	2 (11.76)	2 (5.56)	0.29
Vertical	3 (33.33)	8 (47.06)	11 (30.56)	
Compression	0	0	4 (11.11)	
Extracapsular				
Condylar neck	6 (66.67)	5 (29.41)	12 (33.33)	0.29
Subcondylar	0	2 (11.76)	7 (19.44)	
Total fractures	9	17	36	
Age at the time of injury				
0–7 years	3 (75)	6 (60)	9 (42.9)	0.41
8–14 years	1 (25)	4 (40)	12 (57.1)	
Total no. of patients	4	10	21	

MMF, maxillomandibular fixation; ORIF, open reduction and internal fixation; SORG, Strasbourg Osteosynthesis Research Group.

Table 6

Patients with Complications and Associated Mandibular Fractures

Patient	Sex	Age (yr)	Complication	Follow-Up Period (mo)	SORG	Lindahl	Associated Fractures	Treatment of Associated Fracture
1	F	11	Exposure of hardware	11	Right: CN, CB Left: CN	Right: N, S Left: N	Right: parasymphysis, symphysis	ORIF
2	F	6	Malocclusion	31	Right: CN	Right: N	Right: body, parasymphysis	ORIF
3	M	14	Limited movement	3	Right: DC, CN, CB	Right: V, N, S	Right: ramus, angle, body	ORIF
4	F	10	Malocclusion	1	Right: CN Left: CN	Right: N Left: N	Right: parasymphysis Left: parasymphysis	ORIF
5	F	8	Facial asymmetry	2.5	Right: CB	Right: S	Left: parasymphysis	ORIF
6	M	6	Malocclusion	56	Right: DC	Right: H, V, CP	Symphysis	ORIF
7	M	2	Malocclusion	178	Right: DC	Right: V	Right: coronoid, ramus Left: body	MMF
8	M	10	Malocclusion	0.7	Right: DC, CN Left: CN	Right: V, N Left: N	Symphysis	Conservative
9	M	11	Facial asymmetry	94	Left: CN	Left: N	Right: parasymphysis	MMF
10	M	13	Clicking	1.5	Right: DC Left: DC	Right: V Left: V	None	Conservative

M, male; F, female; SORG, Strasbourg Osteosynthesis Research Group; DC, diacapitular fracture; CN, condylar neck fracture; CB, condylar base fracture; H, horizontal fracture; V, vertical fracture; CP, compression fracture; N, neck fracture; S, subcondylar fracture; CM, combination fracture; MMF, maxillomandibular fixation; ORIF, open reduction and internal fixation.