

# Imaging Injuries in Throwing Sports Beyond the Typical Shoulder and Elbow Pathologies

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## **KEYWORDS**

Athlete 
Injury 
Bone 
Tendon 
Muscle 
Ligament 
Nerve 
Vessel

## **KEY POINTS**

- Several injuries may occur in athletes that fall out of the category of typical for their activity but may be just as debilitating as their more common counterparts.
- Awareness of these injuries allows for accurate, timely diagnosis, and appropriate management.
- Some of these injuries are not always fully imaged because they may occur in regions that are not entirely included in standard fields of view of routine MR imaging. Recognition of these injuries may allow customization of imaging protocols to fully evaluate degree of injury.

#### **BONE INJURIES**

The hamate is an irregularly shaped bone located in the ulnar aspect of the distal carpal row. From its volar margin, it has a hooklike bony projection, the hamulus, which is susceptible to direct compression injuries. As seen in Fig. 1, fractures are usually seen in athletes participating in racket sports, golf, and baseball. The typical presentation in the acute setting is point tenderness over the fracture with ecchymosis. It is not uncommon for fractures to present after a delay from the initial injury, and symptoms may include persistent pain with palpation, gripping or resisted flexion, and ulnar nerve parathesias/weakness given the proximity of the ulnar nerve as it travels through Guyon canal.<sup>1</sup> Imaging initially consists of a standard radiographic series of the hand. Norman and colleagues<sup>2</sup> described 3 signs as indicative of fracture: absence of the hook of the hamate; sclerosis of the hook; and lack of cortical density (ie, a barely visible outline) of the hamulus.

Radiographs are insensitive, however, for this diagnosis. A study by Kato and colleagues<sup>3</sup> demonstrated a sensitivity of only 31% for these fractures with a standard posteroanterior view. Additional views (carpal tunnel and supine oblique) increased sensitivity to 80%; CT demonstrated 100%. If the initial radiographs do not demonstrate a fracture and the clinical suspicion is high, CT should be the next step in the imaging algorithm. Management of these injuries may consist of an initial period of immobilization or surgical excision. Fractures managed conservatively typically require a long period of immobilization (>10 weeks) and may progress to nonunion. Resection of the hamate typically allows for return to activity in a much shorter time frame (6 weeks).<sup>4</sup>

### **MUSCLE/TENDON INJURIES**

The latissimus dorsi is a large, fan-shaped muscle that has its origins from the T7-L5 spinous processes, thoracolumbar fascia, iliac crest, the

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Fig. 1. A 55-year-old golfer with sudden onset of dull wrist pain after striking the ground with club. CT image demonstrates a nondisplaced fracture of the hook of the hamate (*arrow*).

inferior 3 or 4 ribs, and the inferior scapula. It inserts on the intertubercular groove of the humerus and functions to adduct, extend, and internally rotate the humerus. The teres major muscle similarly has its origin from the inferior scapula inserts on the intertubercular groove of the humerus and functions to adduct and internally rotate the humerus. Although each muscle has its own insertion, studies have shown that they are intimately associated<sup>5,6</sup> and electromyographic data show these muscles typically function as one unit.7 During the throwing motion, the latissumus is most active during the late cocking and acceleration phases.<sup>8</sup> At the time of injury, patients typically describe an acute pain posteriorly along the axilla, usually with no significant preceding symptoms.9,10 As seen in Figs. 2 and 3, MR imaging demonstrates high signal intramuscular edema and fluid consistent with strain involving the myotendinous unit. In the setting of an intramuscular hematoma, a well-defined mass with heterogeneous T1 shortening is seen related to methemoglobin. An additional example is seen in Fig. 4, which nicely illustrates the concept of initial incomplete evaluation of an injury due to limitations of a standard field of view. Awareness of injury patterns in these athletes, however, led to calling patients back for additional imaging, resulting in better characterization of the extent of tear (Fig. 5). These injuries are treated nonoperatively, with a majority of athletes returning to preinjury level competition within 3 months.<sup>11</sup>

Injury to the extensor tendons at the distal interphalangeal joints of the fingers is referred to as *mallet finger* or *baseball finger*. This injury is characterized by disruption of the terminal attachment of the extensor tendon to the distal phalanx, with or without an osseous avulsion fragment. The typical clinical history is forced flexion of an extended finger, and the patient presents



Fig. 2. A 30-year-old professional baseball pitcher with sudden-onset chest wall pain in dominant arm while pitching. Water-sensitive axial MR images show intramuscular edema and fluid within the latissimus dorsi muscle belly (*circle*) compatible with grade 2 strain.

with inability to actively extend the distal interphalangeal joint as well as pain and swelling.<sup>12</sup> If the lesion is purely tendinous, pain may be minimal. From an imaging standpoint, radiographs are



**Fig. 3.** Same patient, short interval follow-up. T1 coronal MR imaging shows organized intramuscular collection with intrinsic T1 shortening consistent with hematoma (*arrow*). T1 shortening is related to breakdown of oxyhemoglobin to methemoglobin.

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