

Distal Scaphoid Excision and Dermal Allograft Interposition in a Professional Athlete: Long-term Follow-up

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Summary: Scaphoid nonunion occurs in 10%–15% of scaphoid fractures, potentially resulting in scaphoid nonunion advanced collapse. Distal scaphoid excision without allograft interposition is a known treatment, but can result in loss of carpal height and pain. This report describes the application of human acellular dermal matrix as an interposition graft after distal scaphoid excision for stage I scaphoid nonunion advanced collapse. Postoperatively, the patient initiated early range of motion and returned to full activity at 6 weeks. He demonstrated resolution of his pain 6 years later. (*Plast Reconstr Surg Glob Open* 2024; 12:e5898; doi: 10.1097/GOX.0000000000005898; Published online 21 August 2024.)

Nonunion occurs in 10%–15% of scaphoid fractures^{1,2} and can lead to marginal sclerosis and cystic or resorptive changes to the scaphoid. This may be followed by arthritis of the radioscaphoid joint, leading to loss of normal scaphoid shape, carpal collapse, and/or the midcarpal arthritis found in later stages of scaphoid nonunion advanced collapse (SNAC).^{3,4} Scaphoid nonunion typically presents with wrist pain, decreased range of movement, and decreased grip strength.⁵ Currently, the standard treatment for mild cases is open reduction and internal fixation plus bone grafting.^{6–8} Bone grafting with radial styloid excision can also be considered for stage I SNAC. Unfortunately, this approach carries risks associated with donor harvesting, including pain, hematoma, and nerve injury.¹

Distal scaphoid excision without allograft interposition has also been described. Mayfield et al demonstrated that approximately 68.75% of patients experienced relief of their symptoms after excision. Nonetheless, some patients reported postoperative midcarpal arthritis,⁹ likely due to progressive loss of carpal height.

Human acellular dermal matrix (HADM) is a cadaveric dermal graft that is processed to remove nondermal

cellular components. It is a scaffold for tissue regeneration and is incorporated via gradual replacement with host collagen and scar.¹⁰ It can serve as an interposition graft in the management of wrist pathologies, including carpometacarpal joint arthritis.¹¹ This report describes its successful use in the management of stage I SNAC wrist.

CASE REPORT

A 65-year-old male professional racecar driver presented with 6 months of left wrist pain after jamming his hand on a racecar steering wheel. He exhibited tenderness at the base of the thumb and over the scaphoid, with a positive scaphoid shift test. Radiographs showed scaphoid nonunion through the mid-waist. There was no appreciable scapholunate interval widening. Magnetic resonance imaging confirmed scaphoid nonunion with radioscaphoid arthritis. Basilar joint arthritis was also noted.

Treatment options were discussed. The patient did not wish to be non-weightbearing for an extended postoperative period and was eager to resume racing, so salvage procedures were not desirable. The decision was made to proceed with distal scaphoid excision followed by distal radius graft versus dermal allograft interposition.

Volar dissection was carried down to the region of scaphoid nonunion. There was bony sclerosis in the distal bone fragment. A large 1×2cm defect was noted at the site of scaphoid nonunion. There was concern about potential healing of the bony gap with distal radius bone graft. Therefore, the sclerotic distal scaphoid was excised, and interposition arthroplasty with acellular hydrated dermis was performed (Fig. 1). The HADM was sutured

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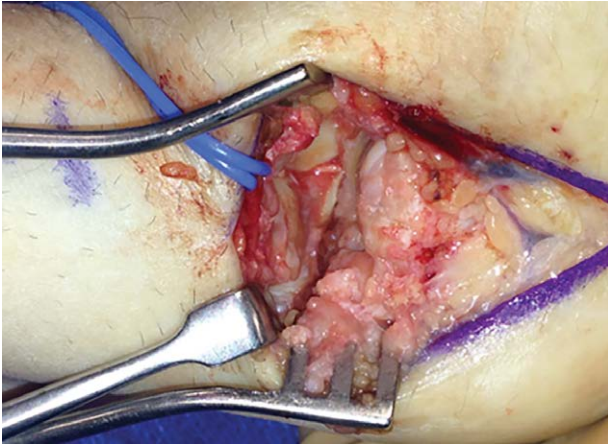


Fig. 1. Intraoperative photograph, excised distal scaphoid.

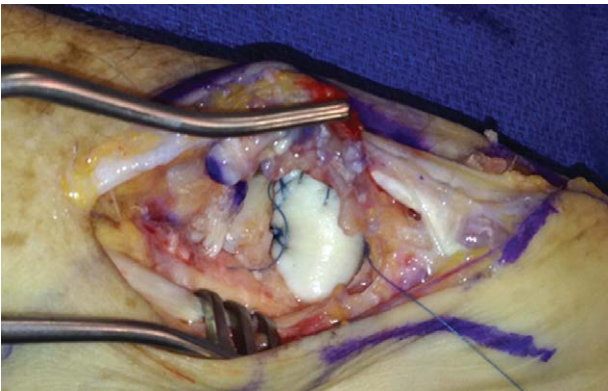


Fig. 2. HADM sutured to base of volar ligament.

to the base of the volar ligament and oriented to fill the space (Fig. 2). A radial styloidectomy was performed, and kissing osteophytes were removed.

He was placed in a postoperative splint. Early range of motion was initiated. At 28 days postoperatively, he transitioned to a cast that was fitted to his steering wheel and was able to complete a race. At 39 days postoperatively, he was transitioned to a removable wrist brace and initiated occupational therapy. At one-year interval examination, he had 0 pain and was back to full activities.

Two years postoperatively, he re-presented to clinic with an isolated nondisplaced extraarticular distal radius fracture of the ipsilateral wrist sustained after his car flipped during a race. Radiographs demonstrated a comminuted nondisplaced extraarticular distal radius fracture and maintenance of the position of the remnant scaphoid and trapezium, with no midcarpal shift. He was treated nonoperatively. Postinjury radiographs demonstrated healing fractures with continued lunate dorsal angulation, which was stable from prior. Notably, there was maintenance of space between the remnant scaphoid and the trapezium, likely filled with scar tissue. At 6 months postinjury, his pain and stiffness were resolved; he had full pronosupination and excellent grip strength.

Six years after his index procedure, he presented yet again for wrist pain secondary to a ground-level fall, later diagnosed as scapholunate strain. Imaging demonstrated continued maintenance of the arthroplasty space (Figs. 3 and 4). There was no avascular necrosis of the remaining proximal scaphoid. Pain improved after 2 weeks of immobilization in a removable wrist brace. He again resumed full physical activity and was discharged to follow-up as needed.

DISCUSSION

SNAC presents a continued clinical challenge. Bone grafting is a treatment option but can carry donor site morbidity and pain.¹ Salvage procedures carry the risk of complications, including pin track infection, pseudarthrosis, hardware failure, or prominence with soft-tissue irritation. Because they eliminate the midcarpal joint, failure of these procedures can require conversion to total wrist fusion.

Studies have evaluated distal scaphoid excision to treat chronic SNAC and discussed the rapidity with which patients return to full activities after surgery. Malerich et al reported that their patient cohort was immobilized for 2 weeks and progressed to full activity after 6 weeks.¹¹ Mayfield and Soejima demonstrated relief of symptoms in patients undergoing this procedure.^{9,12} Our patient also returned to weightbearing activity much earlier than allowed with salvage procedures.



Fig. 3. Patient x-ray 6 years after index procedure.



Fig. 4. Lateral x-ray 6 years after index procedure. Note the increased radiolunate angle with evidence of midcarpal instability and early arthritis, likely associated with distal radius fracture.

In our patient, excision of the distal scaphoid with HADM interposition arthroplasty corrected carpal deformity and prevented progressive carpal instability/arthritis.² This was likely due to long-term interposition with HADM-induced scar. Adjunct radial styloidectomy further relieved impingement between the styloid and arthritic osteophytes. This technique has the potential for adoption as a salvage procedure for patients with large scaphoid defects who cannot tolerate other procedures and

the requisite subsequent immobilization. Our findings are limited due to the single-patient nature of our report. Future studies should assess the role of HADM in this setting via large comparison studies.

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DISCLOSURES

Dr. David Kulber is a member of the Board of Directors for MTF Biologics. He did not hold the position at the time of this intervention. All the other authors have no financial interest to declare in relation to the content of this article.

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This study conformed to guidelines for research as outlined in the Declaration of Helsinki.

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