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CASE REPORT

Rare causes of closed rupture of the flexor tendon

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Abstract

Closed injuries to the flexor tendon are relatively rare. We present three rare causes of closed injury to the flexor tendon. Early recognition and adequate treatment by a specialised hand surgeon are crucial for the prognosis of such cases. Delayed diagnosis and treatment often require secondary reconstruction of the flexor tendon, which results in a worse functional outcome.

Key Words: Closed flexor tendon injury, tendon repair, neurofibromatosis, hamate fracture, osteosynthesis

Introduction

Patients with injuries to the tendons of the hand are regularly encountered at the emergency room. Injuries to the flexor tendons usually present as open (only rarely closed) injuries. In contrast to a closed injury to the extensor tendon such as a mallet finger, closed injuries to the flexor tendon are rare and can therefore easily be missed initially. Prompt recognition and adequate treatment are important to improve the prognosis of function after open as well as closed injuries to the flexor tendons. We present three rare causes of closed injury.

Case reports

Case 1

A 45-year-old man, a right-handed forklift truck operator, presented with sudden pain in his left hand during a firm grip at work, with no direct trauma. After this he was no longer able to flex his middle finger. Initially he suspected a contusion and waited for three days before visiting our emergency room. His medical record showed injury to the triangular fibrocartilage complex of his left hand and neurofibromatosis type I.

On physical examination there was a large soft swelling in the palm of his left hand, thought to be a neurofibroma (Figure 1a). Active flexion in the distal intercarpal phalangeal (DIP) joint was not possible. Flexion in the metacarpophalangeal (MCP) and proximal intercarpal phalangeal (PIP) joint was diminished.

We explored his hand, and immediately below the skin we found a large neurofibroma that extended from the thenar to the hypothenar and from the distal part of the carpal tunnel to the proximal phalanges of the index, middle, and ring finger (Figure 1b). The tumour was removed, and all juxta-proximal branches of the median and ulnar nerves were preserved. The flexor digitorum superficialis tendon of the middle finger was intact but the flexor digitorum profundus tendon was surrounded by tumour and ruptured. Both ends of the tendon were frayed

and had to be debrided, after which a 3 cm defect in the tendon was bridged with a palmaris longus tendon graft.

Postoperatively a dynamic splint (modified Kleinert) was applied for six weeks [1]. During follow up he developed a wound infection and partial wound dehiscence, which healed secondarily after local irrigation and oral antibiotic treatment. Four months postoperatively adhesions persisted, although range of motion was still improving slowly (MCP joint: 0-20-90, PIP joint 0-0-30, and DIP joint 0-0-20). Sensation from the median nerve was completely restored. At this moment intensive occupational therapy was prolonged but adhesiolysis may be required in the future.

Case 2

A 45-year-old, right-handed male metal worker felt a sudden snap in his hand while he was carrying heavy metal plates at work. He was not able to move his right little finger properly. Initially he was treated with a Stack splint by the general practitioner who suspected a mallet finger. After three weeks our department was contacted because the original diagnose was doubted.

During physical examination no external injury or scar was found. Flexion in the MCP joint was normal. Flexion in the PIP joint was limited and flexion in the DIP joint was not possible. A radiograph of the little finger showed no abnormalities. The patient was operated on for a suspected avulsion of the flexor digitorum profundus tendon without a fracture. The most common site of rupture would be the insertion of the tendon at the base of the distal phalanx, so that is where we explored first, but the tendon was found to be intact. Exploration at the level of the distal metacarpal bone of the little finger also showed intact flexor digitorum superficialis and profundus tendons, but we noticed reduced tension on the flexor digitorum profundus tendon. The tendon was ruptured at the level of the proximal handpalm caused by a fractured hook of the hamate bone, which must have occurred earlier and been unnoticed (Figure 2).

Figure 1. Case 1. (a) The palm, in which the large neurofibroma is obvious. Notice the extended resting position of the middle finger. (b) The intraoperative pictures show the extent of the tumour.

The bony fragment was removed and the tendon was sutured. Because of retraction of the proximal stump of the FDP, the tendon had to be lengthened at the musculotendinous junction. Postoperative rehabilitation consisted of a dynamic splinting regimen (modified Kleinert). Three months postoperatively functional recovery was poor because of tendon adhesions for which lysis was required and was successful.

Case 3

A 58-year-old male right-handed sports teacher who was a fanatical mountain climber presented with a sudden painful snap in his right little finger, after which he was not able to flex it. His medical record showed painful osteoarthritis of his right wrist. A partial arthrodesis of the wrist had been successful two years earlier using a spider plate (Kinetikos Medical Inc., Calsbad, CA, USA) to fuse the lunate, capitate, hamate, and triquetral bone. This gave him good pain relief with typical reduction of the active range of motion of his right wrist postoperatively. After that, and a 6-month rehabilitation programme the patient had been able to do his work and his hobby without pain.

During physical examination a swelling on the volar side in the forearm was noticed without other signs of infection. His hand and fingers were neurovascularly intact. Active flexion of the MCP joint of the little finger was possible, flexion of the PIP and DIP joint were not. A rupture of the tendon caused by a protruding screw was suspected. A radiograph did not aid in the diagnosis so we did a computed tomogram (CT). The CT showed a protruding screw through the hamate bone into the trajectory of the flexor tendons of the little finger (Figure 3). As the four-corner fusion was consolidated, the screw could be removed without problems. Subsequently the frayed tendon was reconstructed using a palmaris longus tendon graft from the same forearm followed by dynamic splinting (modified Kleinert). Three months postoperatively he had a 20° extension deficit in his PIP joint, but he had no functional limitations and was able to go mountaineering as preoperatively.

Discussion

Closed injury of the flexor tendon may occur through mechanical overload during sports or heavy labour. During mountain climbing flexor tendons are heavily loaded [2]. Tendon ruptures are therefore common in mountain climbers [3], although not as

common as pulley injury [4]. Usually the deep flexor tendon tears off its insertion with or without avulsion of the bone. This bony fragment is sometimes visible on an exact lateral radiograph [5]. Another common cause of closed tendon rupture is tenosynovitis as accompanies rheumatoid arthritis. Tenosynovitis that does not respond to conservative treatment is an indication for operation without delay [6].

Neurofibromas in the hand have been reported previously [7], but reports of neurofibromas that cause ruptures of tendons are extremely rare [8]. Case 1 would probably have benefited from earlier removal of the enormous tumour in the palm to prevent the lesion to the flexor tendon and the difficult postoperative healing as a result of the aggressive growth of the neurofibroma into the skin. Tendons may also rupture because of repetitive sliding of the tendon along a sharp edge such as a fractured bone [9].

There have been several reports of tendon ruptures caused by osteosynthesis material [10], but they mainly describe problems after plate osteosynthesis of the radius since the massive increase in the use of (multi)angular locking plates for distal radius fractures. The long extensor tendon of the thumb is usually

Figure 2. Case 2. A three weeks old tendon rupture caused by a fractured hook of the hamate bone seen intraoperatively. The left hook holds the distal tendon end of the flexor digitorum profundus tendon. The end of the tendon has a rounded aspect suggesting that the injury is not fresh. In the fatty tissue, pulled aside by the vessel loop is the superficial palmar arch artery. The forceps holds the fractured hook of the hamate bone, which caused the tendon to rupture.

Figure 3. Case 3. (a) A radiograph and (b, c) computed tomograph (CT) of a wrist of a patient with a closed injury of the tendon in the little finger. A spider plate had been inserted two years earlier. The radiograph does not show whether a screw is protruding from the hamate bone. The CT shows this more clearly (arrow).

injured in those cases, followed by the long flexor tendon of the thumb (rare). A lesion to the long flexor tendon in the palm has, to our knowledge, never been reported to be caused by a screw of a spider plate perforating the hamate on the palmar side.

We stress the importance of early diagnosis in cases of closed injuries to the flexor tendon and treatment by a specialised hand surgeon. Early repair of the tendon facilitates bringing back the proximal end of the tendon to its original position, permitting primary repair. Delayed treatment complicates repair considerably and often primary repair is not possible. In that case a two stage reconstruction such as placement of a silicon spacer and tendon transfer or graft may be necessary. This exposes the patient to two or even more surgical procedures and a prolonged recovery including extensive need for hand therapy. Secondary reconstruction of flexor tendon injuries, open or closed, often leads to worse functional results than primary repair, or in case 1, preventive surgery [5], sometimes requiring additional procedures such as lysis of the tendon. These rare causes of closed injuries to the flexor tendon should therefore be known, particularly to hand surgeons.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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