Foreign-Body Reaction and Osteolysis in Dorsal Lunate Dislocation Repair With Bioabsorbable Suture Anchor

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Abstract

Background: In recent years the use of biodegradable suture anchors for treating tendon and ligament pathology in hand surgery became popular. These materials are biocompatible, radiolucent, and load sharing, as they incrementally transfer load to surrounding bone during the resorption process. Despite these numerous advantages, polyglycolic (PGA) and poly-L-lactic acid (PLLA) have become a problem because of the potential risk for foreign body reactions. **Methods:** This article presents a case of an intraosseous foreign body reaction and massive osteolysis of the proximal carpal after dorsal lunate dislocation repair with bioabsorbable suture anchors. **Results:** Because of the persistent pain and the decreased strength, a proximal row carpectomy was performed 12-months after the initial trauma. **Conclusions:** Hand surgeons should be aware of the possibility of a late foreign body reaction, that could be especially severe in carpal bones.

Keywords: foreign-body reaction, lunate dislocation, bioabsorbable suture anchor

Introduction

In recent years, the use of biodegradable suture anchors for treating tendon and ligament pathology in hand surgery became popular.^{1,11,15} Studies have shown that they provide equivalent biomechanical strength than bone tunnels and buttons.⁴

These materials are biocompatible, radiolucent, and load sharing, as they incrementally transfer load to surrounding bone during the resorption process.⁶

Despite these numerous advantages, polyglycolic (PGA) and poly-L-lactic acid (PLLA) have become a problem in shoulder surgery because of the potential risk for foreign-body reactions.^{5,7,13,14}

To our knowledge, there is only 1 report with this complication in the wrist in the English literature.¹⁷

We present a case of an intraosseous foreign-body reaction and massive osteolysis of the proximal carpal row after dorsal lunate dislocation repair with bioabsorbable suture anchor.

Case Report

A 52-year-old right-handed male complained of pain and swelling after he fell onto his outstretched dorsiflexed wrist.

Radiographs showed a dorsal lunate dislocation (Figure 1). After imaging confirmation, reduction by traction and immobilization were performed in the emergency department.

One week later, a surgery was performed. The patient underwent a combined dorsal and volar approach to anatomic repair the dorsal scapholunate and volar lunotriquetral ligaments. Care was taken to ensure the blood supply to the carpus was not injured during the surgical approach. Kirschner wires (K-wires) were placed into the scaphoid and lunate and used as joysticks to correct the intercalated segment instability pattern. Prior to ligament repair, percutaneous intercarpal pinning was done to maintain the carpal relationship. Two K-wires (1.1 mm) were inserted from ulnar side of the wrist to stabilize the lunotriquetral joint, one K-wire was used to stabilize the scaphoid to the lunate, and the other pin was used to secure the distal scaphoid to the capitate to help prevent scaphoid

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Figure 1. (a) Anteroposterior and (b) lateral radiographs showing dorsal dislocation of the lunate.

Figure 2. Intraoperative images of the dorsal aspect of the wrist during the biodegradable suture anchors placement at the scaphoid (S), lunate (L), and triquetrum bone (T).

flexion. Then the dorsal intercarpal scapholunate and lunotriquetral ligaments were repaired and reinforced with dorsal intercarpal ligament capsulodesis. Finally, 3 biodegradable suture anchors made of PLLA (Minilok Quickanchor, De Puy Mitek, Raynham, Massachusetts) were used to fix the ligaments to the scaphoid, lunate, and triquetrum (Figure 2).

The patient was immobilized in a short arm spica cast for 8 weeks (Figure 3A). The pins were then removed, and the patient was required to wear a forearm base wrist splint for protection for the following 4 weeks. At 12 weeks, the splint was discontinued, and the patient was allowed unrestricted activity. Until sixth month after operation, postoperative evolution was uneventful.

At 6-months follow-up, the patient complained of persistent pain. X-ray studies showed bone sclerosis and cystic lesions of the lunate (Figure 3b).

In the tenth-month control, the pain became disabling, and grip strength decreased. The X-ray studies showed progression of the bone sclerosis and focal cystic changes in both scaphoid and lunate (Figure 3c). Computed tomography scan confirmed the fragmentation of the lunate and massive osteolysis of the scaphoid (Figure 4). A rheumatologic work-up was negative.

Twelve months after initial trauma, a reoperation was planned. Intraoperative findings evidenced a severe chondral damage of the lunate and scaphoid. Such evidences did not allow any reconstructive alternatives. As a result, a proximal row carpectomy was performed.

Histological examination of the tissue from the bony defect in the scaphoid and lunate revealed a foreign-body reaction surrounding the anchors (Figure 5).

At 24-months follow-up, the range of flexo-extension motion was 63% of the contralateral extremity, and pain according to the visual analogue score (VAS) was 2 out of 10.

The score of the questionnaire Quick Disabilities of the Arm, Shoulder, and Hand was 13.

Discussion

Shoulder surgeons have recommended bioabsorbable suture anchors over metal anchors.⁷ Some of the advantages are radiolucency, biocompatibility, limited stress shielding, facilitate revision surgery, and equivalent primary stability to non-degradable suture anchors.^{10,16}

Biodegradable devices, usually made of PLLA or PGA, are expected to be harmlessly degraded and replaced by bone.²

However, case reports in the shoulder and trauma literature have documented complications, including recurrent pain, intraosseous granulomas, foreign-body reactions, synovitis, chondral lesions, and osteolysis.^{3,5,12}

It is unclear the cause of foreign-body reaction that leads to osteolysis. Proposed theories implicate the inherent degradation and absorption of these polymers. Some theorize that when the gross geometry of the implant is lost, the large fragments cause an exuberant inflammatory response as macrophages and polymorphonuclear leukocytes phagocytize these products.^{16,18} Other authors have concluded that osteolysis is due not only to the resorption process but also the mechanical effect of a loaded anchor.⁹

Freehill et al noted a substantial number of foreign-body reactions, resulting in synovitis and multiple small osteolytic lesions at the implantation site after using PLLA tack fixation for arthroscopic shoulder stabilization. All 10 patients developed glenohumeral synovitis, and 9 showed evidence of gross implant debris. Three patients developed

Figure 3. Serial radiographs from the immediate initial postoperative through 12-month follow-up. (a) Anteroposterior radiographs of the immediate initial postoperative. (b) At 6-months showing bone sclerosis and cystic lesions of the lunate and (c) the progression of the changes in both scaphoid and lunate at 12-months.

Figure 4. Coronal views of the computed tomography demonstrating the fragmentation of the lunate and lytic lesions in both scaphoid and lunate.

noteworthy full-thickness chondral damage to the humeral head. At 1-year follow-up, 7 out of 10 patients reported relief after debridement, loose body removal, and synovectomy.⁸

Recently, Schrupf et al reported a case of osteolysis, synovitis, and chondral erosion secondary to a PLLA suture anchor repairment for a scapholunate dissociation. The patient was treated with debridement and sinovectomy improving activity-related pain at 5 months after the revision surgery.¹⁷ Conversely, the patient we report had a dorsal lunate dislocation and developed a more aggressive presentation with an extensive osteolysis of the lunate and scaphoid needing a proximal row carpectomy as salvage surgery.

Figure 5. Photomicrograph of the excised material stained with hematoxylin and eosin (original magnification $\times 100$), showing foreign body reaction. Note. Giant cells (arrows) and small foreign bodies (*).

Conclusion

Biodegradable materials are a good option in capsuloligamentous fixation, with multiple advantages and a low incidence of complications. However, hand surgeons should be aware of the possibility of late foreign-body reactions that could be especially severe in carpal bones.

Ethical Approval

The institutional review board approved the retrospective review of the medical chart.

Statement of Human and Animal Rights

This article does not contain any studies with human or animal subjects.

Statement of Informed Consent

Informed consent was obtained when necessary.

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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