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Tendon and ligament injuries of the finger and thumb in athletes: a narrative review

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ABSTRACT

Acute finger and thumb injuries of the ligament and tendons are common. Indeed, a cross-sectional study in 2012 showed that they accounted for 38.4% of all upper extremity injury visits to the emergency room in the USA. Understanding the anatomy and mechanical functions of tendons and ligaments in the digits is crucial for recognising various types of injuries and their treatment. Treating an athlete with such conditions comes with the added pressure of ensuring a timely return to play. This review will cover the anatomy, diagnoses and management of select tendinous and ligamentous injuries of the fingers and thumb seen in athletes.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Tendon and ligament injuries of the fingers and thumb are commonly encountered in athletes; accurate diagnosis begins with the development of a strong understanding of the anatomy and function of these tendons and ligaments.
⇒ There is a paucity of randomised controlled trials comparing management options in tendon and ligament injuries of the finger and thumb in athletes.

WHAT THIS STUDY ADDS

⇒ Evidence from this review indicate that most athletes with acute finger and thumb injuries are able to return to play immediately without surgical intervention if they are able to tolerate immobilization with certain exceptions such as flexor digitorum profundus injuries, flexor pulley ruptures, irreducible dislocations, unstable joints, or large associated fractures.
⇒ The distal forearm squeeze test may be useful in identifying flexor digitorum profundus injuries; we postulate that squeezing the distal forearm in this test primarily targets the flexors rather than the extensors due to greater space (i.e., soft tissue) between the flexors and the radius/ulna.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Our literature review showed ongoing lack of high level of evidence to guide management for the finger/thumb injuries discussed in this review. For example, to our knowledge there are no randomized trials comparing operative and non-operative management for central slip injuries. Hopefully, this review could encourage more research to address these gaps that might potentially change standard of care.

INTRODUCTION

Acute injuries of the ligaments and tendons in the fingers are common. Indeed, a cross-sectional study in 2012 showed that they accounted for 38.4% of all upper extremity injury visits to the emergency room in the USA.[1] Understanding the anatomy and mechanical functions of tendons and ligaments in the digits is crucial for recognising various types of injuries and their treatment. Treating an athlete with such conditions comes with the added pressure of ensuring a timely return to play. This review will cover the anatomy, diagnoses and management of select tendinous and ligamentous injuries of the fingers and thumb seen in athletes.

TENDON INJURIES

Mallet finger

Mallet finger or 'baseball finger' occurs when the terminal extensor tendon or it's attachment at the distal phalanx is injured (figure 1).[2] Mallet finger has a mean incidence of 0.58 per 1000 person-years in patients 18 years of age or older and is most commonly seen in young men.[3 4] The mechanism of this injury usually involves an object (eg, a baseball) that forces an extended distal interphalangeal (DIP) joint into hyperflexion. Fingers three through five of the dominant hand are most frequently affected.[4 5] On examination, patients typically present with pain and swelling in the dorsal aspect of the DIP joint with accompanying extension lag (impaired or absent active extension of the joint). If a mallet finger is left untreated, future function may be impacted due to swan

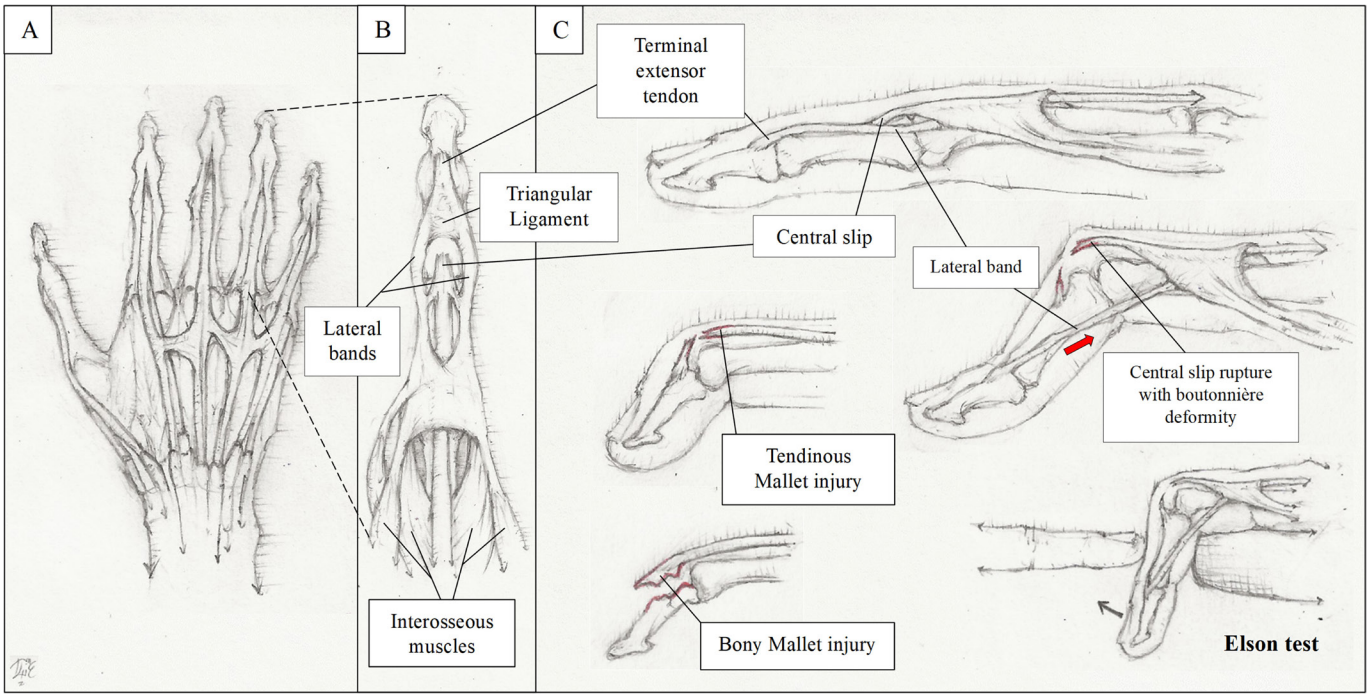

Figure 1 Anatomy and pathology of the extensors. (A) The extensor anatomy of the digits is depicted. (B) The dorsal side of the fourth finger is magnified to show the anatomy in detail. (C) Mallet injuries occur either through the rupture of the extensor tendon (tendinous mallet injury) or through an avulsion fracture with the tendon remaining intact (bony mallet injury). If a central slip injury is left untreated, a boutonnière deformity might develop; this results in volar subluxation of the lateral bands leading to flexion and extension of the PIP and DIP joints (red arrow), respectively. The Elson test may be used to assess for this injury. To perform the Elson test, the injured digit is flexed at a 90° over the edge of a table, the patient then tries to extend the PIP joint against resistance. The test is positive when there is an absence of extension force at the PIP joint and fixed extension at the DIP joint (black arrow). DIP, distal interphalangeal; PIP, proximal interphalangeal.

neck deformity, chronic extensor lag and DIP joint osteoarthritis.[6 7]

When a patient with a suspected mallet injury presents to the clinic, it is essential to obtain plain X-rays (posterior–anterior and lateral views) since avulsion fractures are present in about one-third of these cases.[8] These avulsion fractures may leave the tendon intact as seen with bony mallet injuries, which seem to have better outcomes with splinting (improved extension lag by 5°) compared with those tendinous mallet injuries that rupture the extensor tendon (figure 1).[9] Operative repair is typically indicated if plain films identify an avulsion fracture at the dorsal base of the distal phalanx involving >30% of the articular surface to prevent volar subluxation and loss of joint congruency.[5 10] In uncomplicated cases when radiographs are negative for large avulsion fractures and the DIP joint has full passive extension, splinting of the DIP joint in a neutral or hyperextended position that allows proximal interphalangeal (PIP) joint motion for 6–8 weeks is advised.[11] Athletes should be warned not to flex the DIP joint during this period to avoid redamaging the tendon.[12] Thereafter, splinting is weaned to nighttime use for 6 weeks[13] and may be achieved in a variety of ways, including using QuickCast, stack splints or custom-fabricated thermoplastic splints. Patient compliance with splinting is essential for a successful outcome,[14] and the type of immobilisation product or method used has no difference on outcomes.[15 16] Even in patients with chronic mallet injuries, the use of custom-made finger orthosis (for 6 weeks followed by an additional 2 weeks at nighttime) had comparable efficacy to patients with acute mallet injuries treated the same way in terms of extension lag and disability.[17] These results should be interpreted with caution, as they specifically apply to Doyle-type 1 mallet injuries. Furthermore, the chronic group exhibited greater baseline disability and showed less improvement in total active motion compared with the acute group at the 12-week mark, leaving uncertainty to the generalisability of these results.

Central slip extensor injury

Central slip injuries involve the rupture or injury of the central slip of the extensor tendon at the PIP joint and may be caused by forced hyperflexion of the PIP joint during active extension, volar dislocation of the middle phalanx or direct lacerations (figure 1). Ball sports where the use of the hands is essential such as basketball, baseball, American football or volleyball is where this injury may be seen. Typically, force from a ball applied to the tip of an extended figure resulting in sudden forced flexion at the PIP joint will cause a central slip injury, such as seen in basketball when a player jams their finger while dribbling, or in volleyball during sets.[18]

Patients with a central slip injury will present with tenderness in the dorsal side of the PIP joint with impairment of active extension of the PIP joint. However, if the triangular ligament remains uninjured, the extension of the PIP joint through the lateral bands could remain intact, which may lead the clinician astray, especially in closed central slip injuries. The Elson test (online supplemental video 1) should be performed to avoid the pitfall of missing a central slip injury (figure 1).[19] There is one caveat: a fixed extension may not be present at the DIP joint in patients with concurrent bilateral lateral band laceration, but a lack of extension force at the PIP joint should raise suspicion for this type of injury.[20]

Early immobilisation is the primary conservative treatment for central slip injuries. Splinting regimens should involve PIP joint extension for a period of 6 weeks to allow for healing of the central slip to the middle phalanx, followed by another 6 weeks of nighttime splinting. Compared with operative management in a cohort of 33 adult patients treated within 6 weeks of injury, this 12-week splinting regimen achieved satisfactory results (>80% of normal flexion at PIP joint and/or 'summated flexion') in 75% of patients undergoing conservative treatment compared with 35% undergoing operative management.[21] Operative management is required for central slip injuries with accompanying PIP joint dorsal lip fracture fragments with >2 mm of displacement, ventral (palmar) lip fractures involving >50% of the articular surface, associated volar dislocations with or without fractures or open laceration of the central slip.[22 23] If a central slip injury is left untreated, the patient runs a risk of developing a boutonnière deformity (figure 1). Splinting should allow for daily DIP joint flexion exercises, which may help prevent and treat boutonnière deformities by promoting dorsal positioning of the lateral bands.[23] Persistent boutonnière deformity may necessitate repair of the central slip and/or adjusting the positions of the lateral bands.[24]

Flexor digitorum profundus injury

Injury to the flexor digitorum profundus (FDP) or 'Jersey finger' occurs when a sudden forced extension is applied to a flexed DIP joint (eg, finger catches an opponent's jersey), resulting in avulsion from its insertion in the distal phalanx (figure 2). The fourth finger is affected 62% of the time,[25] which may be explained by the weaker FDP tendon insertion in the distal phalanx of the fourth finger compared with the third finger.[26] FDP injury results in an inability to flex the DIP joint with a tendency to be slightly extended in comparison to other unaffected digits at a resting position. This injury may be further assessed by performing the distal forearm squeeze test (figure 3, online supplemental video 2).[27] Concurrent flexor digitorum superficialis tendon injury is rare, however, if suspected, an ultrasound may be useful to diagnose this injury, which may impact management (eg, surgical planning).[28]

Currently in athletes with suspected FDP injury, surgical treatment is the rule, which includes tendon reinsertion or repair. This has been challenged by a recent small retrospective study that suggests non-operative management has similar outcomes to surgical repair in patients presenting with zone I FDP tendon injuries (figure 2).[29] However, most of the FDP injuries included in this study were due to direct laceration in non-athletic events, potentially limiting its generalisability to athletes. As for more severe, zone II or greater, FDP rupture, the tendon further retracts proximally, damaging the vincula and potentially resulting in devascularisation of the FDP tendon (figure 2). Zone II FDP injuries, also called 'critical zone injuries', are particularly associated with digital artery and nerve damage with poor outcomes if left untreated.[30] Early surgical intervention (7–10 days post injury) is recommended in these instances to prevent ischaemic degeneration of the flexor tendons.[31] Other complications may include reduced or loss of pinch strength due to impaired DIP joint function.[29] FDP avulsion fracture deserves a special mention since these injuries usually get lodged at the annular (A4) pulley (figure 2) due to the avulsed bony fragment still attached to an usually intact FDP tendon;[10] all FDP avulsion fractures require operative intervention (eg, bone fragment fixation with a hook plate).[32]

LIGAMENT INJURIES

Ulnar collateral ligament injury of the thumb

Acute ulnar collateral ligament (UCL) injury of the thumb is classically seen in skiers (ie, 'skier's thumb' or 'goalkeeper's thumb') with a history of breaking a fall while holding the ski pole handles. This results in radial stress to the UCL from forced extreme abduction and extension of the metacarpophalangeal (MCP) joint of the thumb (figure 4). However, any valgus stress to the thumb could potentially injure the UCL, including throwing sports (eg, javelin) or stick sports (eg, hockey, lacrosse). Also in baseball, sliding head first with an outstretched hand with an abducted thumbs towards a base is a common mechanism for injuring the UCL.[33]

Patients typically present with pain and swelling in the UCL or at the base of the thumb with decreased range of motion of the MCP of thumb.[10] Interestingly, the site of a thumb UCL tear or rupture tends to occur at the distal insertion of proximal phalanx. In contrast, the rupture site for thumb radial collateral ligament (RCL) injuries often occurs more proximally at the insertion of the metacarpal head.[34] A firm mass palpated around the ulnar border of the metacarpal head suggests avulsion of the UCL distally resulting in a Stener lesion (figure 4), which occurs in greater than 60% of cases.[33] Ultrasonography is helpful in detecting UCL injury of the thumb and the Stener lesion.[5 35] Moreover, joint laxity may also be assessed with a dynamic ultrasound evaluation; plain films are often normal unless a concurrent avulsion fracture is present,[36] which occurs in a third of cases.[37] Care needs to be taken when abducting the thumb during

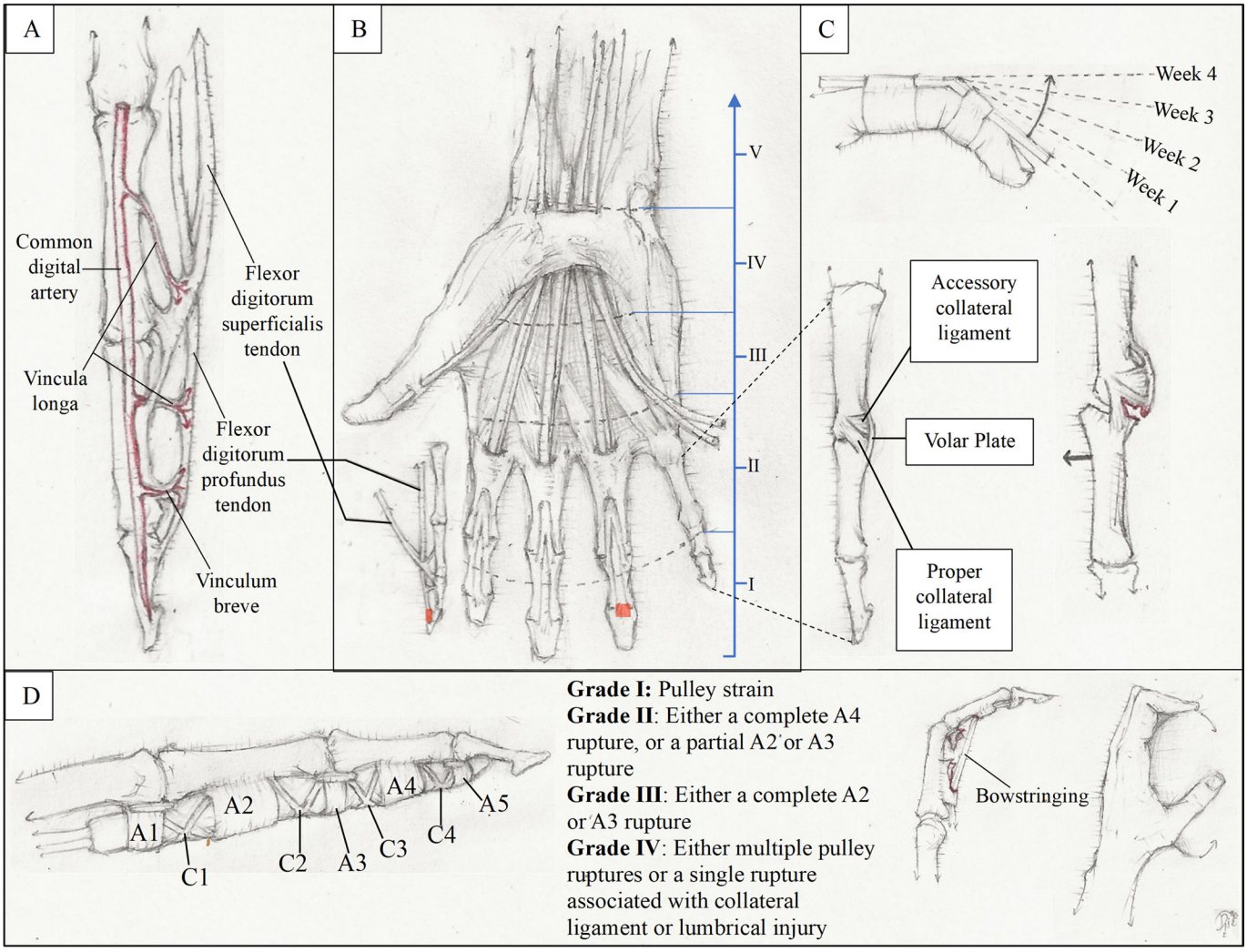

Figure 2 Anatomy and pathology of the flexors and collateral ligaments. The function of the FDP and FDS tendons is to flex the DIP and PIP joints, respectively. The vinculum brevis and longus compromise the vincular system that provides the blood supply to both these tendons. (B) The flexor anatomy of the digits is shown (the fifth finger dissected deeper with tendons retracted); FDP injury typically affects the fourth finger (highlighted in red). The zone classification (roman numerals) of flexor tendon injury is also depicted. (C) The lateral view of the fifth finger portrays the two collateral ligaments and volar plate of the PIP joint. Dorsal dislocation of the middle phalanx (arrow) often results in damage to both the collateral ligaments and the volar plate. An example of progressive extension using a dorsal blocking splint to treat a volar plate injury is also shown. (D) The anatomy of the pulley system of the finger is shown along with Schöffl's injury grades. The 'crimp-grip position' (MCP and DIP joints in extension while PIP joints in flexion) puts a tremendous force across the pulley system, especially across the A2, A3 and A4 pulleys, which may lead to significant damage complicated by bowstringing. DIP, distal interphalangeal; FDP, flexor digitorum profundus; FDS, flexor digitorum superficialis; MCP, metacarpophalangeal; PIP, proximal interphalangeal.

examination to prevent further injuring the patient by inducing a Stener lesion.[38]

Maintaining a high level of suspicion for UCL injuries is crucial to prevent the development of a weak pinch grip, which is an essential function of the thumb's UCL.[39] To identify an unstable joint, valgus stress is applied to the MCP joint. Of note, a nerve block (eg, ultrasound-guided median and radial nerve block with 1% lidocaine (2–5 mL for each nerve)) injected 3–5 min prior to the physical exam may be needed to reduce pain. If the application of valgus stress reveals joint laxity compared with the uninjured thumb, laxity without a fixed endpoint, or laxity >30°, this suggests a complete UCL tear (table 1), requiring surgical intervention to reattach the ligament to the bone (figure 4). Additionally, surgical correction is indicated for a Stener lesion because the adductor aponeurosis prevents ulnar ligament contact with the bony insertion (figure 4), which is essential for healing. Otherwise, laxity of <30° is suggestive of a partial tear and may be treated with a thumb-spica cast or splint for 4–6 weeks followed by thumb rehabilitation exercises.[40] In a recent meta-analysis,[41] no difference in clinical outcomes was noted between different surgical techniques (eg, bone anchor reinsertion, suture fixation, Kirschner-wire fixation of avulsion fracture or combination of techniques), suggesting that the ideal procedure is reliant on surgeon preference.

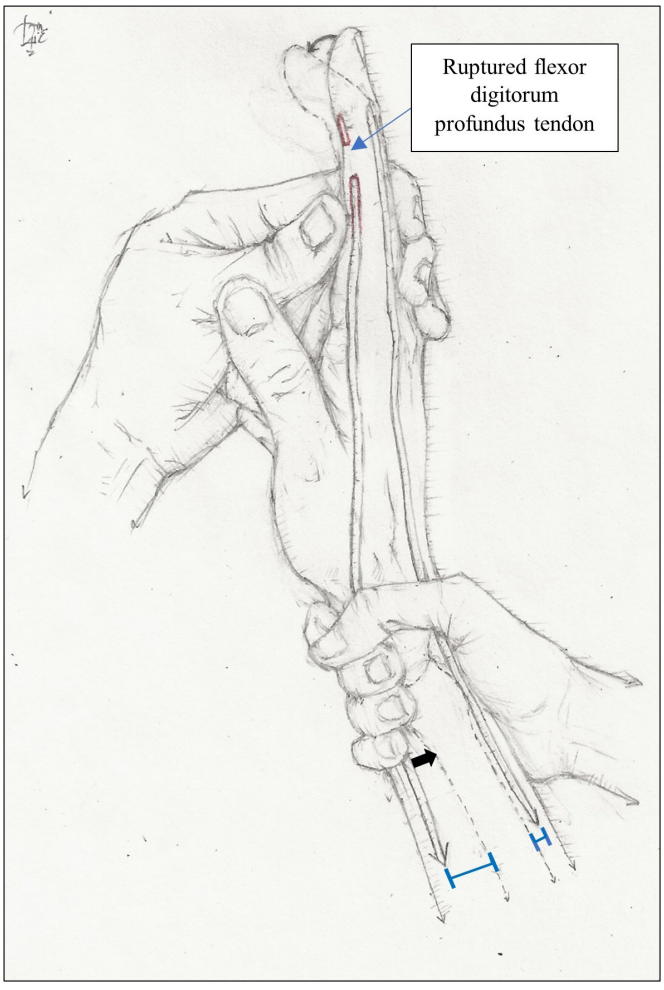

Figure 3 Distal forearm squeeze test. This test is performed by squeezing the distal forearm while isolating the DIP joint of the suspected injured finger; a lack of flexion at the DIP joint (curved black arrow) is considered a positive test. The flexors are favoured in the squeeze test because there is a greater gap (straight black arrow) between the flexors and the arm bones—ie, radius and ulna—than the extensors and the arm bones. DIP, distal interphalangeal.

RCL injury of the thumb

RCL injury of the thumb occurs 10 times less often than UCL injury of the thumb.[33] Mechanism of RCL injuries is due to sudden forced adduction of the thumb.[33] Common mechanisms include a fall into an abducted thumb or a ball strike at the radial side of the thumb. This injury may occur concomitantly with UCL ligament injury, especially in NFL Football players where a retrospective study showed simultaneous combined UCL and RCL tears occurred in 25% of all thumb injuries.[42] This injury could also be seen in ball sports such as basketball[43] and volleyball. Patients may have weakness of the pinch grip and point tenderness at the proximal origin of the ligament at the radial side on physical examination. Ultrasonography and MRI may be necessary if diagnosis is in doubt because this injury is often missed.[44]

Management of this injury is similar to UCL injury of the thumb, such as a thumb-spica cast or splint for 4–6 weeks followed by thumb rehabilitation exercises for grade I–II injuries (table 1). Operative management is especially considered for Grade III RCL (complete ligament tear) injuries since they are more prone to complications (eg, joint instability, arthritis), most likely due to incompetent healing.[45]

Collateral ligament injury of the fingers

Compared with collateral ligament injuries involving the thumb, collateral ligament injuries in the lesser digits are uncommon (figure 2)[46] and are a result of partial or complete tears, most often involving the PIP joints due to forced valgus or varus stress at these joints. The UCLs from the third to the fifth fingers are most vulnerable to these injuries.[47 48] Collateral ligament injury to the MCP joint of the lesser fingers are less common with a predilection to the RCL.[49] Athletes tend to report a history of a 'jammed finger' with pain in the ulnar or radial side of the affected ligament and decreased range of motion.[8] Laxity of the affected joint may be noted in comparison to unaffected joints. Plain films may show associated complications (eg, avulsion fracture, dislocation); However, ultrasonography and MRI are more useful in identifying ligament injuries, with the understanding that MRI accurately detects PIP collateral ligament injuries only 39% of the time.[50]

Collateral ligament injuries can be classified into three grades (table 1) with surgical intervention warranted for grade III injuries or complete collateral ligament rupture.[51 52] A stable joint with no large fractures or grade I injuries may be treated with splinting and/or buddy taping— taping the injured finger to its adjacent preferably larger finger—for 4–6 weeks.[53] Timely treatment with buddy taping in patients with PIP joint collateral ligament injury appears to have the most influence in preventing poor functional outcomes (eg, limited range of motion) in the long term.[54]

Volar plate injury

Injury to the volar plate may be caused by finger joint hyperextension or dorsal dislocations (figure 2). This type of injury is commonly seen in netball, basketball and cricket. A scenario that may cause this type of injury is when an athlete blocks a shot or a pass in a basketball game. This injury has a predilection for the PIP joint (the most commonly dislocated joint),[39] which is especially prone to dorsal dislocations as the central slip is weaker than the volar plate.[12] Patients will present with volar pain at the affected joint and may also have pain on the lateral sides of the injured joint since concurrent collateral ligament injuries are common. Ultrasonography helps identify volar plate injuries and might avoid the need for an MRI.[55]

Untreated chronic volar plate injuries may result in a pseudoboutonnière deformity due to scarred tissue contracting the PIP joint into flexion. This condition exclusively affects the fourth and fifth fingers and should be distinguished from a boutonnière deformity.[56]

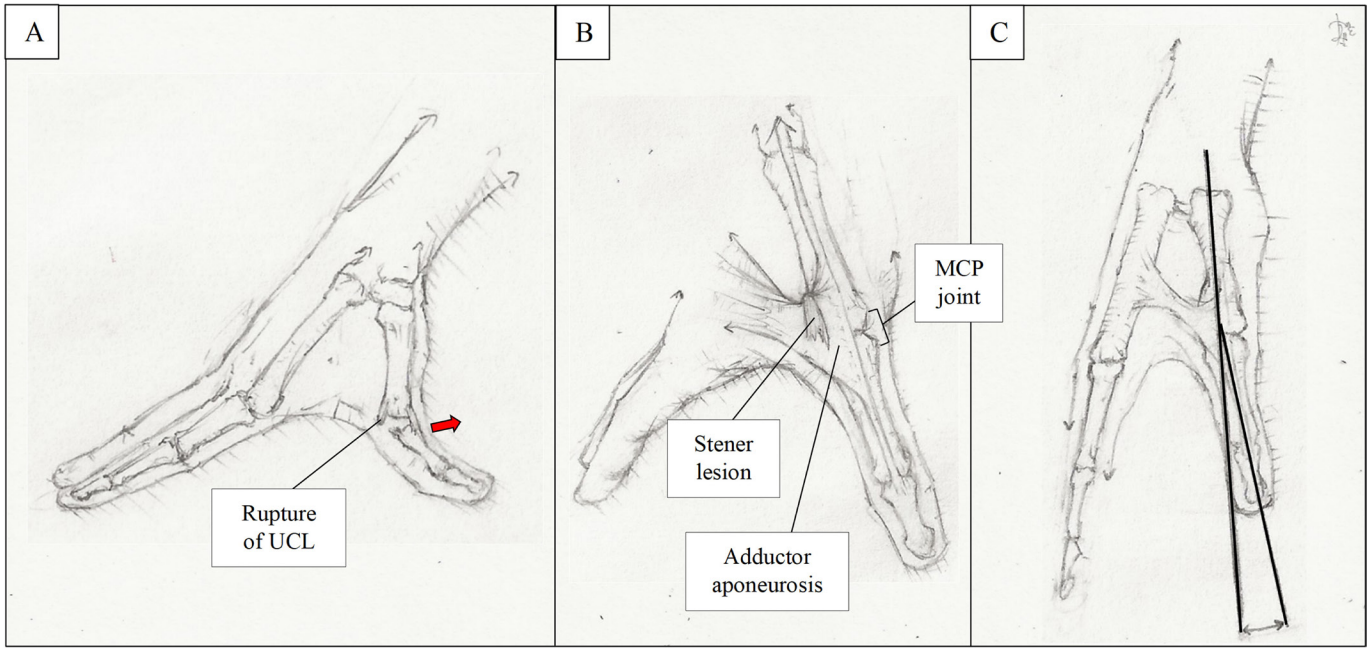

Figure 4 Ulnar collateral ligament injury of the thumb. (A) Ulnar collateral ligament (UCL) may be damaged from forced abduction (red arrow). (B) Stener lesions occur when the UCL is displaced outside the adductor aponeurosis. This leads to UCL entrapment and reduced likelihood of healing with conservative management. (C) To determine the degree of laxity, the metacarpophalangeal (MCP) joint is stabilised while applying a valgus stress.

Unstable joints, irreducible dislocations or a large associated avulsion fracture are likely to need surgical intervention. Otherwise, a dorsal blocking aluminium splint angling the PIP joint at 30° flexion (figure 2) with weekly increases in the extension angle by 8–10° until full extension is achieved, with buddy taping used thereafter is recommended.[8] However, a recent study[57] showed that figure-of-8 orthoses with limitation to extension by 15–20° had similar outcomes for stable PIP volar plate injuries when compared with dorsal blocking splints. Unlike the figure-of-8 orthosis, dorsal blocking splints had to be serially extended by 10° weekly (starting at 30° flexion), possibly making the figure-of-8 orthosis a more attractive option for volar plate injuries due to ease of use.

Flexor pulley injuries

The pulley system of the finger is responsible for maintaining close proximity of the flexor tendon to the phalanges, which is necessary for the proper function of the finger flexors.[10] This system is composed from annular (A1–A5) and cruciate (C1–C4) pulleys (figure 2). Rock climbing and bouldering require a unique gripping motion (ie, 'crimp-grip position') that directs significant amount of force across the pulley systems increasing risk of injury (figure 2).[58] However, martial artists practising Kendo[59] and baseball pitchers[60] may also develop pulley injuries with A1 and A4 pulleys being most vulnerable, respectively. Patients typically present with local tenderness and oedema over the injured pulley(s) in the volar side.[61] Physical exam may reveal pain or discomfort with resisted flexion and gripping motion of the affected finger. Plain X-rays are recommended to rule out fractures. However, an MRI is the gold standard to identify and assess the severity of these injuries (strain vs complete rupture). Due to ease of access and relatively low cost, ultrasound may be an alternative method to MRI in identifying pulley injuries if the operator is skilled enough.[62]

The Schöffl classification system[63] is useful in determining injury severity of flexor pulley injuries to help

Table 1 Classification of collateral ligament injuries*

Grade	Description	Treatment
I	Tenderness over the injured collateral ligament without significant laxity	Buddy taping (lesser fingers) or thumb spica for 4 weeks at minimum[8 33]
II	Partial tears; laxity is present *with* a firm endpoint	†Immobilisation for 6 weeks[45]
III	Complete tears; laxity is present *without* a defined endpoint or Stener lesion	Refer to a hand surgeon for potential surgical repair

*This grading system is used for both the lesser digits and thumb collateral ligament injuries.
†This includes a thumb spica, or full-finger extension cast or orthosis for the lesser fingers.

guide management decisions (figure 2). Grade I–III injuries are often treated conservatively with rest, physical therapy, non-steroidal anti-inflammatory drugs and different taping methods (eg, H-taping) or a protective splint (eg, external pulley ring splint). For these injuries, initial immobilisation is usually necessary except for grade I injuries. Grade IV injuries often require operative intervention (repair or reconstruction), however,

Table 2 Return to play timelines

Type of Injury	Recommendations	Complications/comments
Mallet finger	May return to play if able to compete with a splint	Patients should be warned about flexing the DIP joint during the 6–8 week splinting period because this treatment must be restarted every time flexion occurs
Central slip extensor injury	May return to play if able to compete with a splint*	Boutonnière deformity may develop as soon as 2–3 weeks post-injury if left untreated[64]
Flexor digitorum profundus injury	► Requires surgery (preferably within a week, no later than 3 weeks)† for tendon to heal with anticipated return to play between 10 and 12 weeks post-operation in sports requiring gripping and grasping manoeuvres[7 65] ► In non-grasping sports, an earlier return to play may be achieved with a fist-type cast[66]	Athletes are at risk of re-rupturing tendon if return to full grasping play occurs before 10–12 weeks[67]
Ulnar or radial collateral ligament injury of the thumb	► Partial tears: athlete may return to play if able to tolerate immobilisation with thumb spica splint (4–6 weeks). Patient may return to play without splinting when full range of motion and strength returns in the affected thumb without inducing pain.[68] ► Complete tears: operative intervention is often needed initially, but otherwise return to play is similar to partial tears	It is important not to miss a Stener lesion since it may lead to chronic complications—joint instability, thumb pain and osteoarthritis[69]
Volar plate injury	► Stable joints: may return to play with buddy taping[5] ► Unstable joints: may return to play with dorsal blocking splints or figure-of-8 orthoses with extension limitation for a minimum of 4 weeks‡	Untreated volar plate injuries may lead to contractures and pseudoboutonnière deformity[70]
Collateral ligament injury of the lesser digits	► Stable PIP joints: may return to play if protected with buddy taping ► Unstable PIP joints: add a hinged ligament splint to buddy taping for return to play	Skin injuries such maceration or necrosis have been documented by surgeons,[71] especially with buddy taping of the PIP joint
Pulley injury	► Grade I: light sport activity in 2–6 weeks; full sports activity after 6 weeks ► Grade II: 10–14 days of immobilisation, light sport activity at 6–8 weeks; full sports activity after 8–10 week ► Grade III: immobilisation with light sports activity at 8–12 weeks; full sports activity after 3 months post injury ► Grade IV: requires operative intervention with return to play at around 6 months post-operation[5]	H-taping after return to full play is often done/continued for an additional 3 months in grade I–III injuries, and at least 12 months for grade IV injuries[58]

*There are various game time protection methods (eg, figure-8 taping or digital sleeves) for athletes that allow an unhampered feel of the ball.[72]
†After 3 weeks, the development of muscle fibrosis and tendon contraction eliminates the option of primary tendon surgical repair.
‡Patients who had undergone surgical intervention for volar injuries may require up to 16 weeks of splinting during play.[5]
DIP, distal interphalangeal; PIP, proximal interphalangeal.

clinically apparent bowstringing or longer than anticipated healing time in grade III injuries may also require operative treatment.[7]

Return to play

Numerous factors influence the timing of an athlete's return to their sport (table 2). For instance, athletes playing sports that require less use of the hands (eg, football) are more likely to tolerate a splint than others (eg, basketball). Overall, improvement in range of motion is crucial before return to play. Therefore, certified hand therapists and trainers need to be involved with the rehabilitation process. Buddy taping and splinting can be recommended to athletes for better protection when they resume their sport[12] A multidisciplinary approach that considers factors such as the competition level, hand dominance, athletes' expectations and the type of sport and position played will determine when an athlete can return to play, with the ultimate goal of preventing permanent sequelae that may negatively affect performance or even threaten an athlete's career.

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REFERENCES

1 Ootes D, Lambers KT, Ring DC. The epidemiology of upper extremity injuries presenting to the emergency department in the United States. *Hand (N Y)* 2012;7:18–22.
2 Cheung JPY, Fung B, Ip WY. Review on mallet finger treatment. *Hand Surg* 2012;17:439–47.
3 Krastman P, de Schepper E, Bindels P, *et al*. Incidence and management of mallet finger in Dutch primary care: a cohort study. *BJGP Open* 2024;8.
4 Lamaris GA, Matthew MK. The Diagnosis and Management of Mallet Finger Injuries. *Hand (N Y)* 2017;12:223–8.
5 Netscher DT, Pham DT, Staines KG. Finger Injuries in Ball Sports. *Hand Clin* 2017;33:119–39.
6 Salazar Botero S, Hidalgo Diaz JJ, Benaïda A, *et al*. Review of Acute Traumatic Closed Mallet Finger Injuries in Adults. *Arch Plast Surg* 2016;43:134–44.
7 Rosenbaum YA, Awan HM. Acute hand injuries in athletes. *Phys Sportsmed* 2017;45:151–8.
8 Leggit JC, Meko CJ. Acute finger injuries: part I. Tendons and ligaments. *Am Fam Physician* 2006;73:810–6.
9 Rubin G, Ammuri A, Mano UD, *et al*. Outcome Differences between Conservatively Treated Acute Bony and Tendinous Mallet Fingers. *J Clin Med* 2023;12:6557.
10 Scalcione LR, Pathria MN, Chung CB. The athlete's hand: ligament and tendon injury. *Semin Musculoskelet Radiol* 2012;16:338–49.
11 Simpson D, McQueen MM, Kumar P. Mallet deformity in sport. *J Hand Surg Br* 2001;26:32–3.
12 Miller EA, Friedrich JB. Management of Finger Joint Dislocation and Fracture-Dislocations in Athletes. *Clin Sports Med* 2020;39:423–42.
13 Skinner S, Isaacs J. Extensor Tendon Injuries in the Athlete. *Clin Sports Med* 2020;39:259–77.
14 Azad A, Kegel G, Phelps J, *et al*. A Prospective Analysis of Patient Characteristics Affecting the Outcome of Dorsal Splinting for Soft Tissue Mallet Injuries. *Hand (N Y)* 2023;18:1330–5.
15 Algar L, Backe H, Richer R, *et al*. Prospective Randomized Clinical Trial Comparing 3-Point Prefabricated Orthosis and Elastic Tape Versus Cast Immobilization for the Nonsurgical Management of Mallet Finger. *J Hand Surg Am* 2023;48:951.
16 Pike J, Mulpuri K, Metzger M, *et al*. Blinded, prospective, randomized clinical trial comparing volar, dorsal, and custom thermoplastic splinting in treatment of acute mallet finger. *J Hand Surg Am* 2010;35:580–8.
17 Shafiee E, Farzad M, Beikpour H. Orthotic Intervention with Custom-made Thermoplastic Material in Acute and Chronic Mallet Finger Injury: A Comparison of Outcomes. *Arch Bone Jt Surg* 2024;12:176–82.
18 Warden D, Moore N, Samyn K. Jammed Finger in High School Football Player. *Am Fam Physician* 2022;105:549–51.
19 Elson RA. Rupture of the central slip of the extensor hood of the finger. A test for early diagnosis. *J Bone Joint Surg Br* 1986;68:229–31.
20 Janssen P, Melamed E. Central slip and bilateral lateral band laceration with negative Elson's and modified Elson's tests. *Trauma Case Rep* 2022;40:100671.
21 Souter WA. The problem of boutonniere deformity. *Clin Orthop Relat Res* 1974;116–33.
22 Kiefhaber TR, Stern PJ. Fracture dislocations of the proximal interphalangeal joint. *J Hand Surg Am* 1998;23:368–80.
23 Marino JT, Lourie GM. Boutonnière and pulley rupture in elite athletes. *Hand Clin* 2012;28:437–45.
24 McDevitt ER. On-Site Treatment of PIP Joint Dislocations. *Phys Sportsmed* 1998;26:85–6.
25 Brady C, Lee A, Gardiner M, *et al*. The outcomes of zone 1 flexor digitorum profundus tendon injury: A systematic review and meta-analysis. *J Plast Reconstr Aesthet Surg* 2022;75:893–939.
26 Manske PR, Lesker PA. Avulsion of the ring finger flexor digitorum profundus tendon: an experimental study. *Hand (N Y)* 1978;10:52–5.
27 Zhi Y, Wu C, Li M. Distal forearm squeeze test for the diagnosis of digital flexor tendon injuries. *BMC Musculoskelet Disord* 2023;24:975.
28 de Villeneuve Bargemon J-B, Jaloux C, Viaud-Ambrosino S, *et al*. A jersey finger diagnostic trap: Rupture of the flexor digitorum profundus tendon and the flexor digitorum superficialis tendon. *Trauma Case Rep* 2021;34:100476.
29 Compton J, Wall LB, Romans S, *et al*. Outcomes of Acute Repair Versus Nonrepair of Zone I Flexor Digitorum Profundus Tendon Injuries. *J Hand Surg Am* 2023;48:832.
30 Pamuk Ç. Is microsurgical experience essential in Zone II flexor tendon injuries? *Jt Dis Relat Surg* 2023;34:183–9.
31 Henry SL, Katz MA, Green DP. Type IV FDP avulsion: lessons learned clinically and through review of the literature. *Hand (N Y)* 2009;4:357–61.
32 Fa-Binefa M, Pérez-López G, Almenara M, *et al*. Hook Plate as a Treatment for Flexor Digitorum Profundus Avulsion Types II and III. *Hand (N Y)* 2021;16:551–6.
33 Daley D, Geary M, Gaston RG. Thumb Metacarpophalangeal Ulnar and Radial Collateral Ligament Injuries. *Clin Sports Med* 2020;39:443–55.

34 Morales-Restrepo A, Bhogal S, Fowler JR. Rupture Site Location of Surgically Treated Thumb Metacarpophalangeal Ulnar and Radial Collateral Ligaments. *J Hand Surg Glob Online* 2021;3:278–81.
35 Allen GM, Jacobson JA. Ultrasonography: sports injuries. In: Hodler J, Kubik-Huch RA, von Schulthess GK, eds. *Musculoskeletal diseases 2021-2024: diagnostic imaging*. IDKD Springer Series. Springer, 2021.
36 Knisely B, Noland SS, Melville DM. Ultrasound versus MRI in the evaluation of the thumb metacarpophalangeal joint. *J Ultrason* 2023;23:e214–22.
37 Clavero JA, Alomar X, Monill JM, *et al*. MR imaging of ligament and tendon injuries of the fingers. *Radiographics* 2002;22:237–56.
38 Rozmaryn LM. The Collateral Ligament of the Digits of the Hand: Anatomy, Physiology, Biomechanics, Injury, and Treatment. *J Hand Surg Am* 2017;42:904–15.
39 Leggit JC, Meko CJ. Acute finger injuries: part II. Fractures, dislocations, and thumb injuries. *Am Fam Physician* 2006;73:827–34.
40 Ritting AW, Baldwin PC, Rodner CM. Ulnar collateral ligament injury of the thumb metacarpophalangeal joint. *Clin J Sport Med* 2010;20:106–12.
41 Legerstee IWF, Derksen BM, van der Oest MJW, *et al*. Clinical outcomes after primary repair for thumb ulnar collateral ligament ruptures: a systematic review and meta-analysis. *J Hand Surg Eur Vol* 2024;49:534–45.
42 Werner BC, Belkin NS, Kennelly S, *et al*. Injuries to the Collateral Ligaments of the Metacarpophalangeal Joint of the Thumb, Including Simultaneous Combined Thumb Ulnar and Radial Collateral Ligament Injuries, in National Football League Athletes. *Am J Sports Med* 2017;45:195–200.
43 Holderread BM, Jafarnia J, Phelps B, *et al*. Return to Sport and Performance After Thumb Metacarpophalangeal Joint Collateral Ligament Surgery in the National Basketball Association. *Cureus* 2023;15:e42499.
44 Madden CC, Putukian M, McCarty EC, et al, eds. *Netter's Sports Medicine*. 3rd edn. Elsevier, 2023.
45 Langdell HC, Zhang GX, Pidgeon TS, *et al*. Management of Complex Hand and Wrist Ligament Injuries. *Hand Clin* 2023;39:367–77.
46 Lourie GM, Gaston RG, Freeland AE. Collateral ligament injuries of the metacarpophalangeal joints of the fingers. *Hand Clin* 2006;22:357–64.
47 Wieschhoff GG, Sheehan SE, Wortman JR, *et al*. Traumatic Finger Injuries: What the Orthopedic Surgeon Wants to Know. *Radiographics* 2016;36:1106–28.
48 Giese J, Cerniglia C. Soft Tissue Injuries of the Finger and Thumb. *Semin Ultrasound CT MR* 2018;39:397–410.
49 Cockenpot E, Lefebvre G, Demondion X, *et al*. Imaging of Sports-related Hand and Wrist Injuries: Sports Imaging Series. *Radiology* 2016;279:674–92.
50 Sahin MS. The Accuracy and Cost-Effectiveness of MRI Assessment of Collateral Ligament Injuries of the Lesser Digits' Proximal Interphalangeal Joints. *Cureus* 2022;14:e28306.
51 Delaere OP, Suttor PM, Degolla R, *et al*. Early surgical treatment for collateral ligament rupture of metacarpophalangeal joints of the fingers. *J Hand Surg Am* 2003;28:309–15.
52 Sahin MS. Midterm clinical outcomes of collateral ligament repair of the thumb and lesser digits: a retrospective analysis of 35 cases. *BMC Musculoskelet Disord* 2022;23:697.
53 Halim A, Weiss APC. Return to Play After Hand and Wrist Fractures. *Clin Sports Med* 2016;35:597–608.
54 Roh YH, Koh YD, Go JY, *et al*. Factors influencing functional outcome of proximal interphalangeal joint collateral ligament injury when treated with buddy strapping and exercise. *J Hand Ther* 2018;31:295–300.
55 Wang T, Guo F, Qi H, *et al*. The role of ultrasonography in diagnosing acute closed volar plate injury of proximal interphalangeal joint. *BMC Med Imaging* 2023;23:117.
56 Rothwell AG. The pseudo-boutonniere deformity. *N Z Med J* 1979;89:51–4.
57 Grange M, Carra K, Barrett S, *et al*. Management of stable proximal interphalangeal joint volar plate injuries with figure-of-8 orthoses: A parallel-group randomized controlled trial. *J Hand Ther* 2024;37:363–70.
58 Miro PH, vanSonnenberg E, Sabb DM, *et al*. Finger Flexor Pulley Injuries in Rock Climbers. *Wilderness Environ Med* 2021;32:247–58.
59 Lee JH, Kim HS, Joo SH. Isolated A1 Pulley Rupture of Left Fourth Finger in Kendo Players: Two Case Reports. *Ann Rehabil Med* 2015;39:838–43.
60 Lourie GM, Hamby Z, Raasch WG, *et al*. Annular flexor pulley injuries in professional baseball pitchers: a case series. *Am J Sports Med* 2011;39:421–4.
61 Shapiro LM, Kamal RN. Evaluation and Treatment of Flexor Tendon and Pulley Injuries in Athletes. *Clin Sports Med* 2020;39:279–97.
62 Berrigan W, White W, Cipriano K, *et al*. Diagnostic Imaging of A2 Pulley Injuries: A Review of the Literature. *J Ultrasound Med* 2022;41:1047–59.
63 Schöffl V, Hochholzer T, Winkelmann HP, *et al*. Pulley injuries in rock climbers. *Wilderness Environ Med* 2003;14:94–100.
64 Carruthers KH, Skie M, Jain M. Jam Injuries of the Finger: Diagnosis and Management of Injuries to the Interphalangeal Joints Across Multiple Sports and Levels of Experience. *Sports Health* 2016;8:469–78.
65 Griffin M, Hindocha S, Jordan D, *et al*. An overview of the management of flexor tendon injuries. *Open Orthop J* 2012;6:28–35.
66 Freilich AM. Evaluation and treatment of jersey finger and pulley injuries in athletes. *Clin Sports Med* 2015;34:151–66.
67 McCue FC, Wooten SL. Closed tendon injuries of the hand in athletics. *Clin Sports Med* 1986;5:741–55.
68 Lese AB, Waggy CA. Hand and Finger Injuries: Tendon and Soft Tissue Injuries of the Hand. *FP Essent* 2021;500:28–32.
69 Tresley J, Singer AD, Ouellette EA, *et al*. Multimodality Approach to a Stener Lesion: Radiographic, Ultrasound, Magnetic Resonance Imaging, and Surgical Correlation. *Am J Orthop (Belle Mead NJ)* 2017;46:E195–9.
70 Prucz RB, Friedrich JB. Finger joint injuries. *Clin Sports Med* 2015;34:99–116.
71 Won SH, Lee S, Chung CY, *et al*. Buddy taping: is it a safe method for treatment of finger and toe injuries? *Clin Orthop Surg* 2014;6:26–31.
72 Smith DW. Boutonnière and pulley rupture in elite basketball. *Hand Clin* 2012;28:449–50.