CASE REPORT

Delayed rupture of flexor tendons in zone V complicated by neuritis 18 years following Galeazzi fracture-dislocation

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Accepted 23 March 2014

SUMMARY

We report a rare case of an 84-year-old woman who presented with delayed, complete rupture of superficial (flexor digitorum superficialis) and deep flexor tendons (flexor digitorum profundus) of the third, fourth and fifth digits of the right hand in zone V of the flexor tendons. The patient, who was otherwise healthy, active and independent, incurred a closed fracture of her right wrist 18 years ago, which was treated conservatively. Current X-rays and operative findings confirmed a malunited Galeazzi fracture-dislocation with volar dislocation of the ulna from the distal radioulnar joint. She underwent surgical treatment to improve her hand function and agonising neuritis symptoms, as she was unable to use her middle, ring and little fingers and had developed severe neuritis of the ulnar nerve. Exploration and repair of the flexor tendons, nerve decompressions and Darrach procedure were performed. On follow-up, the patient showed improvement in hand function with the neuritis completely resolved.

BACKGROUND

A recent review of literature on flexor tendon ruptures within the hand demonstrated that spontaneous ruptures are rare.¹ Most cases involved ruptures within zones II, III and IV, more often affecting the ulnar flexor digitorum profundus (FDP) tendons. Although true, spontaneous tendon ruptures are extremely rare, suggesting that no extrinsic or intrinsic pathological processes were involved as direct trauma, rheumatoid arthritis and use of steroids or statins. Closer evaluation using microscopy shows that pathological changes including degenerative processes and anatomical variations may be involved. Other cases included a history of arthritis, exostosis of the distal radius, gout, synovitis and chronic use of steroids. Murase and Hiroshima² and Kato *et al*³ have reported rare cases of flexor tendon ruptures as a late complication of malunited Colles' fractures.

We report a rare case of delayed flexor tendon rupture involving six tendons (flexor digitorum superficialis (FDS) and FDP) in zone V of the flexor tendons, which occurred 18 years ago following a fall resulting in a Galeazzi fracture-dislocation in the right wrist. Misdiagnosis or inadequate management of this injury may result in disabling complications, such as distal radioulnar joint (DRUJ) instability, malunion, limited forearm range of motion, chronic wrist pain and osteoarthritis.⁴ Our patient was managed conservatively and although

she appeared to recover from the fracture, its complications took their toll after 18 years.

CASE PRESENTATION

An 84-year-old woman was referred by her general practitioner following a sudden onset of inability to flex her middle, ring and little fingers of the right hand. There was no history of recent injury.

This independent, right-hand dominant and very active woman did not have any pre-existing relevant aetiology for spontaneous tendon rupture; particularly, there was no history of rheumatoid arthritis, diabetes or use of steroids or statins. She was able to manage her day-to-day activities herself including cleaning, shopping, washing and dressing herself but had difficulties in using her right hand (eg, holding a cup).

She reported a history of a closed fracture of her right wrist 18 years ago following a fall on her outstretched hand. Conservative treatment at this time included manipulation under haematoma block and application of a below-elbow cast. No radiographs were available from this time for review. She underwent steroid injection of the A1 pulley area of her right ring finger for trigger finger 3 years ago with some success. Her trigger finger was not related or caused by any pre-existing medical condition; there was no history of diabetes or rheumatoid arthritis.

On examination, she was holding her hand in dorsi-flexed position. She had an obvious deformity of the right wrist with a prominent lower end of the ulna on the volar aspect ([figure 1](#)). She had agonising tenderness and neuritic pain on the distal end of the ulna. There was no active flexion of the interphalangeal joint of the middle, ring and little fingers. However, there was full and pain-free passive movement of all joints.

Radiographs of her right wrist revealed a healed fracture of the distal radius with angulation of 25° and volar dislocation of the ulna ([figure 2](#)). The lower end of the ulna was eburnated with severe DRUJ arthritis. These findings suggested a previous Galeazzi fracture-dislocation. Unfortunately, no X-rays were available in digitalised form from the initial consultation.

Clinical diagnosis was a complete rupture of the FDS and FDP of the third, fourth and fifth digits of the right hand in zone V with severe ulnar nerve neuritis.

She opted for surgical management of her injury; options included direct repair of the ruptured tendons or the use of a tendon graft. Preoperative planning included the assessment for intact tendons

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To cite: Nagy MT, Ghosh S, Shah B, *et al*. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2013-010188

Figure 1 Obvious deformity of the right wrist with a prominent swelling over the head of the ulna (black arrow). No flexion in middle, ring and little fingers (white arrow).

on the affected wrist; the palmaris longus tendon was found to be clinically intact. This tendon can be used as a graft in difficult cases, as well as the plantaris tendon. Harvesting tendons from a different site may lead to donor site complications and require additional incisions and prolong recovery. The patient declined any additional procedures, as she did not wish to have multiple incisions. Therefore our surgical plan included aiming for a direct repair or the use of the ipsilateral palmaris longus as graft.

TREATMENT

Surgical treatment involved exploration and repair of the ruptured tendons of the FDP at the wrist level in zone V, decompression of

Figure 2 Radiograph of the right wrist (anteroposterior and lateral) showing the resected head of the dislocated ulna and a healed fracture of the distal radius with 25° of angulation.

ulnar nerve and Darrach procedure. These procedures were performed under joint care of orthopaedic and plastic surgeons.

The procedures were performed under general anaesthesia, with the patient placed in supine position. A pneumatic tourniquet was applied. A single incision was made over the volar aspect of the ulna. The distal end of the ulna was identified and was found to be dislocated with grade IV arthritis (figure 3).

Darrach procedure was performed for the symptomatic malunion following Galeazzi fracture-dislocation. Our patient had low functional demand with severe DRUJ arthritis and a prominent dislocation in this joint; therefore, this procedure appeared to be a good choice. Resection of the anteriorly dislocated head of the ulna was performed (figure 4) mainly to reduce the risk of a rerupture of the repaired flexor tendons and to prevent irritation of the ulnar nerve. Following identification of the ulnar nerve, decompression of the Guyon's canal was performed.

FDS and FDP tendons of the third, fourth and fifth digits were identified and found to be completely ruptured in zone V, making a ragged appearance. There was a large gap of 5 cm between the proximal and distal end of the ruptured tendons. A distinct, very long and intact palmaris longus tendon was identified and found to be in excellent condition (figure 4). Hence it was decided to use the palmaris longus tendon as graft to bridge the gap between the distal and proximal end of the FDP.

The distal end of the palmaris longus tendon with the palmar fascia was weaved into the distal ends of all three FDP tendons as a mass repair using 4/0 Prolene sutures. Proximally, at the myotendinous junction the palmaris longus tendon was sutured to the ruptured tendons of the FDP using a weaving technique with side-to-side insurance and 4/0 Prolene sutures.

We aimed for functional repair of the flexor tendons (figure 5), as a precise repair was not feasible. The ruptured tendons of the FDS were very atrophic and flimsy; hence, it was decided not to attempt a repair of the attenuated tendons.

Figure 3 Intraoperative image of the right wrist showing the dislocated head of the ulna and missing tendons (*) of flexor digitorum superficialis (FDS) and flexor digitorum profundus (FDP) to middle, ring and little fingers.

Figure 4 Intraoperative image of the right wrist showing missing tendons (*) of flexor digitorum superficialis (FDS) and flexor digitorum profundus (FDP). Palmaris longus tendon (1), retracted ulnar nerve and artery (2), resected head of ulna (3), median nerve (4), FDS to index finger (5) and ruptured distal end of FDS to ring finger (6).

The flexor retinaculum and wound were closed in layers and the patient's arm was placed in a below-elbow cast for 1 week, followed by a dynamic splint and rehabilitation under the supervision of a hand therapist. Her recovery was uneventful.

At the latest follow-up 4 months postoperatively, the patient showed improvement in the function of hand and wrist. The neuritis resolved completely. She had good range of movement of her wrist with active palmar flexion of 60° and dorsiflexion of 30°. Active flexion of middle, ring and little fingers improved to approximately 70°. She was pain free with no neurovascular disturbance. Regarding function, she was able to hold a cup now and function well with her hand, however the grip strength remained reduced which is understandable and acceptable.

We decided to accept the outcome of the surgery, as the patient was satisfied with the functional results.

Figure 5 Intraoperative image of the right wrist showing successful tendon reconstruction with improved flexion of middle, ring and little fingers.

DISCUSSION

True spontaneous rupture of tendons in the wrist and hand is rare, although more cases have been reported in the past three decades. Boyes *et al* published a review in 1960, on flexor tendon injuries in the hand, and cited that only 3 out of 80 cases examined could be considered spontaneous, which he defined as “ruptures which were not directly related to underlying or associated pathological changes.”⁵ A review of literature conducted by Bois *et al*¹ demonstrated that in the past 50 years, 43 cases (including 50 spontaneous tendon ruptures) have been published, showing that these were unique compared with the more common ruptures that result from avulsion.

Most cases of spontaneous tendon ruptures as described in the literature, involved men (90.7%), with a mean age of 47 years, and affecting the dominant hand (65%). Eighty per cent of the tendons affected were in zone III, mostly (82%) involving the FDP of the small finger (62%), followed by the ring (14%) and middle (10%) fingers. Involvement of the FDS or a combination of both was far less common (12% and 9%, respectively). Their analysis also showed that the pathogenesis of spontaneous tendon ruptures is most likely multifactorial, and may involve underlying pathological processes or a history of trauma, such as a Colles' fracture that failed to unite adequately. It is generally believed that a normal tendon does not rupture either clinically or experimentally because it is the strongest link within the musculotendinous chain.⁶

Our elderly patient was referred to us for inability to flex the middle, ring and little fingers of the right hand, in the absence of pain, after sustaining a wrist fracture some 18 years ago. No radiographic studies were available from time of her injury and she was treated conservatively. We assume she sustained a Galeazzi fracture-dislocation due to the current findings on X-ray and operation. Galeazzi first described this injury in 1934; this is known as the fracture of necessity, usually requiring open reduction internal fixation for definitive treatment.⁴

We found that she had a healed fracture of the distal radius, volar dislocation of the ulna and severe DRUJ arthritis. Three FDS and FDP tendons of the third, fourth and fifth digits were found to be completely ruptured in zone V. The most likely cause of the tendon rupture was the prominent head of ulna caused by the malunion and dislocation from her Galeazzi fracture-dislocation. No underlying conditions as diabetes or rheumatoid arthritis were found in this patient. Tendon rupture was a rare late consequence of the wrist fracture with volar displacement of the ulna. Only a few cases reported so far, including those cited by Loon *et al*, Younger and DeFiore and Wada *et al*, where the flexor tendons to the ulnar digits were ruptured due to attrition after volar dislocation of the ulnar head.² Furthermore, ruptures of extensor tendons after fracture of the distal radius are more common than those of the flexor tendons.³

Surgical approach for the Darrach procedure is usually dorsal, however a volar approach was chosen instead to perform nerve decompression and tendon repair through the same approach. Tendon repair was performed with the aim to achieve good functional results. A precise end-to-end repair was not possible due to the ragged appearance of the FDS and FDP; a mass repair was performed under utilisation of the palmaris longus tendon as graft.

Ideally, the gap between each ruptured tendon should be bridged with a tendon graft. However, due to the age of the patient and lack of adequate donor graft on the ipsilateral side, the above described technique was chosen. Harvesting tendon

grafts from the contralateral wrist or other sites were not reasonable as it would have restricted the day-to-day activities of the patient in the postoperative period. Moreover, further incisions were refused by the patient.

Learning points

- ▶ Delayed rupture of multiple flexor tendons in zone V as a late consequence of a Galeazzi fracture-dislocation is extremely rare.
- ▶ Sudden rupture of tendons in the hand and wrist without apparent cause may reveal an underlying pathological condition as a malunited fracture as demonstrated in this case report.
- ▶ Correct initial management of a Galeazzi fracture-dislocation must be ensured to avoid possible late complications such as a tendon rupture.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Bois AJ, Johnston G, Classen D. Spontaneous flexor tendon ruptures of the hand: case series and review of the literature. *J Hand Surg Am* 2007;32:1061–71.
- 2 Murase T, Hiroshima K. Rupture of the flexor tendon after malunited Colles' fracture. *Scand J Plast Reconstr Surg Hand Surg* 2003;37:188–91.
- 3 Kato N, Nemoto K, Arino H, *et al.* Ruptures of flexor tendons at the wrist as a complication of fracture of the distal radius. *Scand J Plast Reconstr Surg Hand Surg* 2002;36:245–8.
- 4 Atesok KI, Jupiter JB, Weiss AP. Galeazzi fracture. *J Am Acad Orthop Surg* 2011;19:623–33.
- 5 Tos P, Calalano F. Spontaneous rupture of the flexor superficialis tendon of ring finger: a case report and review of literature. *Musculoskelet Surg* 2011;95:245–6.
- 6 Wada A, Ihara F, Senba H, *et al.* Attritional flexor tendon ruptures due to distal radius fracture and associated with volar displacement of the distal ulna: a case report. *J Hand Surg Am* 1999;24:534–7.

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