Management of Pediatric and Adolescent Condylar Fractures

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KEYWORDS

• Pediatrics • Adolescents • Condylar fracture • Closed reduction • Open reduction • Internal fixation

KEY POINTS

- Mandibular condyle fractures are a common site of fracture in children involved in maxillofacial trauma.
- Condylar fractures in children may often go undiagnosed and thus untreated.
- Condylar fractures in children can have long-term effects on mandibular growth.
- There is no definitive age that defines the treatment of condylar fractures in children versus teenagers.
- Closed treatment of pediatric and adolescent condylar fractures remains to be the most commonly used treatment technique, open reduction is rarely indicated.

Introduction

The management of mandibular condyle fractures in the pediatric and adolescent population presents the surgeon with unique challenges. The distribution and fracture patterns of the mandibular condyle at various stages of development predictably follow the developmental anatomy of the lower jaw[1] (Fig. 1). The anatomy of a child's (age 2–5) mandible predisposes itself to intracapsular comminuted fracture patterns in the regenerative setting of a thin cortex with periosteum in a very active osteogenic phase (Fig. 2). Although anatomic reduction using wide exposure and rigid internal fixation has gained increasing support for mandibular condylar process fractures in adults, this method of treatment is seldom useful in children. Conservative closed treatment of the condyle fracture in children *without* open reduction and internal fixation remains the standard today for most injuries. Despite encountered postsurgical radiographic abnormalities, conservative management of condylar fractures in children usually yields satisfactory to excellent clinical results.

The condyle as a subunit is an important area of growth in the developing mandible. As a result, any trauma to the pediatric or adolescent condyle has the potential to disrupt growth and has long-term adverse effects. Possible traumatic fracture complications include pain, malocclusion, masticatory dysfunction, facial asymmetry, restricted mandibular movements, and temporomandibular joint disorders or ankylosis. It is therefore imperative for the surgeon to be able to properly identify and diagnose mandibular condyle fractures and provide appropriate treatment to help avoid these potential complications. The overall goal of treating mandibular condyle fractures in the growing patient is to reduce these risks and restore function, symmetry, and occlusion, while not interfering with mandibular growth.

In general terms, a patient is considered to be a *pediatric* patient from birth until the age of 18, whereas the World Health Organization defines *adolescence* as the period in human growth and development that occurs after childhood and before adulthood, from ages 10 to 19. It is important to note that in terms of treating maxillofacial trauma, including condylar fractures, there is no clear delineation between a pediatric patient and an adolescent patient in terms of treatment.

Craniofacial growth and development

For surgeons who treat pediatric facial fractures, an understanding of craniofacial growth and development can guide clinical treatment. It is the anatomy of the pediatric mandible that determines its response to trauma. The general pattern of normal facial growth occurs in a downward and forward motion along with concurrent lateral expansion, depending on the amount and location of apposition and resorption of bone (Fig. 3). Differences in the rate and location of apposition and resorption of bone are responsible for characterizing the typical growth pattern of the face, and any disturbance can cause skeletal and/or dental malocclusions. The mandible follows the downward and forward growth pattern of the face with the addition of upward and backward growth of the condyles to maintain contact with the glenoid fossa. Vertical height is gained at the condyle through endochondral replacement, and height is added via remodeling of the ramus

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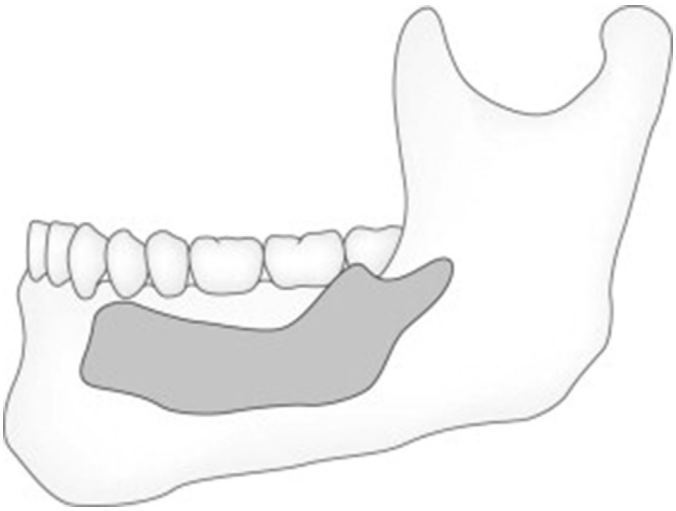

Fig. 1 Developmental anatomic differences between the mandibular condyle of a child and adult.

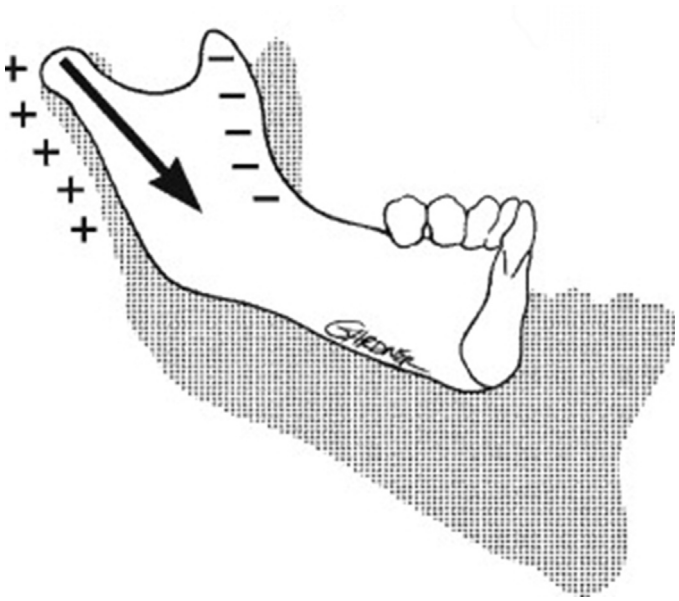

Fig. 3 Illustration showing vector of growth of the mandible. In the mandible, there is resorption of bone at the anterior ramus with bone apposition on the posterior ramus and the free margins of the condyle, causing the mandible to grow downward and forward. (*Adapted from* Digman SW, Hayes SL, Niel JG. Pediatric dentoalveolar surgery. Munich, Germany: Saunders; 2009. p. 165–84; with permission.)

(Fig. 4). Skeletal maturity of the maxilla and mandible is reached by approximately 14 to 16 years of age in girls and 16 to 18 years of age in boys. With respect to the mandible, it is the last bone in the face to reach skeletal maturity and is vulnerable to growth-related injuries for the longest time period. The age of a patient and stage of mandibular growth can have a large impact on the fracture patterns seen and thus influence the treatment. The following are some age relevant points related to the development of the condylar region.

Ages 0 to 2

- The condylar neck is short and thick and engages a shallow glenoid fossa
- Extensive vascular channels are found in the condylar head that make it vulnerable to a crush-type injury
- Unlike older age groups, the short stocky nature of the condylar neck makes it relatively resistant to fracture, whereas the regenerative capacity is significant (Fig. 5)

Ages 3 to 12

- A more adultlike configuration of the condylar process and glenoid fossa begins to develop
- Although unlike adults, there still remains an enormous potential for regeneration and remodeling in this age group (Fig. 6)

Ages 13 to 18

- Although the capacity for extensive new bone formation is equivalent to that of children, teenagers lack the corresponding capacity for condylar remodeling that is found in the younger groups (Fig. 7)

Frequency of pediatric condylar fractures

Pediatric mandibular fractures represent fewer than 10% of all mandibular fractures.[2] The condyle is well represented in this group, however. Imahara and colleagues[3] reported that mandibular fractures account for 32.7% of all facial fractures in children, based on analysis of the National Trauma Data Bank

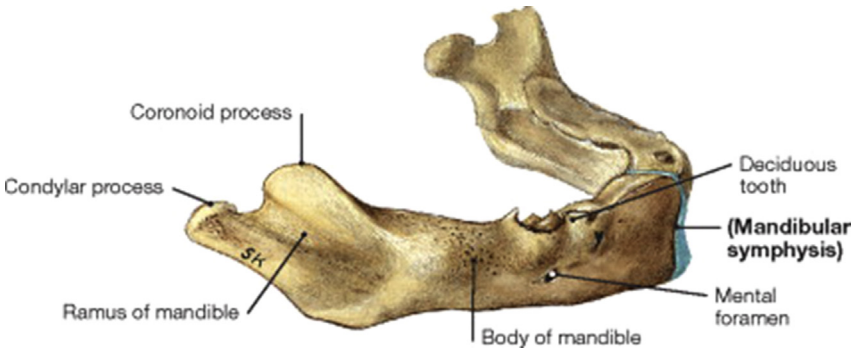

Fig. 2 Condylar process of the newborn. Illustrating the broad condylar head and relatively thick condylar neck. (*From* Paulsen F, Waschke J. Sobotta atlas of human anatomy. Vol. 3, 15th edition. Munich: Elsevier GmbH; 2013. p. 1–96; with permission.)