

# A Comparative Study between Two Different Bone Grafting Methods for Early Scaphoid Nonunion: Vascularized Bone Grafting vs. Arthroscopic Non-Vascularized Bone Grafting

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## INTRODUCTION:

Scaphoid nonunion often requires bone grafting. Good results have been reported for both vascularized bone grafting (VBG) and arthroscopic non-vascularized bone grafting (ASBG). However, few reports have directly compared the results of the two methods. The purpose of the present study was to investigate the surgical outcomes of VBG and ASBG.

## METHODS:

Records of patients with surgically-treated scaphoid fracture delayed/nonunion between 2001 and 2020 were retrospectively reviewed. Patients aged between 18 and 60 with early symptomatic scaphoid fracture delayed/nonunion, defined as no bony healing observed 2-12 months after the initial injury, were treated with headless screw. The exclusion criteria were as follows: previous scaphoid surgery, fracture treated with plate or Kirschner wire, and carpal deformity/malalignment defined as radio-lunate (RL) angle >20. The range of motion (ROM), grip strength, and Mayo Wrist Score were measured. The radiological evaluation of bone union and postoperative RL angle were also assessed. Comparisons between the two continuous and categorical variables were made with the Mann-Whitney's U test and  $\chi$ -square test, respectively. Statistical significance was defined as  $p < 0.05$ .

## RESULTS:

A total of 52 hands in 51 patients were included in the final analysis. Twenty-six hands underwent pedicled VBG (Zaidenberg method: 15 hands and Makino method: 11 hands) and the rest 26 hands underwent ASBG. No significant difference was observed in patient demographics, preoperative ROM, and preoperative Mayo Wrist Score. ASBG group showed statistically significantly better postoperative ROM only for palmar-flexion (VBG 60.4 vs. ASBG 71.9,  $p < 0.001$ ) (Table 1), and no significant difference in dorsal-flexion ROM. In terms of other clinical outcomes, postoperative grip strength and Mayo Wrist Score were similar in both groups. Bone union rates were 96.2% in VBG and 100% in ASBG. (Table 2)

**DISCUSSION AND CONCLUSION:** In our study, both VBG and ASBG demonstrated similar clinical results for scaphoid delayed/nonunion treated within 12 months of the initial injury. ASBG was associated with slight but statistically significantly better palmar-flexion ROM compared to VBG. Vascularized bone graft may not be necessary for scaphoid delayed/nonunion if treated early after the initial injury.

Table 1 Patient demographics

		VBG (n=26)	APBG(n=26)	p-value	
Age at surgery	Mean (SD)	28.7 (12.1)	23.2 (9.2)	0.16	
Sex	Male:Female	17:9	12:1	0.60	
Side	Right : Left : Bilateral	17:9:0	12:12:1	0.26	
Time between injury to surgery (month)	Mean (SD)	6.1 (3.1)	4.9 (3.0)	0.15	
Preoperative ROM	palmer flexion	Mean (SD)	58.3 (17.0)	61.4 (12.2)	0.57
	dorsal flexion	Mean (SD)	63.0 (15.3)	61.0 (10.5)	0.43
Preoperative Mayo Wrist Score	Mean (SD)	63.1(9.5)	65.5(10.3)	0.44	
Fracture location	Proximal:Waist	10:14	10:16	1.00	

Table 2 Clinical outcomes

			VBG (n=26)	APBG(n=26)	p-value
Postoperative ROM	palmer flexion	Mean (SD)	60.4 (10.0)	71.9 (13.1)	<0.01
	dorsal flexion	Mean (SD)	72.3 (11.5)	71.7 (9.1)	0.87
Postoperative grip strength (% of unaffected side)		Mean (SD)	94.2 (11.4)	93.1 (10.1)	0.88
Postoperative Mayo Wrist Score		Mean (SD)	90.2 (9.0)	90.0 (8.1)	0.75
Postoperative radio-lunate angle		Mean (SD)	5.2 (6.8)	3.8 (6.9)	0.41
Bone fusion			25/26 (96.2%)	26/26 (100%)	1.00