



## Distal Tip Injuries and Blisters

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Distal fingertip injuries in baseball are common and can lead to significant losses of playing time. Injuries to the hand, fingers, and thumb make up 10% of musculoskeletal injuries in Major and Minor League Baseball [1]. Hand and finger injuries comprise up to 21.8% of hit by pitch injuries and result in mean of 14.39 playing days lost [2]. The fingertip is the most exposed area of the hand which leads to its high susceptibility to injury. Baseball activities provide several unique opportunities for injury to the fingertips of its participants, both amateur and professional. Traumatic fingertip injuries in baseball such as distal phalangeal fractures and nail bed injuries may occur during fielding balls, sliding into base, or hitting. Attritional injuries such as fingertip blisters and nail plate fractures occur in pitchers. This chapter will discuss injuries to the distal fingertip, including traumatic injuries such as distal phalangeal tuft fractures and nail bed injuries, as well as attritional friction blisters in throwers.

Evaluation of the injured fingertip begins with a thorough examination of the injured and uninjured digits. Neuromuscular status is quickly assessed. Open wounds and nail bed injuries are inspected for soft tissue defects and displacement as well as underlying bony involvement. Fingers should be evaluated for clinical alignment as well

as for classic fracture signs of swelling, pain, and bony tenderness. Digital functions such as flexion and extension are assessed and deficits are noted. If clinical suspicion indicates, injuries of the distal fingertip are evaluated with X-ray. A standard finger X-ray series should include PA, lateral, and oblique views as some fractures are only visible on a single view.

Distal phalangeal fractures consist of fractures of the tuft and extraarticular shaft and intraarticular fractures of the distal interphalangeal joint which may include volar flexor digitorum profundus avulsions (Jersey finger) and dorsal terminal extensor avulsions (Mallet finger). This chapter will discuss fracture of the tuft and extraarticular shaft. Tendon avulsions of the DIP joint are discussed elsewhere in other chapters.

Fractures of the distal phalangeal shaft may be transverse, longitudinal, or oblique. They are often minimally displaced and stable. Displaced fractures may require closed reduction, which are often stable once reduced. Closed stable shaft fractures of the distal phalanx are typically treated with nonoperatively with splinting for 3–6 weeks followed by rapid mobilization [3]. Open or unstable fractures may require debridement and percutaneous pin or screw fixation [4]. Symptomatic nonunions are rare, but can be treated with percutaneous pinning with or without bone grafting [3]. Whether treated operatively or nonoperatively, splints should include the DIP joint, but avoid the PIP joint. Diligent mobilization

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of all uninjured joints in the hand is encouraged. Return to play is a function of injury severity, healing, handedness, position, and timing of season. Once the injury/fracture is determined to be stable, one must assess player comfort and ability to perform. Protective devices such splints or guards can often be used on glove hand injuries in order to accelerate return to play.

Tuft fractures are the result of crushing or direct impact injuries to the flared distal aspect of the distal phalanx. In baseball, they are most associated with ball versus fingertip, such as hit by pitch or line drive versus fingertip. They are often associated with nail matrix injury or pulp lacerations. Painful subungual hematomas are often seen with closed fractures [3]. More significant injuries include displaced fractures and nail bed lacerations through the perionychium or eponychium.

Tuft fractures are often stable secondary to the generous fibrous network of the fingertip. Closed tuft fractures with intact nail plate are amenable to nonoperative treatment. The fingertip is splinted and large subungual hematomas are drained for pain relief. Drainage is performed with a heated paperclip or ophthalmic electrocautery. When the heated object contacts the pooled blood, it cools while leaving a large enough hole in the nail plate for ongoing drainage [5]. The fingertip and DIP joint are then splinted for comfort, typically 7–14 days [3]. The player will often transition to a sturdy nonrestrictive compressive wrap (athletic tape or a simple Band-Aid) for support once the pain has subsided. These often heal with symptomatic stable fibrous unions. Return to play is determined by tolerance to symptoms and ability to perform.

Open tuft fractures are often unstable and have associated lacerations through the pulp or nail bed. Treatment includes fracture debridement, stabilization, and laceration repair. Some fractures may be stabilized with acute nail bed repair and nail plate replacement alone [5]. More unstable or widely displaced fractures require longitudinal pinning for stabilization prior to nail bed repair. Lacerations of the perionychium and particularly the eponychium require nail plate

removal and anatomical repair with a small (6-0 or 7-0) absorbable suture. The nail plate is then replaced to assist in maintenance of reduction.

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## Blisters

Friction blisters are common in athletics. These range in severity and are uniquely related to index and long fingertips, and occasionally the thumb of baseball pitchers, as the fingertip is the last point of contact as the ball is released. They are most common in the areas of the fingertip that contact the seam of the ball [6]. Fingertip blisters lead to pain, altered grip, and loss of pitching command. They often lead to loss of playing time.

Blisters occur in areas of the body where the stratum corneum and stratum granulosum are substantial, such as the palmar and plantar surfaces of the hands and feet. These layers transmit surface forces to the stratum spinosum, thus disrupting the spinosum layer and causing a blister. In areas with less robust strata, the corneum and granulosum, abrasion forms instead [7, 8]. By 48 h a new granulosum layer is formed and by 120 h a new corneum layer is formed [9, 10].

Frictional forces and number of cycles affect blister formation. Moist skin increases frictional forces, while dry skin reduces friction [7, 8, 11]. Baseball pitchers' distal pulp experiences frictional forces during release of the baseball as they use the index and long finger as well as the thumb to impart spin on the baseball. Frictional forces are higher leading to increased blister susceptibility in humid environments.

Methods of blister prevention are anecdotal and steeped in tradition. Prevention methods involve minimizing the added moisture from sweating and playing in humid environment. Antiperspirant sprays are often utilized by pitchers to reduce the added moisture from sweat [12]. This may need to be reapplied to the hand and fingers between innings. Other options include using a rosin bag and dry towel or placing the hand in a rice bucket between innings. The rice absorbs moisture and prevents pruning of the dig-

its. Digital calluses may develop and lead to blistering. Calluses need to be maintained by trimming and contouring rough or loose edges that may lead to prevent blister formation.

Blister treatment is similarly anecdotal and is largely performed by the training staff. Blisters may be drained by using a sterile syringe to penetrate only the top layer of the blister. Drainage provides pain relief and allows apposition of the skin layers for quicker healing. If a player remains in the game after drainage, they must be carefully monitored for skin avulsion or secondary blistering underneath. Skin adhesives such as skin glues or super glue may be utilized, but often need to be reapplied throughout the game. Once removed from the game, treatment includes warm water Betadine soaks for disinfecting and toughening the surrounding skin [6]. Compounded creams and salves contain alum powder and tincture of

benzoin may be utilized to promote blister healing. Antibiotic ointments that moisten and soften the skin should be avoided. Bandages that trap moisture against the skin are also discouraged.

Fingernail fractures are common in pitchers. Vertical or horizontal fractures typically occur in the long finger from the force of the ball as it is released from the fingertip. Playing time is rarely limited due to these injuries. Treatment is symptomatic only. To support the injured nail and avoid loss of playing time, a nail cast may be applied. A nail cast is fashioned out of Steri-Strips cut to fit the nail and placed perpendicular to the fracture. A second layer of Steri-Strips cut and placed perpendicular to the first layer. Super glue is then applied to the Steri-Strips. It is allowed to dry the reapplied. A total of four layers of glue is preferred (Fig. 8.1). Once dry, the player may return to play as tolerated.



**Fig. 8.1** Nail cast application

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