POSNA

The Core Curriculum

Fractures of the hand and wrist

Objectives

1. Describe management of distal phalangeal crush injuries
2. Describe management of the "mallet finger equivalent" fracture of the distal phalangeal physis
3. Describe management of proximal phalangeal physeal fractures
4. Describe patterns of injury to the base of the thumb in the skeletally immature child, and management of each pattern
5. Describe management of scaphoid fractures in children, comparing indications for open treatment with those in adults
6. Describe management of dislocations of the PIP joints in fingers, and MCP joint in the thumb
7. Discuss ways in which management of acute flexor tendon lacerations may differ in children and adults

Discussion points

1. How does remodeling potential affect management of hand injuries in children?
2. Does rotational deformity in the fingers or metacarpals remodel? How do you assess rotational alignment?
3. Do distal radioulnar joint injuries occur in children?
4. What kind of exercise equipment has been linked to a growing number of hand injuries in young children?

Discussion

The immature hand and wrist can sustain a variety of injury patterns. Fractures and soft tissue injuries of the immature hand are common, comprising 1.7% of all pediatric emergency room visits in one study.

The distal phalanx is often injured by crushing forces, the nail bed is usually disrupted with forces sufficient to crush the distal phalanx, and management of the nail bed injury usually suffices for fracture management. The nail should be removed, and the nail bed accurately repaired with 6-0 absorbable suture. Some use the nail for a stent to protect the repair. Fractures of the physis of the distal phalanx are essentially mallet finger equivalent injuries. Some residual displacement of the physeal fragment can be accepted in children, and success can be anticipated with closed management. If the fracture is intra-articular (Type III physeal injury), open reduction is necessary, with pin fixation. The physis of the proximal phalanx is the most common site of fracture in the

immature hand. Closed reduction is usually achievable by maximally flexing the MCP joint to stabilize the proximal phalanx. Closed pinning can be used for unstable fractures of the phalanges. Angulation in the plane of motion of the joint up to 25 degrees can be accepted. Accurate reduction and reliable of intra-articular phalangeal fractures is as necessary in the immature hand as the mature. Careless radiographic technique may allow displaced fractures to escape detection. Most metacarpal fractures can be managed with closed treatment. The neck is the site most often fractured, and the fifth metacarpal is the bone most often fractured. The MCP joints are flexed to 90 degrees to relax the intrinsics and collaterals, and the distal fragment is reduced. The requirements for anatomic reduction are increased for the radial metacarpals in the adolescent, residual angulation of up to 30 degrees is acceptable in the fifth metacarpal. For all fractures of the metacarpals and phalanges, particular attention should be directed to assuring that the rotation of the fractured finger is aligned with the other fingers. This is easily assessed by viewing the alignment of the nails, any visible rotational deviation warrants correction.

At the base of the thumb, the adductor pollicis, abductor pollicis brevis, and flexor pollicis brevis. The most common fracture pattern of the immature thumb is the Type II fracture, from the type of injuring forces producing a Bennett's fracture in the adult. The adductor pulls the metacarpal shaft; the abductor and flexor, through the volar plate, pull the proximal fragment laterally. Closed reduction is usually successful, and considerable remodeling at this site is possible. Percutaneous pinning can be used if remodeling potential is uncertain in the adolescent. Physeal fractures of the thumb may also be variants of a gamekeeper's thumb. Types I and II may be managed closed, but type III, with the ulnar fragment of the epiphysis still attached to the ulnar collateral, requires open reduction and anatomic fixation.

The scaphoid is the most commonly fractured carpal bone in children. The vast majority of fractures can be managed closed, open reduction for more than 1 mm of displacement or 10 degrees of angulation have been proposed as indications for open reduction in adults; this is undoubtedly much too rigid for children, but the final decision on a particular fracture depends on the age of the child. Despite excellent reports following conservative management of scaphoid fractures in children, an impressive series of nonunions of the scaphoid has also been reported in children.

Dislocations of the MCP joint of the thumb involves rupture of the volar plate; closed management is possible only if the head of the proximal phalanx has not passed through the volar plate defect. If the proximal phalanx is hyperextended, closed reduction may be possible, if the metacarpal and phalanx are parallel, the phalanx has passed through the defect. Many authors caution against traction for reduction of this injury, opining that traction can result in converting a reducible dislocation to an irreducible one. Dislocations of the PIP joints of the fingers are also common, and much more easily reduced with traction and manipulation.

Distal radioulnar joint injuries as an isolated entity can occur, almost 50% in a series of late diagnosed cases. This underscores the need to be vigilant for such injuries. Management of the acute injury is as for adults; if the injury results from hyperpronation, the dorsal radioulnar ligaments are disrupted and the ulna appears to subluxate dorsally. This injury is reduced and treated with immobilization in supination, and conversely for the reverse. Immediate management is much simpler than delayed.

Flexor tendon lacerations in children are more forgiving than adults and surprisingly good (by adult standards) results have been documented following primary repair.

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