Vascularized vs Non Vascularized Bone Grafting for Scaphoid Nonunion: Real World Outcomes from a Single Center Cohort

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Disclosures: We have no pertinent financial disclosures.

Introduction: Scaphoid fractures are among the most common carpal injuries, and a substantial proportion progress to nonunion, leading to pain, dysfunction, and degenerative wrist changes. Surgical fixation with bone grafting remains the gold standard of treatment, yet the relative benefit of vascularized versus non-vascularized bone grafts remains debated. Although vascularized grafts are traditionally favored for proximal-pole avascular necrosis, recent meta-analyses have shown comparable union rates between these two techniques. This single-center retrospective cohort study reviewed treatment patterns and outcomes in patients presenting with scaphoid nonunion who received operative management. We hypothesize that that non-vascularized bone grafting will achieve union rates comparable to vascularized grafting.

Methods: A retrospective chart review was performed of all patients who underwent operative fixation for scaphoid nonunion at a single academic center between 2010 and 2024. Patients were identified using CPT codes for scaphoid nonunion surgery and included if they had radiographically confirmed nonunion with postoperative imaging available to assess union. Demographic, clinical, and operative data including fracture location, graft type and source, fixation construct, and time to union—were collected. Union status was determined radiographically by a board-certified hand surgeon. Descriptive statistics were calculated, and subgroup outcomes were summarized without between-group hypothesis testing due to sample size limitations.

Results: Thirty-one patients met inclusion criteria, with a mean age of 27 years and 90% male predominance. Fractures most commonly involved the scaphoid waist (74%), followed by the proximal and distal poles (13% each). Overall union was achieved in 26 of 31 cases (83.9%) with an average time to union of 197 days (6.6 months). Union occurred in 3 of 4 patients (75%) treated with vascularized bone grafts (VBG) and 22 of 26 patients (84.6%) treated with non-vascularized bone grafts (NVBG), corresponding to mean times to union of 5.5 and 6.9 months, respectively. Among six patients with proximal-pole avascular necrosis, all of whom were treated with NVBG, five achieved union (83.3%).

Discussion: In this single-center retrospective cohort, union rates following operative treatment for scaphoid nonunion were comparable between vascularized and non-vascularized bone grafting. These findings align with recent literature suggesting no universal superiority of vascularized grafts, even in the presence of proximal-pole avascular necrosis. Non-vascularized grafting remains a reliable option for most cases, though larger prospective studies are needed to clarify graft selection criteria and optimize outcomes in complex nonunion patterns.

Significance/Clinical Relevance: This study examines treatment patterns and outcomes in surgically treated scaphoid nonunion, providing insight into whether non-vascularized bone grafts are comparable to vascularized techniques helping to guide graft selection in clinical decision making.

Images and Tables

Surgical Outcomes	Distal Pole (n=4)	Waist (n=23)	Proximal Pole (n=4)	Total (n=31)
Union				
Yes	4 (100%)	18 (78%)	4 (100%)	26(84%)
No	0	5 (22%)	0	5(16%)
Average Time to Union (SD)				
Day	269.5 (183.38)	187.61 (120.35)	165.00 (55.83)	196.73 (123.80)
Month	8.98 (6.11)	6.25 (4.01)	5.50(1.86)	6.56 (4.13)
Proximal Pole AVN				
Yes	0	5 (22%)	1 (25%)	6 (19%)
No	4 (100%)	18 (78%)	3 (75%)	25 (81%)

Table 1: Surgical Outcomes by Fracture Location

Surgical Outcomes	**VBG**	**NVBG**
Union		
Yes	3 (75%)	22 (85%)
No	1 (25%)	4 (15%)
Average Time to Union (SD)		
Day	164.3 (80.58)	5.48 (2.69)
Month	205.6 (142.64)	6.86 (4.75)

Table 2: Surgical Outcomes by Graft Type