Review Article

Baseball Injuries of the Hand and Wrist

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ABSTRACT

Injuries of the hand and wrist are common in baseball. Because of the unique motions and loads encountered in this sport, physicians treating baseball players may encounter hand and wrist injuries ranging from common to rare. An understanding of these baseball-related injuries must include their pathoanatomy, diagnosis, and treatment options. This knowledge is critical for the general orthopaedic surgeon treating baseball players to allow for timely and appropriate treatment. This article reviews the pathophysiology, diagnosis, and treatment of baseball-related hand and wrist injuries, with a target audience of general orthopaedic surgeons.

here are approximately 882 major league baseball (MLB) players and approximately 3,600 minor league baseball (MiLB) players in the United States.¹ Injuries of the hand and wrist in these players are common and can result in notable time away from play. Before 2011, the exact characteristics of injuries in professional baseball players were not well reported. However, beginning in 2011, MLB and MiLB developed and implemented the Health and Injury Tracking System (HITS).² The purpose of this HITS System is to provide information that could be used in injury prevention. Any player who sustains an injury that requires at least 1 day away from play is entered into the HITS database to improve documentation of all injuries sustained by professional baseball players.

Rhee et al³ described the characteristics and effect of hand and wrist injuries in MLB and MiLB players during the 2011 to 2016 seasons by using the HITS comprehensive injury surveillance system. Patient-specific variables were analyzed including age, position, and level of play (MLB versus MiLB). Injury-specific variables were also analyzed including injury date, days missed, the specific activity that resulted in injury, injury mechanism, body region (wrist versus hand), laterality, diagnosis, and need for surgery. In total, 6,226 total hand and wrist injuries were reported during this period. The most common injury mechanisms were contact with a baseball, the ground, another player, or bat, and noncontact injuries. The most common activities associated with injury were batting, fielding, pitching, sliding, throwing, and base running in that order. Infielders were found to be the most commonly injured players. The most common hand and finger injuries included contusions, blisters, metacarpal fractures, proximal phalangeal fractures, and finger proximal interphalangeal joint sprains. The most common wrist injuries were wrist sprains, wrist contusions, and wrist extensor tendinopathy. Hamate hook fractures and thumb ulnar collateral

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None of the following authors or any immediate family member has received anything of value from or has stock or stock options held in a commercial company or institution related directly or indirectly to the subject of this article: Gallant, Tulipan, Rivlin, and Ilyas.

J Am Acad Orthop Surg 2021;29:648-658

DOI: 10.5435/JAAOS-D-20-00101

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ligament (UCL) injuries, the two most common injuries requiring surgery in professional baseball players, were also highly represented.

Many of the injuries noted in the study by Rhee et al³ are common in the general population, and treatment options for these injuries are well known to most hand surgeons. In the high-level athlete, focus is on early diagnosis, rapid treatment, and expedited return to play. This review is not intended to discuss common softtissue and bony injuries that occur incidentally during baseball. Rather, the purpose of this review was to focus on baseball-specific hand and wrist injuries and conditions, and the special considerations guiding surgical treatment. The diagnosis, treatment, and recommendations for return to play for each injury are discussed to help guide clinicians taking care of high-level baseball athletes. Injuries discussed in this review include flexor tendon pulley rupture, hypothenar hammer syndrome, digital vascular ischemia, adductor pollicis injury, thumb UCL injuries, hamate hook fractures, and extensor carpi ulnaris tendon instability.

Conditions Affecting the Hand

Flexor Tendon Pulley Rupture

Rupture of a flexor tendon pulley mostly occurs in the middle fingers of predominantly fastball pitchers.⁴ Unlike rock climbers who most often rupture the A2 pulley, baseball pitchers usually rupture the A4 pulley.⁴ The release of a fastball during pitching creates a forceful extension force to the actively flexing fingers. This repetitive stress to the flexor tendons may eventually lead to pulley rupture.⁴ Players often experience prodromal pain over the volar middle phalanx before the rupture occurring.⁴ Individuals often feel a "pop" sensation when this injury occurs.⁴

Examination shows direct tenderness over the volar middle phalanx with swelling and ecchymosis present. Bowstringing of the tendons at this level is rarely seen because this finding would require rupture of multiple pulleys. Magnetic resonance imaging (MRI) is useful in establishing the diagnosis and can detect vincular tears and bleeding. Some have also recommended ultrasonography as a diagnostic tool.⁵ Nonsurgical treatment is usually successful for this condition. Splint, tape, or a pulley ring can be used and should be worn for 4 weeks.^{4,6} Our preference is to apply a pulley ring at the middle phalanx level, allowing active range of motion of the digit for a period of 4 weeks (Figure 1). The pulley ring is then discontinued, followed by a gradual return

to throwing over the next 2 to 3 weeks. We agree with other authors that surgery rarely, if ever, is necessary for this injury.⁷ Surgical reconstruction is indicated if a player fails conservative management.

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Hypothenar Hammer Syndrome

Hypothenar hammer syndrome is the term used to describe the complex of pain, cold sensitivity, paresthesias in the ulnar digits, cyanosis, and weakness related to ulnar artery and superficial palmar arch insufficiency because of repetitive trauma. On rare occasions, chronic nail bed changes, digital ulceration, or frank digital gangrene is present. Distal vessel spasm may also occur because of the increased sympathetic tone stimulated by vascular injury. In professional baseball players, repetitive trauma from catching a baseball causes the superficially located ulnar artery in Guyon canal to repetitively contact the hamate hook, which can result in the development of an aneurysm, pseudoaneurysm, or thrombus formation.⁸

This condition is much more common in catchers than other position players because of both the large volume of pitches they catch and the catcher's mitt design which has a smaller web space compared with other positions. The high velocity and movement of pitches ensure that catchers, in contrast to other position players, often fail to catch the ball in the mitt's webbing. This is in contrast to other position players who more often catch the ball in the webbing of the glove away from the hand. Therefore, catchers potentially endure more global hand trauma with each catch, increasing their risk of vascular disorders of the hand. Catchers often show notable abnormalities with diagnostic vascular testing, including reduced digitalbrachial indices and Doppler anomalies at Guyon canal.⁷

Physical examination demonstrates the presence of a hypothenar mass, which may be pulseless (thrombosis) or pulsatile (aneurysm). The Allen test is useful in demonstrating an incompetent ulnar artery/superficial arch system. Players with an incomplete superficial palmar arch are more prone to having digital ischemia. MRI and/or magnetic



Photograph showing a middle phalangeal level ring splint being used for A4 pulley rupture in a baseball pitcher.

resonance angiography of the region for diagnosis of thrombosis or aneurysm is useful. Diagnosis can also be confirmed with an angiogram of the upper extremity⁸ (Figure 2).

When symptoms of hypothenar hammer syndrome are mild, we recommend nonsurgical treatment. This can include supplemental hand padding over the hypothenar region to reduce the force of effect in this region. Modifications of the catcher's mitt by baseball glove manufacturers are another option for treatment. Antiplatelet agents and calcium channel blockers can be used to improve digital perfusion. Our recommendation is aspirin 325 mg once daily or clopidogrel 75 mg once daily. Oral nifedipine 30 mg once daily can also be added if there is no improvement with the above regimen. Tobacco cessation should be emphasized because tobacco use is known to worsen vascular conditions of the hand. If nonsurgical measures are successful, then return to play can be immediate.

Surgery is indicated for players that fail conservative measures.⁹ If there is sufficient collateral flow to the ring and small digits, excision of the affected portion of the ulnar artery with ligation is recommended (Figure 3). In the absence of sufficient collateral flow to the ring and small digits, excision of the affected portion of the ulnar artery with either direct repair or interpositional vein graft is recommended. If simple excision and ligation is done, return to full unrestricted play can occur within 3 to 4 weeks. However, if interpositional vein graft is needed, return to play is not allowed until at least 6 weeks postoperatively.

Digital Vascular Ischemia

Ginn et al reported on the microvascular changes that were present in the hands of otherwise healthy professional baseball players of any position before the development of clinically significant ischemia. The microvascular changes

Figure 2



Angiogram showing the preoperative ulnar artery in a professional baseball catcher with thrombotic hypothenar hammer syndrome. The white arrow indicates the absence of flow at this specific level.

observed included reduced digital-brachial indices and Doppler flow abnormalities, with a markedly higher prevalence of these changes found in the glove hand of catchers.¹⁰ Sugawara et al¹¹ showed that the development of digital ischemia in baseball players is correlated with accumulated playing time.

Local trauma to the digital arteries usually occurs in baseball catchers and pitchers.¹¹ The design of a catcher's mitt focuses the force at the index metacarpal head level. This can result in symptoms of digital weakness, paresthesias because of local nerve trauma, pain, and microvascular ischemia. In pitchers, increased digital pressure in the index and/or middle digits of the throwing hand during pitching can lead to digital vasospasm or more severe vascular compromise.¹² Hypertrophic lumbricals or Cleland ligaments and thickening of the palmar aponeurosis have been reported in the throwing hands of baseball pitchers.¹³ Diagnostic modalities include digital Allen testing, digital-brachial indices, and digital ultrasonography. Angiogram may demonstrate digital artery occlusion, segmental thrombosis, and regional stenosis.

In our experience, conservative treatment is most often successful. Supplemental padding for catcher's mitts along with leaving the index finger outside of the mitt to minimize effect is almost always successful. On rare occasions, supplemental aspirin, clopidogrel, and calcium channel blockers in the dosages noted above may be necessary. For pitchers, a brief period of rest is usually successful as well. An oral medication is recommended for more severe conditions. We find it rarely necessary to conduct digital sympathectomy. However, for persistent cases with lumbrical hypertrophy noted on MRI, surgical decompression of the lumbrical canal may be considered.¹⁴

Adductor Pollicis Muscle Injuries

The adductor pollicis muscle plays a key role in hand strength and function, especially for grip, pinch, and dynamic thumb metacarpophalangeal (MP) joint stabilization.¹⁵ Anatomically, the adductor pollicis has both a transverse and oblique head, with the transverse head originating from the long metacarpal and the oblique head from the volar deep carpal ligaments and the index, middle, and sometimes ring metacarpal. Both heads converge and insert on the adductor tubercle of the thumb proximal phalanx and ulnar sesamoid as one common tendon.

In a baseball swing, the top forearm begins in a nearneutral position, progressing to relative supination with the initiation of the swing, and transitioning to pronation



Photograph showing the intraoperative appearance of a thrombotic ulnar artery (tip of forceps) in a baseball catcher. The tortuous and enlarged artery at this level is the common appearance for this particular problem. In this case, excision of the thrombosed arterial segment with ligation alone was successful in treatment because of sufficient collateral flow from the radial artery/superficial palmar arch.

during follow-through. With the location of the pitch and timing of the swing being highly dynamic, the position of the hand relative to the bat is quite variable. Although in most swings, the force transmission from the bat handle to the hand occurs through the palm, this is likely not the case when the batter swings at a pitch thrown very close to the body. In baseball terminology, this is known as getting "jammed by an inside pitch." Unlike a typical swing, in a "jammed" swing, the batter maintains his top forearm in supination and is unable to extend his arm, resulting in the bat handle position in the hand shifting from the palm toward the base of the thumb. Force applied through the bat handle to the base of the thumb causes a sudden abduction force during eccentric contraction of the adductor pollicis. This injury is commonly referred to as a "jammed thumb." Eccentric contraction has been described in other muscle injury patterns, such as hamstring and biceps injuries, as a mechanism for both muscle strain and tendon rupture.^{16,17}

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Altobelli et al¹⁸ reported two cases of adductor pollicis injury in professional baseball players and recommended MRI for additional assessment. They described two types of injuries to the adductor pollicis: a tendon avulsion from its insertion and an intramuscular tear. The first case they presented was a tendon avulsion of the transverse head of the adductor pollicis (Figure 4). Surgical repair was done, and the patient was immobilized for 6 weeks, followed by range of motion exercise programs from week 6 to 12, with a strengthening program beginning at week 12. The player was allowed to return to unrestricted play at 4 months. The second case they presented was an intramuscular tear. Treatment consisted of immobilization for 3 weeks followed by return to play using a lighter bat and a custom orthosis for 3 additional weeks (Figure 5). At week 6, the custom orthosis was discontinued and the patient was allowed to return to full unrestricted play. Follow-up MRI at 6 weeks showed complete healing of the injury.

Figure 4



Magnetic resonance imaging showing the right hand of a 31-year-old baseball player with multiple jamming events culminating in an event that resulted in acute pain and swelling in the first web space. **A**, Coronal magnetic resonance imaging scan demonstrates a retracted tear of the transverse head of the adductor pollicis muscle (arrow) and intact oblique head (arrowhead). **B**, Axial magnetic resonance imaging scan demonstrates a retracted tear of the transverse head of the adductor pollicis (arrow). This patient was treated with surgical repair. (Reproduced with permission from Altobelli GG, Ruchelsman DE, Belsky MR, Graham T, Asnis P, Leibman MI: Adductor pollicis jamming injuries in the professional baseball player: 2 case reports. *J Hand Surg Am* 2013;38(6):1181-1184.)



Photograph showing the custom orthosis designed to pad the first web space (white flexible material) and prevent forced abduction of the thumb (black rigid material). (Reproduced with permission from Altobelli GG, Ruchelsman DE, Belsky MR, Graham T, Asnis P, Leibman MI: Adductor pollicis jamming injuries in the professional baseball player: 2 case reports. *J Hand Surg Am* 2013;38(6):1181-1184.)

Thumb Metacarpophalangeal Joint Ulnar Collateral Ligament Injury

The thumb MP joint UCL is most commonly injured in the professional baseball player while sliding into a base. Camp et al,¹⁹ in their analysis of injuries in professional baseball players from 2011 to 2015, determined that the hand and thumb were the most commonly injured body parts when sliding into a base and can result in a notable amount of time away from play. The mechanism of injury typically involves hyperabduction or hyperextension of the thumb MP joint if the thumb gets caught on the base during sliding. This injury can occur in players of any position but occurs mainly in position players because pitchers rarely act as base runners.

Anatomically, the thumb MP joint is supported by a combination of static and dynamic stabilizers. The primary restraints to a radial directed force are the UCL, dorsal capsule, volar plate, and osseous congruity. The UCL is divided into the proper collateral ligament and the accessory collateral ligament. The proper UCL is located on the ulnar side of the MP joint and originates on the ulnar tubercle of the metacarpal condyle. It then travels in a proximal-dorsal to distal-volar direction to insert on the proximal phalanx. The accessory UCL arises from approximately the same position on the distal ulnar metacarpal but inserts volar and proximal to the proper UCL on the proximal phalanx and volar plate.²⁰

Acute injuries often present with pain, ecchymosis, and swelling on the ulnar aspect of the thumb MP joint. Stress examination with the thumb MP joint in full extension and 30° of flexion is the most important aspect of the physical examination (Figure 6). Laxity of 30° from neutral in full MP extension, greater than 15° than the contralateral side, or lack of a firm end point is all strongly suggestive of UCL disruption. Laxity at 30° of MP flexion and at full MP extension is suggestive of injury to both the proper and the accessory collateral ligament components, respectively.²¹ Radiographs may be negative or show a small bony fragment avulsion and should be done before physical examination to prevent displacement of a nondisplaced fracture (Figure 7). MRI is most reliable to confirm the diagnosis when radiographs are negative, with several studies showing a sensitivity of 96% to 100% and specificity of 94% to 100%.²² A Stener lesion, the interposition of the adductor aponeurosis between the torn UCL and its proximal phalanx insertion, is reliably identified on MRI imaging²³ (Figure 8, A and B).

For partial UCL tears with a firm end point on examination, immobilization with a hand-based thumb spica splint or cast leaving the thumb IP joint free is recommended for approximately 4 weeks followed by gradual return to play. Surgical repair is indicated for complete tears without an end point on examination, as well as injuries with a Stener lesion. Most modern repair techniques use a suture anchor with nonabsorbable



Photograph showing the physical examination showing marked laxity of the thumb metacarpophalangeal joint in full extension. This is consistent with ulnar collateral ligament disruption.



Plain radiograph showing avulsion fracture in a professional baseball player after suffering an injury sliding headfirst into a base.

suture. The ligament is almost always avulsed from its distal insertion.²⁴ This exact insertion site has been well described and is located at the volar ulnar base of the proximal phalanx.²⁵ If present, injuries to the dorsal capsule and/or volar plate can be repaired concurrently.

After a standard repair, we recommend a thumb spica cast for 3 weeks followed by hand-based splinting for an additional 3 weeks. The player can remove the splint intermittently for range of motion exercise programs. At 6 weeks, players can begin gradual return to play with splint protection for an additional 4 weeks during all activity except throwing and batting. For standard UCL repair, Jack et al reported a mean return to sport of 120 days for MLB players, with an in-season return of 56.2 days. They also noted that surgical repair of the thumb UCL yielded excellent results and 100% return to sport at the same performance level.²⁶

Suture tape augmentation of a thumb UCL repair has been shown by Shin et al to have much greater clinical load to failure and faster return to play compared with nonaugmented repair.²⁷⁻²⁹ They observed an average return to play of approximately 30 days in high-level



A, MRI showing interposition of the adductor aponeurosis between the avulsed ulnar collateral ligament and its proximal phalanx insertion site. The small arrow indicates the adductor aponeurosis, and the large arrow shows the ulnar collateral ligament. **B**, Intraoperative photograph showing a Stener lesion. The arrow shows the ulnar collateral ligament, and the asterisk shows the adductor aponeuroses.



Wrist axial (A) and coronal (B) CT images showing a hamate hook fracture in a professional baseball player's nondominant wrist after an injury while swinging a bat.

baseball players following thumb UCL repair with suture tape augmentation.²⁷ After repair Shin et al recommended a custom hand-based thumb spica orthosis beginning at 1 week postoperatively, and initiating occupational therapy at that time. They thought that the suture tape augmentation acts as an internal brace and increases load to failure of the repair tissue during ligament healing.²⁹ Their series noted 100% return to play at the same level with no failures and no complications. Return to play depended on sufficient healing of the soft tissues, ability to tolerate pain associated with the demands of playing baseball with or without a splint, and the patient's overall level of comfort. They did not use any strength testing measurements in return to play determinations. Without any reported negative effects of augmentation, and with the potential to strengthen the repair and decrease return to play time, we use suture tape augmentation for thumb



Illustration showing the extensor carpi ulnaris subsheath and its attachments. **A**, The limbus attachment of the radial leaf. **B**, The ulnar leaf, its labrum-like attachment, and the longitudinal fibers of the linea jugata (asterisk). (Reproduced from Goldfarb CA, Puri SK, Carlson MG: Diagnosis, treatment, and return to play for four common sports injuries of the hand and wrist. *J Am Acad Orthop Surg* 2016; 24(12):853-862.)

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A, **B**, **C**, Progression photographs showing dorsal extensor carpi ulnaris tendon dislocation in a baseball player (postinjury while batting), as he progressively moves from wrist flexion and neutral forearm rotation to full forearm supination.

UCL repairs in high-level baseball players. However, long-term studies are required to determine if suture tape augmentation will become the standard of care for high-level athletes.

Conditions Affecting the Wrist

Hamate Hook Fractures

Hamate hook fractures in baseball players most often occur in the batter's lead hand that is in contact with the end of the bat.³⁰ Injury can occur either because of repetitive contact of the ulnar side of the carpus with the end of the bat while swinging or because of acute trauma with direct effect by a stray pitch.^{30,31} A displaced fracture is anatomically important because it may impinge on the ulnar nerve and ring and small finger flexor tendons. Players can present with any combination of pain, weakness of grip, and ulnar nerve paresthesias.³⁰ Chronic injuries may result in attritional rupture of the small finger flexor digitorum profundus and/or flexor digitorum superficialis.32 On examination, there is focal tenderness over the hamate hook at the volar-ulnar palm. A carpal tunnel view radiograph can be done, but it is often difficult to obtain a reliable view. CT is highly sensitive and specific for detection of fracture, with an accuracy of 97.2% compared with 80.5% for radiography³³ (Figure 9, A and B). MRI is an alternative to CT for the detection of hamate hook

fractures. Although less accurate than CT for visualization of hook cortical fractures, MRI is superior for characterization of associated bone marrow edema, ulnar nerve injury, tendon abnormalities, and carpal tunnel abnormalities.³⁴

Hamate hook fractures can be classified into three types according to anatomic location: type 1, distal tip; type 2, middle portion; and type 3, base of the hook. Type 3 fractures account for over 75% of hamate hook fractures.³¹ Nonsurgical treatment has a high risk of nonunion because of the limited vascular supply to the watershed area of the hook body intersection together with in vivo tendinous forces.^{35,36} Surgical options include excision of the hook fragment or ORIF. It has been shown that simple excision of the fracture is superior to open reduction and internal fixation, with shorter associated recovery times and minimal to no difference in functional outcome.³⁷

Our preferred treatment method is early surgical excision. We recommend this for displaced and nondisplaced fractures in professional baseball players to quickly return the player to their preoperative functional level. Regardless of the type of hook fracture, we recommend excision of the entire hook to prevent attritional tendon rupture. After surgery, patients are allowed to throw at 2 weeks and allowed to hit at 4 weeks. Return to full unrestricted play shortly thereafter is recommended once comfortable. Burleson et al noted predictable early return to play with limited complication rate after hook



Illustrations showing three types of extensor carpi ulnaris subsheath lesions. The arrows indicate the direction of tendon mobility. **A**, Rupture of the ulnar attachment. **B**, Rupture of the radial attachment or mid-substance rupture. **C**, Ulnar delamination and creation of a false pouch. The most common injury is type C. (Reproduced from Goldfarb CA, Puri SK, Carlson MG: Diagnosis, treatment, and return to play for four common sports injuries of the hand and wrist. *J Am Acad Orthop Surg* 2016;24(12):853-862.)

excision. Their series included 12 professional baseball players.³⁸ Guss et al analyzed 18 MLB players who underwent hamate hook fracture excision. All 18 players resumed their normal preinjury performance level after operative treatment.³⁹

Extensor Carpi Ulnaris Tendon Instability

Instability of the extensor carpi ulnaris (ECU) tendon usually occurs because of a combination of wrist flexion, ulnar deviation, and supination against resistance. This motion occurs during batting and can result in an acute painful dislocation event. The ECU tendon travels across the wrist in the sixth dorsal extensor compartment, courses through the ulnar groove, and is bound by its own fibroosseous subsheath and the extensor retinaculum. The importance of the depth of the ulnar groove at the distal ulna for ECU tendon stability is unknown.⁴⁰ The extensor retinaculum is not the primary stabilizer in preventing ECU tendon dislocation. Rather, the ECU subsheath is the primary stabilizer for the ECU tendon. It is a fibroosseous tunnel that inserts on the borders of the ulnar groove. It is composed of radial and ulnar limbs with the ulnar limb being reinforced by the linea jugata, a stabilizing soft-tissue structure confluent with the epimysium of the ECU⁴¹ (Figure 10).

Diagnosis is made by clinical history and physical examination. ECU tendon instability can be elicited by having the patient forcefully ulnar deviate the wrist with the forearm in supination and the wrist in slight flexion. This maneuver often allows tendon subluxation or dislocation. Often patients can elicit dislocation of the ECU tendon on their own with wrist flexion and forearm supination (Figure 11, A, B, and C). A positive ECU synergy test can be helpful in diagnosing ECU tendon pathology and in ruling out intraarticular injuries.⁴² Because of the dynamic nature of ECU instability,

caution is advised when using tendon position to diagnose instability by MRI.²⁴ Lee et al⁴³ showed that dynamic ultrasonography provides excellent correlation of tendon motion with elicitation of symptoms. Inoue et al classified ECU tendon dislocation into three types. Type 1 is an ulnar disruption of the subsheath, type B is a radial disruption of the subsheath, and type C is an ulnar delamination that creates a false pouch for the dislocated tendon. Type C is the most common type⁴⁴ (Figure 12).

We recommend initial conservative treatment consisting of forearm immobilization in pronation with the wrist immobilized in a position of extension and radial deviation for 4 weeks. This is followed by a range of motion and strengthening program with return to full unrestricted play at 6 to 8 weeks.⁴⁵ For persistent painful snapping of the ECU tendon or for mid-season injury in players who do not wish to miss any time away from play, athletic taping to prevent tendon snapping can be done until the end of the season.⁴⁶ Surgery can then be done at the conclusion of the season if symptoms persist.

Various surgical procedures have been developed to correct ECU tendon dislocation. These include using a radial-based sling of extensor retinaculum, anatomic primary repair of the subsheath with or without ulnar groove deepening, patch grafting using a portion of extensor retinaculum, and use of a strip of flexor carpi ulnaris tendon passed through an osseous tunnel to reconstruct the ulnar wall and roof of the ECU subsheath.⁴⁷ We favor using a radial-based sling of extensor retinaculum. We have found it to be technically straightforward while also limiting the potential for ECU stenosing tenosynovitis. Surgical repairs are immobilized for 3 weeks in a long-arm cast followed by short arm splinting with an early range of motion program for an additional 3 weeks. Progressive range of motion and gradual strengthening are then initiated with full unrestricted return to play at 10 to 12 weeks.

Summary

Injuries of the hand and wrist unique to professional baseball players result in a notable amount of lost time from sport. Understanding of the anatomy, injury mechanism, diagnostic measures, and treatment options, both conservative and surgical, will allow optimal care of these individuals, with the ultimate goal of return to previous level of play as soon as safely possible.

Acknowledgements

The authors would like to thank Clay Townsend for his contributions to this article.

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