The Weekend Warrior: Common Hand and Wrist Injuries in Athletes

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ABSTRACT

Weekend warriors are individuals who condense their weekly physical activity into extended intervals over one or two days.[1] Excessive physical activity can result in a multitude of overuse and traumatic upper extremity injuries. The purpose of this review is to highlight the etiology and management of the more common hand and wrist injuries in athletes.

INTRODUCTION

The Centers for Disease Control and Prevention and the American College of Sports Medicine recommend at least 30 minutes of physical activity on most days of the weeks in order to optimize the health benefits achieved from an exercise regimen.[2] Weekend warriors are individuals who condense their weekly physical activity into extended intervals over one or two days.[1] Excessive physical activity can result in a multitude of overuse and traumatic upper extremity injuries.[3] Overuse injury is defined as repetitive microtrauma that occurs at a rate that exceeds the tissue's capacity to adapt and recover.[4] Of the 1–3% of adults in the United states classified as weekend warriors, 65% participated in sports or an exercise regimen.[1] While lower extremity injuries are the most common in sports-related injuries, upper extremity injuries account for approximate 22% of these injuries.[5] The purpose of this review is to highlight some of the common hand and wrist injuries in athletes.

HAND

Phalangeal and metacarpal fractures and joint dislocations

The pattern of **phalangeal and metacarpal fractures** depends on the position of the bone and the external force applied. Transverse fractures from result from direct blows and distal phalanx fractures occur from crush injuries and may be associated with a nail bed laceration. Sudden radial or ulnar deviation forces result in a spiral fracture of the proximal phalanx or the metacarpal.[6]

Metacarpal and phalanx fractures that occur in athletic injuries generally result from lower energy trauma in comparison to the high energy trauma such as those that occur in a motor vehicle accident.[7] Given the lower level of energy, a majority of these fractures are stable and could successfully be managed nonoperatively for short period (i.e. 2 to 6 weeks) of immobilization in a splint, cast, or buddy tape.[8,9] In cases where the fracture remains unstable or there is unacceptable articular displacement, the fracture should be reduced through a closed or open approach and secured with either Kirschner wires, independent lag screws, or a plate.[10,11]

The most common **hand joint injures** in athletes include injuries to the proximal interphalangeal (PIP) of the digits and the metacarpophalangeal (MP) joint of the thumb.[7] PIP joint injuries include dislocations, fracture-dislocations, and collateral ligament injuries. Collateral ligament injuries occur when the digit suddenly sustains an axial load and dorsiflexion force. In most circumstances, the collateral ligament injuries are incomplete and can be effectively treated with buddy taping, splinting and early range of motion. With proper immobilization, the athlete could return to sport immediately.[7]

PIP joint dislocations account for the majority of dislocations in the hand. These are most commonly caused by impact in ball handling sports (e.g. basketball, football, etc.). Dorsal dislocations result from sudden hyperextension that results in rupture of the volar plate. A majority of these are successfully managed with closed reduction and a short period of immobilization in a dorsal blocking splint or buddy tape.[7] Immediate return to sport with a stable joint results in no impact on the final outcome.[12] Volar dislocations result from a sudden radial or ulnar deviation force combined with a volarly directed force.[6,13] These dislocations are associated with central slip, collateral, and transverse retinacular ligament injuries. These should be close reduced and immobilized to protect the central slip to prevent subsequent boutonnière deformity. In case where close reduction is not readily achieved, open reduction reveals that the proximal phalanx head is buttonholed between the central slip and the lateral band.[7] Dislocations are frequently associated with articular fractures.[7] In those circumstances, the objective is to restore a concentric and stable joint with minimal intraarticular displacement, which could sometimes be achieved with a closed reduction but may require percutaneous fixation or in some cases even open reduction and internal fixation. This injury may keep an athlete out of sport for at least 6 to 8 weeks.[9,14]

Thumb MP joint injuries in sports are common and primarily include dislocations, fracture-dislocations, and collateral ligament tears.[7,15] **Dorsal thumb MP dislocation** is generally caused by a sudden hyperextension force that results in rupture of the volar plate. These are often readily reduced and immobilized for up to 4 weeks. In cases where reduction is not readily achieved, open reduction usually reveals that the metacarpal head is trapped between the two heads of the flexor pollicis brevis or the reduction is block because of volar plate, collateral or flexor pollicis longus (FPL) interposition.[7,16]

Campbell first reported gamekeeper's thumb as mechanism for chronic **thumb ulnar collateral ligament** injury in 1955.[17] Subsequently acute thumb UCL injuries were found to occur commonly in skiers who sustain a sudden hyperextension and hyperabduction force to the thumb MP joint resulting in avulsion of the ligament off of the base of the proximal phalanx.[18] Patients present with pain at the thumb UCL that is exacerbated with gripping. Assessment of stability in full extension and 30 degrees of flexion is critical so that both the accessory and proper bundles are examined, respectively.[15] Nonoperative managed is reserved to partial and nondisplaced avulsions.[19] Operative repair is indicated in circumstances of gross instability, displaced avulsion fracture or in cases where the adductor aponeurosis interposes between the torn ligament and the bone (i.e. Stener lesion).[15,19]

Closed tendon injuries

Mallet finger is caused by disruption of the terminal slip of the extensor mechanism resulting in characteristic extensor lag.[7] Mallet finger injuries have been classified into 5 types: 1) tendon attenuation, 2) tendon rupture, 3) tendon avulsion fracture, 4) fracture, and 5) physeal fracture.[20] Extension splinting remains the gold standard in circumstances where the joint remains concentric.[21] Comparison of splinting versus pinning mallet injuries demonstrated excessive risk of long-term complications after pinning.[22] In the setting of joint subluxation, there may be value of operatively reducing and pinning the joint.[23]

Flexor digitorum profundus (FDP) tendon avulsion injuries occur when the finger is forcefully extended while the profundus tendon is contracting.[24] This injury, also referred to as jersey finger, commonly occurs when a player grabs the jersey of another player resulting in avulsion of the tendon. FDP avulsion injuries have been classified into 3 types: 1) tendon retracted into palm, 2) tendon retracts to the level of the PIP joint and could occasionally avulse a small piece of bone, and 3) avulsion with large osseous fragment that prevents retraction beyond the middle phalanx. While all 3 warrant reinsertion, type 1 injuries are the most time-sensitive and should be repaired within one week because a substantial portion of the blood supply is compromised as the viniculae are torn.[24]

WRIST

Wrist fractures

While **distal radius fracture** most commonly occur in the pediatric and elderly populations, sports-related distal radius fractures in the young adult population remain the most common cause of distal radius fractures in this population.[25] These fractures primarily occur from a fall onto an outstretched wrist. According to the American Academy of Orthopedic Surgeons (AAOS) clinical practice guideless, distal radius fractures should undergo operative fixation if post-reduction radial shortening is >3 mm, dorsal tilt is > 10 degrees, or intra-articular displacement is >2 mm.[26] Currently, fixation of distal radius fractures with volar-locking plates through a modified Henry approach or extended flexor carpi radialis (FCR) approach has become the most common method for surgical fixation of these fractures.[27] While the introduction of the volar plate introduced an effective approach to managing these fractures, subsequent recognition of problems associated with volar plating spearheaded investigations that demonstrated the signification of plate placement and screw lenths.[28,29] Although optimal outcome could be achieved with restoration of alignment within these parameters, it is important to recognize that even optimally reduced and nonoperatively managed fractures could be associated with complications such as extensor pollicis longus (EPL) tendon ruptures and immobilization-related complications such as stiffness.

Scaphoid fractures result from falls on the outstretched, hyperextended, and radially deviated wrist.[15] Scaphoid fractures account for 70% of all carpal bone fractures and most commonly occur in young males.[30,31] The majority of the blood supply to the scaphoid enters dorsally and distally at the dorsal ridge.[32] A lesser degree of blood supply enters the scaphoid volarly at the distal tuberosity.[32] This predominately retrograde blood flow corresponds to the healing potential of scaphoid fracture. Distal pole fractures heal reliably whereas proximal pole fractures are predisposed to delayed healing and nonunion. Nondisplaced scaphoid fractures present with predictable tenderness on exam; however, radiographs are often negative.[33] These cases were once routinely managed with a period of immobilization and repeat imaging. Only 20% of these cases subsequently develop radiographic evidence of fracture.[33] Advanced imaging with a magnetic resonance imaging (MRI) or commuted tomography (CT) scan has been demonstrated to have a higher sensitivity and specificity for detecting occult scaphoid fractures.[33,34] Obtaining these studies has been demonstrated to accelerate time to diagnosis and reduce the duration of unnecessary immobilization.[35] The majority of acute nondisplaced scaphoid fractures are treated nonoperatively with cast immobilization.[36] Although several scaphoid fracture classifications have been described, the four fracture characteristics that generally provide insight into the optimal strategy are anatomic location (70–80% occur at the waist, 10–20% at the proximal pole, and least frequently at the distal pole), displacement, fracture stability, and chronicity.[37,38] For instance, distal pole fractures have been demonstrated to consistently heal (100% union) in 7–8 weeks and non-displaced scaphoid waist fractures heal in 9–10 weeks with a nonunion rate of 6%.[38] In contrast, nondisplaced proximal pole fractures required 4–8 months of immobilization and had a 14% nonunion rate.[37,38] Operative reduction and fixation of scaphoid fractures is indicated for displaced or unstable fractures, delayed fracture presentation, proximal pole fractures, open fracture, and established nonunions.[39,40] Currently, scaphoid fractures are most commonly stabilized with a single headless compression screw (HCS) placed along the longitudinal axis of the scaphoid.[41,42]

Other commonly encountered carpal fractures in athletes include hook of hamate and triquetral avulsion fractures.[43] **Hook of hamate fractures** account for 2% of carpal bone fractures and are associated with racquet sports, golfers and baseball players and are a result of direct impact.[44,45] The fracture is associated with pain at the hypothenar eminence that is exacerbated with gripping or direct palpation.[44,45] A carpal tunnel view could detect the fracture; however the fracture is best delineated with a CT scan.[44,45] Acute nondisplaced fractures should be immobilized in a short arm cast resulting in an approximately 50% healing rate.[46,47] Nonunions or displaced fractures that are symptomatic or present in associated with ulnar nerve compression are effectively managed with excision with no sequelae on grip strength.[44,45]

Triquetral fractures are the second most common carpal fractures accounting for approximately 15% of all carpal fractures.[48,49] Dorsal triquetral fractures are caused by an axial load applied to the dorsiflexed and ulnarly deviated wrist.[48] The most common type of dorsal triquetral is an avulsion of the dorsal radiocarpal or dorsal intercarpal ligament from its insertion onto the triquetrum.[48,50,51] Dorsal avulsion fractures present with tenderness at the dorsum of the triquetrum and radiographically detected on the lateral radiograph. Given that the this fracture represents avulsion of the critical dorsal extrinsic wrist ligaments, the wrist should be casted for at least 3 weeks followed by progressively working on regaining range of motion and strength.[51]

Scapholunate ligament injuries

The **scapholunate (SL) ligament** is the most commonly injured ligament in the carpus. The injury is caused by excessive wrist hyperextension, ulnar deviation and intercarpal supination.[52] Based on the degree of energy, the ligament may be partially or completely torn.[52] When the ligament is completely torn, the scaphoid flexes and the lunate and triquetrum extend, resulting in a dorsal intercalated segment instability pattern (DISI).[53] Unrecognized injuries result in abnormal cartilage wear patterns and subsequent arthrosis that progresses through a pattern known as scapholunate advanced collapse.[54]

SL ligament injuries initially present with radial sided wrist pain, diffuse swelling, and diminished range of motion. The scaphoid shift test is generally not tolerated acutely.[13] In cases of complete disruption, there may be widening (>3 mm) evident on the posteroanterior radiograph. In some circumstances, subtle widening of the SL interval may be accentuated with a power grip view. It is critical to compare the injured wrist to the contralateral wrist as there may be a physiologic degree of widening that is normal in some individuals.[7,55] Magnetic resonance imaging could further characterize the extent of injury to the ligament and identify concomitant injures.[56] Wrist arthroscopy remains the gold standard diagnostic tool for carpal ligament injury.[55] Management (i.e. immobilization, arthroscopic debridement, repair, reconstruction, or salvage procedure) depends on the timing, extent of ligament injury, carpal alignment, reducibility of malalignment, and the status of the cartilage.[57]

Distal radioulnar joint and Triangular fibrocartilage complex injuries

The triangular fibrocartilage complex (TFCC) includes the volar and dorsal distal radioulnar ligaments, central disc, meniscus homolog, ulnocarpal collateral ligament, ulnolunate ligament, ulnotriquetral ligament, and the extensor ulnaris tendon subsheath.[58,59] The TFCC is the primary stabilizer of the distal radioulnar joint (DRUJ).[60] **TFCC injuries** in athletes can occur from an acute traumatic event or repetitive microtrauma that results in degenerative tears.[60] Acute TFCC typically result from a concomitant axial load and rotational stress at the TFCC.[60] TFCC injuries in athletes can be distinguished from other ulnar-sided wrist injuries by preforming a careful history and physical examination.[7] TFCC pain localizes to the depression between the ulnar styloid and the pisiform.[7] Radiographs are often normal in patients with isolated TFCC injuries.[7] MRI (3Telsa) has been demonstrated to effectively detect TFCC injuries with a sensitivity and specificity of 86% and 100%, respectively.[56] In cases where imaging is negative but history and exam are consistent with TFCC injury, wrist arthroscopy can result in a definitive diagnosis and allow for simultaneous management of TFCC injuries.[3] Degenerative or acute central tears are successfully managed with debridement, while peripheral tears are often repaired given the vascularity and healing potential at the periphery.[61–63]

Overuse conditions

Dequervain's, or first dorsal compartment tendonitis, is the most common overuse related tendonitis of the wrist among athletes.[7] This condition is caused by the cumulative microtrauma that results from repetitive shearing of the abductor pollicis longus and extensor pollicis brevis at the undersurface of the sheath of the first dorsal compartment at the radial styloid.[7] Patients report pain at the radial styloid process that is exacerbated with twisting and grasping activities.[64,65]

Tenderness localizes to the first dorsal compartment over the radial styloid. Finklestein test is performed by placing the patient's thumb in a flexed position and concomitantly ulnarly deviating the wrist.[66] Conservative management includes splinting, steroid injection and therapy.[67] In cases where conservative management fails, first dorsal compartment release is associated with optimal results.[68]

Intersection syndrome results from the repetitive shearing that occurs between the first and second dorsal compartments. Pain and occasionally crepitus localizes to this region approximately 4 cm proximal to the level of the wrist. The primary etiology of the pain is suspected to be inflammation with the 2nd dorsal compartment. Conservative management includes splinting, steroid injection and therapy. In cases were conservative management fails, the second dorsal compartment could be surgically released.[69]

Extensor carpi ulnaris (ECU) pathology is the second most common overuse injury in athletes.[70] Microtrauma to the ECU tendon that occurs with repetitive activity in sports such as tennis can result in ECU tendonitis.[71] In contrast, abrupt supination of the flexed and ulnarly deviated wrist can result in rupture of the ECU subsheath and associated ECU instability.[71] ECU injuries are associated with pain and swelling along the course of the ECU tendon.[72] Conservative management includes splinting, nonsteroidal anti-inflammatories (NSAIDs), steroid injection and therapy.[71] ECU instability could be initially managed with a course of immobilization of the wrist in a pronated, extended and radial deviated position.[73] If ECU instability does not resolve with immobilization, several ECU stabilization techniques have been reported.[72,74,75]

CONCLUSION

Weekend warriors are individuals who condense their weekly physical activity into extended intervals over one or two days.[1] Excessive physical activity can result in a multitude of overuse and traumatic upper extremity injuries. Recognizing common hand and wrist injuries in these athletes can help clinicians effectively diagnose and manage these patients.

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