

SUBSPECIALTY PROCEDURES

SCAPHOID NONUNION VOLAR PLATING
WITH PURE NONVASCULARIZED
CANCELLOUS AUTOGRAFT

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Published outcomes of this procedure can be found at: *J Hand Surg Am.* 2019 Feb;44(2):160.e1-7, and *J Hand Surg Am.* 2019 Apr;44(4):339.e1-7.

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Abstract

Background: Surgical treatment of scaphoid nonunion has evolved over the years to include a variety of procedures and techniques involving a number of vascularized and nonvascularized bone grafting options and fixation strategies. Volar plating of scaphoid nonunions with use of pure cancellous nonvascularized autograft is a safe and effective treatment method with good functional outcomes and union rates¹.

Description: Volar plating of the scaphoid nonunion is performed via a volar approach, with debridement and reduction of the nonunion site. A nonvascularized pure cancellous bone autograft is then harvested and impacted from the distal aspect of the ipsilateral radius or the olecranon. Finally, a low-profile volar locking plate is applied for fixation².

Alternatives: There is no consensus regarding the optimal treatment of scaphoid nonunion. Headless compression screws are currently popular, and advances have been made over time to include various nonvascularized and vascularized corticocancellous grafts. The advent of plate fixation of the scaphoid has enabled the surgical treatment of nonunion to better replicate scaphoid morphology, allowing for improved biomechanical stability and optimizing the biologic milieu for healing.

Rationale: Headless compression screws, although a reasonable option for most acute scaphoid fractures, may not be the most appropriate application for nonunions. Compression, in itself, is not required for the surgical treatment of scaphoid nonunion, and can even prove detrimental by forcing the reduction into a malunion. The stability of headless compression screws must rely on a structural graft to resist the compression and create friction. The more structural the graft, however, the less biologically active it tends to be. Further, the simple placement of a metallic screw within the fracture site is counter to orthopaedic principles because it dramatically lowers the surface area available for union. Volar locking plates address the shortcoming of headless compression screws by (1) directly buttressing the deforming forces superior to headless screws³⁻⁶; (2) utilizing the most accessible, biologically active nonvascularized

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bone graft, which is pure cancellous graft; (3) allowing for maximal surface area contact for union; and (4) preserving the intraosseous vascular network within the scaphoid and its vascular supply at its dorsal ridge.

Expected Outcomes: Volar scaphoid plating with cancellous bone grafting is a reliable technique with excellent union rates and favorable functional outcomes. A review of 34 patients with scaphoid nonunions with segmental defects treated with volar plates and pure cancellous autograft demonstrated 100% union as verified by computed tomography scans postoperatively¹. Average Disabilities of the Arm, Shoulder and Hand scores and grip strengths improved by final follow-up. Another series of 13 scaphoid nonunions with osteonecrosis treated with volar plating and pure cancellous autograft showed 100% union and good patient-reported and functional outcomes, despite smokers, proximal poles, and previous failed surgical procedures in the cohort². These favorable results are consistent with earlier reports of the modern plating systems; however, concerns for hardware-related complications have been elucidated over the years, including symptomatic hardware impingement⁷. This risk can be mitigated by proper surgical technique and plate placement.

Important Tips:

- Clear visualization of the entire volar surface of the scaphoid is crucial. Take care not to reflect too much capsule, so as to cause ulnar translation of the carpus.
- Thorough debridement of nonviable bone is paramount. Using a 2.0 or 3.0-mm low-speed burr with continuous irrigation can be helpful. We have had successful unions even in cases in which the remaining proximal pole was just a cortical shell and essentially a hollow vessel for graft.
- Err on the side of verticalization of the scaphoid, overextending and supinating the distal pole. Overstuffing the nonunion site with cancellous autograft aids in reduction and maximizes the osteoinductive and osteoconductive properties of the graft.
- Impaction of the graft is crucial, and the surgeon should harvest more autograft than one might initially anticipate.
- Secure the plate to the proximal portion of the scaphoid first. There is less room for error on the proximal portion where plate positioning is more critical.
- Do not cross the scaphoid “line in the sand”; to do so will result in plate impingement on the radius. Proper placement of the plate is just distal to the point at which the convex surface of the proximal pole transitions to become the concave surface of the scaphoid waist, as viewed from a volar approach.
- Plate modification for proximal pole fractures and nonunions: removal of the most proximal hole in the plate allows for improved fixation despite the plate itself remaining behind the scaphoid “line in the sand.” In these cases, the locking screws must be directed so that they buttress the subchondral bone of each pole, especially the proximal pole.

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