Chapter 8
Scaphoid Nonunion Open Treatment with Distal Radius Bone Graft via Mini Dorsal Approach

Michael Lin and Tamara D. Rozental

Case Presentation

A 26-year-old right-hand-dominant male presented for evaluation for right wrist pain. He sustained a fall during a volleyball match 4-months prior and continued to experience significant wrist pain during the activities of daily living. Limitations included the inability to lift heavy objects.

Physical Examination

The patient exhibited no swelling or deformity. He had no pain over the distal radius or ulna but had pain in the anatomic snuffbox. He had wrist motion of 45° of extension and 40° of flexion, whereas his contralateral wrist had 65° of flexion and extension. He had full forearm rotation, and full digital motion bilaterally.

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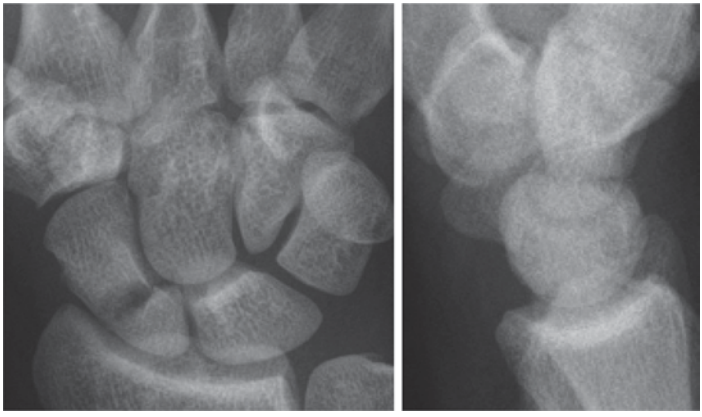

Fig. 8.1 Preoperative X-ray showing scaphoid nonunion with cystic defect. (Published with kind permission of © Michael Lin and Tamara D. Rozental, 2015. All Rights Reserved.)

Diagnostic Testing

AP, lateral, and oblique X-rays of the wrist showed a nonunion through the proximal third of the scaphoid with cystic changes (Fig. 8.1). CT scan of the wrist was obtained to determine whether a humpback deformity was present. The CT revealed a distracted fracture with minimal bony contact but without dorsal osteophyte or humpback deformity (Fig. 8.2).

Because of the patient's young age and potential risk for degenerative arthritis, surgical treatment was discussed. Given the lack of humpback deformity, the decision was made to proceed with open reduction internal fixation with cancellous bone grafting through a dorsal approach.

Surgical Technique

Surgery is performed under regional nerve block and MAC anesthesia. Prophylactic antibiotics are given prior to incision. After exsanguinating the forearm, a 2-cm incision is made just ulnar to

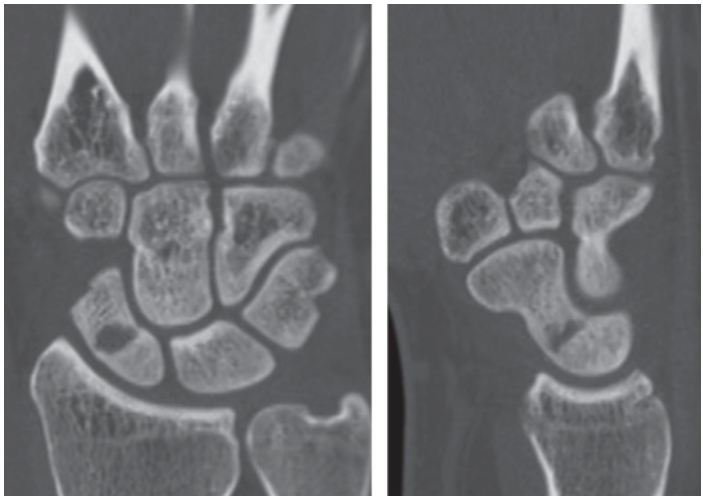

Fig. 8.2 Representative slices of preoperative CT demonstrating scaphoid nonunion with cystic defect. Notice there is no humpback deformity. (Published with kind permission of © Michael Lin and Tamara D. Rozental, 2015. All Rights Reserved.)

Lister's tubercle. The extensor retinaculum is incised over the third dorsal compartment, and the EPL tendon is retracted radially. A distal radius cortical bone window proximal to Lister's tubercle is created, and 1 mL of cancellous bone graft is harvested. The cortical window is replaced after bone graft harvest. A 1-cm longitudinal incision is then made in the dorsal proximal capsule. The wrist is brought into hyperflexion until the proximal pole of the scaphoid is visualized. In this patient, a guidewire from the Acutrak 2 (Hillsboro, OR) mini screw set was advanced from proximal to distal in a central position in both the AP and lateral planes. Once the position was confirmed radiographically, a second anti-rotation guidewire was placed. The central guidewire was over-drilled and removed. The distal radius cancellous bone graft was then packed through the drill hole into the nonunion site.

After bone grafting, the central guidewire was replaced, and the position was confirmed radiographically to ensure that the wire was in the proper path. An Acutrak 2 mini screw was then advanced

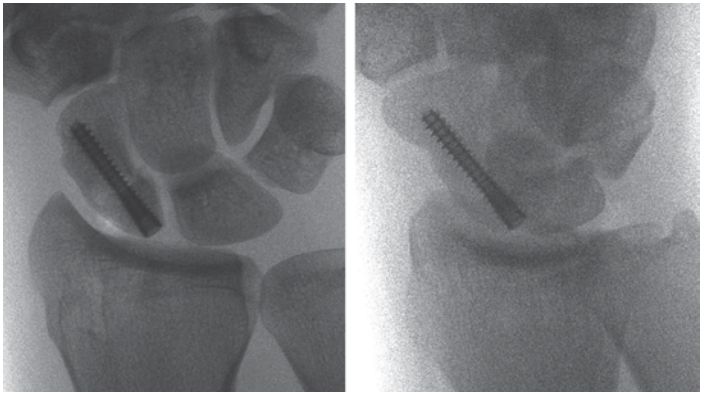

Fig. 8.3 Intraoperative fluoroscopy demonstrating bone graft of cystic defect, proper screw placement, and fracture compression. (Published with kind permission of © Michael Lin and Tamara D. Rozental, 2015. All Rights Reserved.)

over the wire to achieve fixation and compression of the fracture. AP, lateral and oblique fluoroscopic images were taken to confirm proper screw position (Fig. 8.3). After wound irrigation, the capsule and the extensor retinaculum were repaired. The subcutaneous tissue and skin were closed with Monocryl, followed by Steri-Strips. A thumb spica splint was applied.

Clinical Course and Outcome

The patient was brought back to the office in 10 days for application of a short arm thumb spica cast. Radiographs were obtained on the first postoperative visit to confirm adequate positioning of the hardware. At 2 months, a CT scan of the wrist was obtained to assess fracture healing and showed early bony bridging. The patient was placed in a second thumb spica cast. A second CT scan at 4 months demonstrated obvious fracture healing (Fig. 8.4). At this point, the patient was transitioned to a splint and began occupation therapy for range of motion and strengthening exercises. At final follow-up 8 months after surgery (Fig. 8.5), the patient

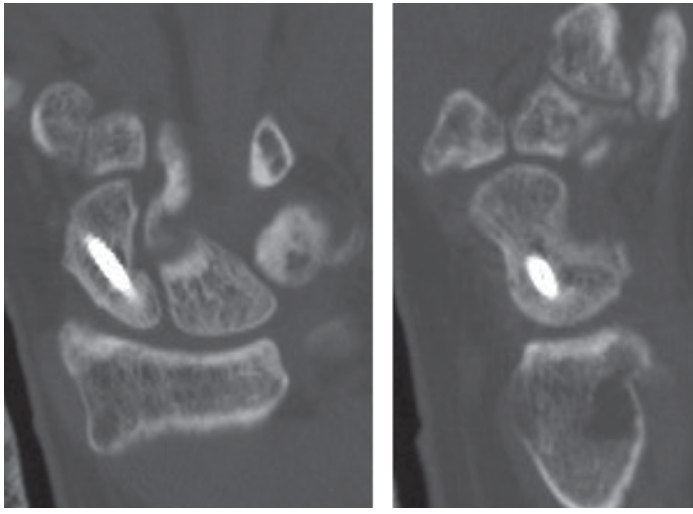

Fig. 8.4 Postoperative CT at 4 months showing definitive fracture healing. Note the visible bone graft donor site. (Published with kind permission of © Michael Lin and Tamara D. Rozental, 2015. All Rights Reserved.)

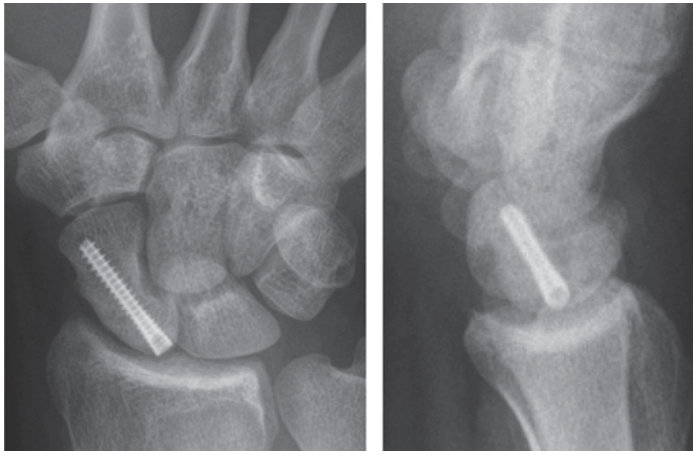

Fig. 8.5 Final follow-up X-ray at 8 months demonstrating fracture healing and complete resolution of cystic defect. (Published with kind permission of © Michael Lin and Tamara D. Rozental, 2015. All Rights Reserved.)

exhibited wrist extension of 58°, flexion of 63°, radial deviation of 15°, and ulnar deviation 20°. His grip strength was 104 lbs compared to 120 lbs in the contralateral side. He reported no limitations in activities and had a quickDASH score of 2.3.

Clinical Pearls and Pitfalls

- Obtain a preoperative CT scan to determine whether a humpback deformity is present. If a deformity exists, structural bone graft may be more appropriate.
- Place the incision just ulnar to Lister's tubercle and protect the EPL tendon.
- Place the wrist in hyperflexion to allow visualization of the proximal pole of the scaphoid.
- Obtain fluoroscopic images with the wrist in slight flexion to avoid bending the guide wires as the wrist is extended.
- Following the removal of the guide wire for bone graft insertion, it may be necessary to redrill the tract before replacing the guide wire and compression screw.
- Obtain a postoperative CT scan to adequately assess for healing

Literature Review and Discussion

Neglected scaphoid nonunion predictably results in pain and functional impairment; and can lead to scaphoid humpback deformity, radiocarpal arthrosis, and eventual advanced carpal collapse [1–3]. Therefore, with the exception of the elderly or poor surgical candidates, we typically recommend surgical treatment to achieve fracture union. The technique presented here is ideal for early scaphoid nonunion without extensive sclerosis or significant alteration in the overall scaphoid geometry. Cases of significant osteonecrosis may be better addressed with vascularized bone graft [4–6], and patients with shortened scaphoid or humpback deformity are better served by corticocancellous graft to restore proper scaphoid

anatomy.[7, 8] As illustrated in this case presentation, our technique reliably and effectively treats scaphoid nonunion with cystic defect without the need for extensive open debridement or bone grafting. Perhaps some of the success is attributable to a limited dorsal approach which minimizes the disruption of the scaphoid's external blood supply by preserving the dorsal radial and anterior interosseous arterial branches of radial artery and the anterior interosseous artery [9]. We routinely educate patients on the tenuous nature of scaphoid's vascular supply and the possibility of delayed healing despite optimal surgical technique. Additionally, we feel that postoperative cast treatment and CT evaluation of healing is an important component of this treatment protocol. All of our patients received short arm thumb spica cast postoperatively for at least 2 months, with subsequent CT evaluation. The cast is discontinued after radiological evidence of union.

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