Flexor Tendon Ruptures After Distal Scaphoid Excision for Scaphotrapeziotrapezoid Osteoarthritis

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Abstract

Background: Distal scaphoid excision is one treatment option for osteoarthritis of the scaphotrapeziotrapezoid (STT) joint following failure of conservative measures. Potential complications of this procedure include injury to the carpal ligaments, cartilage, and radial artery. **Methods:** A single case was identified by the senior author, and the medical record was reviewed for surgical notes, progress notes, and radiographs. **Results:** A 68-year-old male sustained ruptures of the flexor digitorum superficialis (FDS) and flexor digitorum profundus to the index finger 3 years following a distal scaphoid excision for symptomatic STT osteoarthritis. He required a flexor tendon reconstruction using the remaining FDS tendon for graft incorporated with a Pulvertaft weave. His midcarpal pain continued after recovery of his index finger function, eventually requiring a 4-corner fusion of the wrist. **Conclusions:** Flexor tendon rupture is a previously unreported complication of distal scaphoid excision for STT arthritis.

Keywords: scaphotrapeziotrapezoid, STT, flexor rupture, distal scaphoid excision, midcarpal arthritis, complications

Introduction

Osteoarthritis (OA) of the scaphotrapeziotrapezoid (STT) joint is a cause of wrist pain and weakness with a reported incidence of 6% of the population in anatomical studies.¹⁵ Conservative treatment consisting of protective splints, anti-inflammatory medications, intra-articular corticosteroid injections, formal hand therapy, and avoidance of exacerbating activity is successful in the majority of patients.^{3,6} When conservative measures fail, surgical options include interpositional arthroplasty, STT fusion, or resection of the distal articular surface of the scaphoid. Distal scaphoid excision offers shorter postoperative immobilization for patients desiring a more rapid return to function.⁶ Known complications include injury to the carpal ligaments, cartilage, or radial artery.² We present a case in which a patient with STT OA had ruptures of the flexor digitorum profundus (FDP) and flexor digitorum superficialis (FDS) tendons after distal scaphoid excision.

Methods

A single case was identified by the senior author (A.P.C.W.), and the medical records were reviewed for all notes and images.

Results

A 68-year-old man presented with sudden loss of left index finger flexion for 1 week after pushing an aerosol can button. His history was significant for symptomatic STT and trapeziotrapezoid OA treated with a distal scaphoid excision and partial trapeziotrapezoid resection performed 3 years prior through an incision based on the flexor carpi radialis tendon sheath. During the index procedure, the radioscapophcapitate ligament was preserved while the distal one-fourth of the scaphoid was resected, and the remaining proximal scaphoid appeared normal. No suspensionplasty or ligament reconstruction tendon interposition arthroplasty was performed at that time; a segment of collagen matrix was placed between the trapezium and the remaining scaphoid as an interposition material. On physical examination, he was found to have no FDP/FDS function of the index finger and volar wrist tenderness. Anteroposterior and lateral fluoroscopy on the day of

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Figure 1. Anteroposterior fluoroscopy image of the left wrist demonstrating the sharp edge of the remaining proximal scaphoid.

presentation demonstrated a distal scaphoid excision with a sharp distal aspect of the remaining scaphoid (Figures 1 and 2). Rupture of the FDP/FDS was suspected, and the patient underwent operative exploration.

Under general anesthesia with an upper arm pneumatic tourniquet, a Bruner incision was made from the A1 pulley through the carpal tunnel into the proximal wrist. The carpal tunnel was opened, and the median nerve was identified and found to be intact without any signs of trauma. The FDP/FDS rupture was easily identified within the carpal tunnel. The FDS tendon was more severely eroded along its length through the carpal tunnel than the FDP tendon. The FDS was harvested as a graft as proximal as possible and incorporated into a Pulvertaft weave with 3 weaves both proximally and distally repaired using 3-0 Mersilene sutures (Ethicon, Blue Ash, Ohio). Careful attention was paid to tensioning the graft appropriately for a normal digital cascade. Prior to skin closure, a large rent in the volar capsule was noted which was caused by the protruding distal aspect of the remaining proximal scaphoid. The scaphoid was noted to have a sharp edge, which had eroded through the capsule, and the radioscaphoid joint was noted to have moderate osteoarthritic changes. For these reasons, the entire remaining scaphoid was excised. The capsular rent was closed with 3-0 Mersilene suture. The skin was closed using nylon horizontal mattress sutures, and a dorsal blocking splint was applied above a bulky dressing.

Postoperatively, the patient's symptoms initially improved with hand therapy, and he regained near full range of motion and ability to use his hand in his activities of daily living. However, wrist pain from midcarpal arthritis

Figure 2. Lateral fluoroscopic image of the left wrist demonstrating the distal scaphoid excision.

persisted (Figures 3 and 4), and the patient underwent another procedure approximately 5 months postoperatively. Despite his advanced collapse and poor bone quality, he elected to undergo 4-corner fusion rather than total wrist fusion (Figures 5 and 6). With hand therapy, the patient has noted improvement in pain but still requires the occasional use of medications for relief.

Discussion

A recent survey of 1156 members of the American Society for Surgery of the Hand revealed the current trends in treatment of trapeziometacarpal OA.¹⁸ Fifty percent of surveyed surgeons preferred trapeziectomy with flexor carpi radialis ligament reconstruction tendon interposition (LRTI), 28% STT fusion, 12% distal scaphoid excision, and 9% other procedures.¹⁸ More frequent for thumb carpometacarpal OA, LRTI has been recently studied for isolated STT OA in 14 consecutive patients with improved grip strength, pinch strength, and visual analog pain scores with activity and rest.⁸ The authors also noted that partial trapezoidectomy was not required.⁸

STT fusion has long been described as a reliable method for treatment of STT OA with Crosby et al reporting improved pinch and grip strength but decreased wrist range of motion following arthrodesis.³ Watson et al reported on 800 STT fusions performed over 27 years with range of motion within 70% to 80% and grip/pinch strength within 69% to 89% of the opposite side.¹⁷ Subsequent arthritis developed in only 1.8% of cases. Complications occurred in

Figure 3. Anteroposterior radiograph of the wrist demonstrating carpal collapse, midcarpal, and radiocarpal arthritis following scaphoid excision.

Figure 4. Lateral radiograph of the wrist demonstrating midcarpal arthritis and collapse.

13% of cases, most commonly nonunion (4%) and reflex sympathetic dystrophy (3.6%).¹⁷ The technique has been

Figure 5. Postoperative anteroposterior radiograph of the wrist following 4-corner carpal fusion, radial scaphoid excision, and bone autograft from the distal radius.

Figure 6. Postoperative lateral radiograph of the wrist following 4-corner fusion.

adapted through arthroscopy, with Ho reporting on 3 cases of STT fusions through arthroscopy and percutaneous

fixation, with 2 unions and 1 asymptomatic fibrous union.⁷ Complications within this series of arthroscopic partial wrist fusions included skin thermal injury.⁷ To tackle the concern over nonunion, Nemoto and Inagaki described a vascularized bone graft consisting of the 1,2 intercompartmental supraretinacular artery combined with autogenous cancellous bone chips for STT fusion with an average union at 10 weeks.¹³

Pyrocarbon implant arthroplasty has been reported as another option for isolated STT OA with good outcomes in 9 patients at a mean of 16.4 months.⁹ Compared with the opposite side, grip and pinch strength returned to 82% and 85%; there were no changes in alignment or complications reported.⁹ Concern exists however for the potential for implant dislocation and survivorship.

Distal scaphoid excision is one treatment option for patients with STT OA and distal scaphoid nonunion refractory to conservative measures.^{6,12} Techniques of distal scaphoid excision have included or bypassed tendon interposition with removal of the distal one-fourth of the scaphoid.^{4,15} Immobilization can be reduced from the traditional 8 to 12 weeks associated with STT fusion to 2 to 3 weeks with distal scaphoid resection.⁶ Arthroscopic techniques have been described allowing for minimally invasive approaches.¹⁴ Known complications to date have not included the possibility of flexor tendon rupture.

An alteration in carpal kinematics results in increased radioulnar translation of the proximal row with diminished flexion-extension after distal scaphoid excision.⁶ Load across the wrist is then transferred from the now resected distal pole of the scaphoid to the trapezoid-capitate articulation, with resulting overload and the tendency to worsen a dorsal intercalated segment instability (DISI) pattern.^{5,6} Garcia-Elias recommends careful preoperative evaluation for dorsal midcarpal instability through radiographs and the fluoroscopic “posterior drawer’s test” in which a dorsally directed force is applied to the volar aspect of the capitate-metacarpal articulation with the forearm and wrist in neutral alignment.^{4,16} Dorsal instability is diagnosed if the capitate displaces past the dorsal aspect of the lunate, and the surgeon should then consider another treatment for STT OA such as STT fusion.⁴ Some advocate a radioscapoid capsulodesis effect by the use of intraosseous tunnels to reconstruct the palmar radioscapohocapitate ligament to the scaphoid to prevent the scaphoid from extending and DISI.⁴

Sharp bony fragments of the distal pole of the scaphoid have been implicated in flexor tendon ruptures.^{10,11} In one case in the literature, a scaphoid nonunion resulted in a sharp, bony spicule that eroded through the anterior capsule of the wrist and into the carpal tunnel, where it caused attritional rupture of both the flexor pollicis longus and index finger FDP ruptures.¹⁰ Mannerfelt and Norman described the causes of attritional flexor tendon ruptures from rheumatoid arthritis, often by a spur at the trapezium or distal tubercle of the scaphoid protruding through the capsule and

floor of the carpal tunnel.¹¹ The proximity of the flexor tendons, including the FDS and FDP to the index as well as the flexor pollicis longus, to the scaphoid within the carpal tunnel has been established by cross-sectional anatomy and imaging studies.¹ Here, we describe a similar mechanism, in which the sharp bony remnant of the proximal pole of the scaphoid violated the wrist capsule resulting in injury to the flexor tendons of the index finger.

We present this case to demonstrate a potential complication of distal scaphoid excision. We believe the distal aspect of the remaining scaphoid caused erosion of the volar capsule and attritional rupture of the adjacent FDP/FDS tendons proximal to the A1 pulley. To avoid this complication, the surgeon must be cognizant of the remaining scaphoid after excision of the distal pole to ensure that a sharp bony prominence is not created after the osteotomy. Even if these steps are taken, some resulting flexion of the scaphoid remaining may impinge on the flexor tendons in a portion of patients treated by distal scaphoid excision.

Conclusions

Distal scaphoid excision is a known procedure for the treatment of symptomatic STT OA. This case report presents a novel complication of this procedure, flexor tendon rupture, which was caused by a sharp remaining edge of the proximal scaphoid. The surgeon should pay careful attention to the remaining scaphoid to prevent this potential complication.

Ethical Approval

This study was approved by our institutional review board.

Statement of Human and Animal Rights

All procedures followed were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008.

Statement of Informed Consent

Informed consent was obtained from the patient in the study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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