Closed Sagittal Band Injury Due to Low Energy Trauma

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Abstract

Sagittal band injury is a relatively common cause of extensor tendon subluxation caused by inflammatory disease or high-energy trauma. However, there are few reports in the literature describing sagittal band injury due to low energy trauma. In this report, we describe successful nonsurgical management of a closed sagittal band injury and extensor tendon subluxation associated with low-energy trauma. Patients in 2 cases had no rheumatoid arthritis or history of inflammatory diseases. Conservative treatment resulted in relief of symptoms and corrected the instabilities with no complications.

Sagittal band injuries typically cause pain over the metacarpophalangeal (MCP) joint and, if severe, may cause extensor tendon subluxation. Review of literature indicates that this type of tendon instability is not commonly encountered in patients without rheumatoid arthritis or sustained significant acute trauma. Congenital deficient or absence of the sagittal bands has also been reported.[1,2] Treatment for these injuries is often conservative, but can also require surgical intervention if conservative treatment fails or if the extensor tendon cannot be reduced with splinting.[3] In this report, we present 2 cases of sagittal band rupture and subluxation of the extensor tendon mechanism at the level of the MCP joint with the inciting event being a minimal low-energy activity. The patients provided written informed consent for print and electronic publication of these case reports.

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Case Reports

Case 1

At the time of presentation, the patient was a 42-year-old, right-hand dominant female working as a college administrator. She had not been involved in any recent repetitive athletic or vocational activities. She presented with a history of feeling a snap on the dorsum of the right hand while throwing a piece of paper into a trash can the previous day. She experienced immediate pain following the snap, and later that evening, noticed swelling and ecchymosis over the dorsal aspect of the third metacarpal head. The patient denied any numbness or tingling, but reported pain with active finger flexion.

Physical examination of the right hand revealed mild erythema and bruising over the dorsum of the third metacarpal head. Flexion at the MCP joint produced pain and ulnar subluxation of the extensor tendon at that level (Figure 1). In full extension, the extensor tendon was centralized. She had full flexion and extension of the digit, but weakness on resisted extension. There was tenderness over her radial sagittal band. Stress testing showed stability of the collateral ligaments. The patient was neurovascularly intact and had no evidence of hyperlaxity of the affected or adjacent joints. There was no clinical evidence of neurovascular damage. X-rays at the time showed no fractures, dislocation, or arthritis.

The patient was placed in a volar splint that held the MCP joint in 25° of flexion, the wrist in 25° of

Figure 1. Clinical photograph of the right metacarpophalangeal joint showing ulnar dislocation of sagittal band of the right hand middle finger (Case 1).

Figure 2. Hand in extension splint demonstrating centralization of extensor tendon (Case 1).

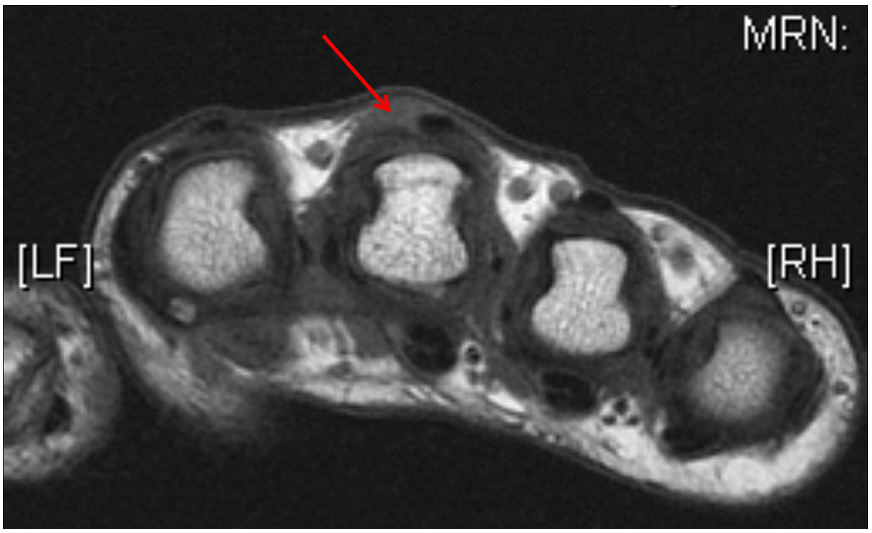

Figure 3. MRI confirming injured radial sagittal band (red arrow) and subluxation of central tendon (Case 1).

Figure 4. Clinical photograph after closed treatment showing decreased swelling and improved tendon alignment similar to contralateral hand (Case 1).

extension, and the interphalangeal (IP) joints free. In this position, the extensor tendon was centralized and remained reduced with active IP joint motion (Figure 2). This splint was worn at all time except for bathing, including sleep. At follow-up clinical exams, the tendon remained located centrally while splint was in place. Erythema, swelling, and pain decreased over the next few weeks with the treatment regimen.

At the 6-week visit, the patient reported further improvement, but still had persistent pain over the MCP joint. On physical exam, it was noted that although the tendon sat centrally while the hand was in a splint, subluxation remained evident upon flexion. At this time, the patient was sent for a magnetic resonance imaging (MRI) study for further evaluation. MRI revealed focal injury to the radial sided sagittal band of the extensor hood and subluxation of the central tendon at the level of the third metacarpal head (Figure 3).

It was recommended that the patient continue using the splint. By her 3-month visit, the patient reported that she was doing very well and had resumed light typing activity at work. On physical examination, there was no tenderness over the MCP joint. Her range of motion was full and now there was no longer any increased subluxation of her extensor tendon. In extension, the tendon was centrally located; in flexion the position was improved and similar to her contralateral side (Figure 4). Although the central tendon had slight subluxation, the patient had full range of motion and was non-tender. The patient was advised to continue with range of motion therapy and only wear the splint for heavy activities and sleeping. Most recently, the patient was seen 6 months after the initial injury and was noted to have painless range-of-motion at the MCP joint with no limitations in activity of the right hand.

Case 2

A 36-six-year-old, right hand dominant, male neurosurgeon who presented with a 2-week history of right hand pain. Two weeks prior to presentation, the patient was picking up a small toy for his child with his thumb index and middle finger when he felt a pop in his hand. He had not been involved in any recent repetitive athletic or vocational activities prior to his presentation. He described immediate pain over the dorsal aspect of the MCP joints of his index and middle fingers. At the time of presentation to our office, the pain over the middle finger had resolved. While the pain over the index finger had improved, it was still present. The patient was neurovascularly intact and had no evidence of hyperlaxity of the affected or adjacent joints.

Physical examination revealed minimal swelling at the dorsum of the index finger base and hand without any erythema. The patient had joint tenderness over the dorsal aspect of his right index finger MCP joint located over the ulnar sagittal bands. The extensor tendon

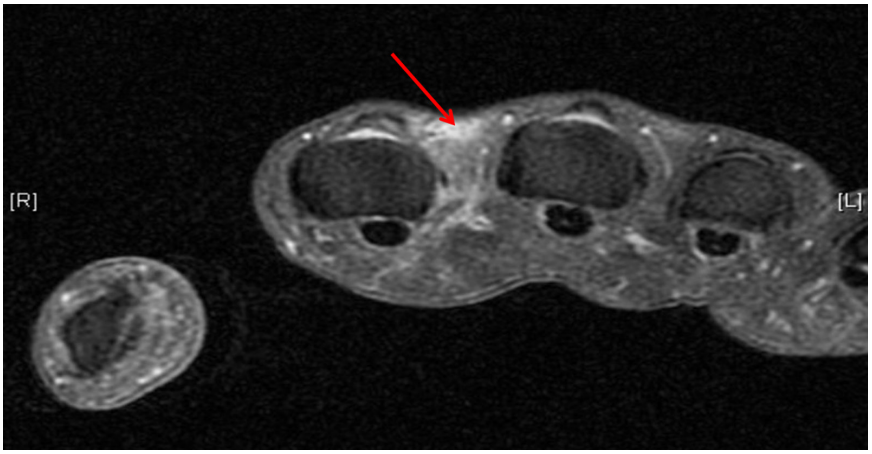

Figure 5. Axial MRI scan confirming injury to ulnar sagittal band (red arrow) in Case 2.

appeared to be well centralized in extension, but subluxated to the radial side with flexion. The patient had full flexion and extension at the MCP joint, however, he reported pain with active and passive flexion.

Plain films revealed no fractures or dislocations. An MRI was obtained and revealed the tendon to be intact with edema about the ulnar side of the MCP joint of the second digit with evidence of injury to the ulnar sagittal band (Figure 5). The patient was placed in a volar hand-based static splint with the wrist at 25° of extension, the MCP joints at 25° of flexion, and the IP joints free. He wore this splint on a continuous basis and did not operate during this time period. At the 3-week visit, the patient reported having decreased pain over the dorsal aspect of the injured joint. Physical examination showed the tendon to be centralized over the joint with only mild tenderness to palpation at the ulnar sagittal band. The patient felt that he was improving; it was recommended that he continue with the splint and return in 4 weeks for re-evaluation. At this visit, the patient reported complete lack of pain and physical exam revealed full range of motion with no tenderness to palpation. The extensor tendon was centralized in extension and flexion. The patient was told to discontinue the brace and was able to resume normal surgical work activities.

Discussion

The extensor tendon at the dorsum of the MCP joint is overlaid by a complex retinacular system called the dorsal hood.[4] The dorsal hood is made up of 3 structures: the sagittal, oblique, and transverse bands. The extensor tendons are stabilized by the sagittal bands at the MCP level and more distally between the MCP and the proximal IP joints by the transverse and the oblique bands, corresponding to a fibrous extension of the interosseous and lumbrical muscles, respectively.[4] Dorsally, the sagittal band is divided into a very thin superficial layer and a thicker deep layer forming a channel through which the extensor tendon runs through.[4] The sagittal bands are the most important structure of the dorsal hood in the stability of the extensor tendon at the MCP level. The tendons tend to follow the ulnar slope of the metacarpal heads[5] and generally would dislocate in an ulnar direction on flexion. This unique contour of the MCP joint articular surface induces an ulnar deviation of the fingers.[5,6] The propensity for ulnar dislocation is also related to the anatomical difference between the radial and ulnar sagittal bands. Rayan and colleagues[7] found that the radial sagittal band was often thinner and longer than the ulnar component, making it more vulnerable to injury causing ulnar instability of the involved extensor tendon. Although any of the fingers can be affected, the most commonly injured finger is the middle finger.[3] In injuries involving significant trauma, there is generally a history of a direct blow to the dorsal aspect of the joint or sudden forced flexion of the joint. The truly low-energy sagittal band ruptures are rare and reported only sporadically in the literature.

Elson,[8] in 1967, described a case of progressive type of extensor tendon subluxation of the small finger in a 71-year-old woman. There was no clear inciting traumatic event and the symptoms developed over 3 years. The patient was treated successfully with surgery and he attributed the problem to atrophic changes in the extensor hood and dorsal capsule. Harvey and Hume[9] reported spontaneous, progressive dislocation of the extensor tendon in 5 elderly patients. The patients were all women, age ranging from 75- to 82-years-old, with no definitive traumatic event. All of the patients had an inability to extend their MCP joints and had symptoms that developed over a time ranging from 10 days to 4 years. All were felt to require surgery; however, 2 patients elected not to have surgical treatment due to their advanced age. The authors suggested excessive digital-joint laxity with age-related muscle atrophy as a cause for the spontaneous dislocation of extensor tendon. Bin Iftikhar and colleagues[10] also reported 2 cases of rupture of the sagittal band leading to extensor tendon subluxation and inability to actively extend the digit. The first case did not have a distinct traumatic event, but was noticed after "fishing, for about 3 hours"; and the second case involved higher energy trauma in a 73-year-old female as she tried to get out of bed and placed all of her weight

through the hand rail. Both cases noted inability to extend their digits at the MCP joint and were treated by surgery.

Ishizuki[11] reported 16 patients with ulnar subluxation of the extensor tendon hood of the middle finger that all required surgical treatment. He characterized 11 of them as being of the spontaneous type. However, several of these patients had clear traumatic events such as weight bearing with a fist or hitting a ball with a bat. The remainder did have low energy injuries due to "paper crumpling, snapping the finger, and crossing finger." All of these patients had surgical treatment. The indication for surgical treatment is not clear in their report.

Some authors have advocated that nonoperative treatment should be attempted before proceeding to operative intervention in acute injuries. In 1985, Ritts and colleagues[12] reported 2 cases of acute traumatic sagittal band injuries due to relatively low energy injuries. Similar to our study, the patients were treated closed and resulted in functional range of motion, but both cases had mild residual tendon subluxation. Then, in 1987, Araki and colleagues[13] reported 5 cases of acute dislocation of the extensor tendon over the MCP joint. Four of these cases had high-energy injury, such as playing volleyball and practicing karate, while one had a true low-energy injury (ie, flicking a spider) similar to our case report. Only 1 patient was surgically treated. Inoue and Tamura[2] reported 27 patients with dislocation of the extensor tendon. Sixteen had high-energy traumatic events, 7 had "spontaneous" dislocation that occurred during daily activities, and 4 had congenital dislocation. Of the low-energy ruptures, 4 required surgical treatment, and 3 were successfully treated with splinting.

A recent study by Catalano and colleagues[14] evaluated the outcome of 10 patients (11 digits) of closed sagittal band rupture with dislocation in non-rheumatoid patients. The mechanism of injury in their cases appears to cover a broad range from high- (falls) and medium-energy (skinning a chicken) to low-energy (flicking a finger). The injury mechanism in each patient is not clarified in their paper. Treatment with a custom molded "sagittal band bridge" splint produced good functional results, however, 3 patients had moderate pain, 3 had some degree of residual tendon subluxation, and 1 patient required sagittal band reconstruction. In this report and all others, there was no MRI documentation of the sagittal band injury as in our report.

Extensor tendon subluxation or rupture may result in disabling injuries to patients. Acute dislocation of the extensor tendon over the MCP joint caused by injury to the sagittal bands can present in non-rheumatoid patients with seemingly innocuous trauma. This clinical entity should be considered when patients present with pain over their MCP joint and a history of an acute inciting nontraumatic event. In these 2 cases caused by low-energy trauma, conservative treatment using splint resulted in relief of symptoms with no complications. We consider initial conservative management a reasonable treatment option in patients with acute low-energy injury to the sagittal band component of the extensor mechanism.

Authors' Disclosure Statement

The authors report no actual or potential conflict of interest in relation to this article.

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