

Cartilage Cap in Scaphoid Nonunions: An Indication of Stability and Biology?

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INTRODUCTION: Scaphoid nonunion management is controversial, dependent upon many factors without a clear algorithm. Traditionally, open approaches involved corticocancellous, vascularized or non-vascularized structural bone grafting with internal fixation. However, recent arthroscopic techniques have improved the ability to assess the stability of fractures and the need for bone grafting, while preserving blood supply. We hypothesized that scaphoid nonunions with an intact cartilage cap at the nonunion site at the time of arthroscopic assisted repair would go onto union with screw fixation alone.

METHODS: Retrospective review of patients diagnosed with scaphoid nonunion was performed. Nine patients noted to have an intact cartilage cap at the nonunion site during diagnostic arthroscopy were included. All underwent percutaneous screw fixation without fracture debridement. Time to union, range of motion (ROM), and patient-reported outcome measures (PROMs) were collected retrospectively.

RESULTS:

Nine patients, aged 16 to 33 years, underwent scaphoid nonunion fixation during the study period. Preoperatively, mean radiographic displacement was 2 mm (range: 1-3 mm). Bony healing on CT scan was achieved in all 9 cases (100%) after 14 weeks, with no additional procedures (Table 1). At the final follow-up, the mean VAS score was 0.11 (range: 0 to 1). The mean SWV was 91.5% (range: 65% -100%). The mean PRWE score was 2.33 (range: 0-8.5). The mean QDASH score was 0.77 (range: 0-2.3) (Table 2). Paired t-test for pre- vs postoperative VAS and SWV scores showed that there was a significant difference in both scores (p=0.004 and p=0.002 respectively). Final postoperative average wrist ROM revealed average flexion of 70° (range: 50 – 80), extension of 61.7° (range: 40 – 80), ulnar deviation of 32° (range: 25– 40), and radial deviation of 23° (range: 10 – 30) (Table 3). None of the patients showed radiographic signs of osteoarthritis, osteonecrosis of the scaphoid, or intra-articular screw penetration. Throughout the study period, no complications were reported in any of the patients. There were no reoperations.

DISCUSSION AND CONCLUSION: Scaphoid nonunions with minimal displacement and maintained mechanical alignment of the carpus and an intact cartilage represent a stable pattern that can be treated by restoring mechanical stability. Thus, if a cartilage cap is found to be intact, arthroscopic-assisted percutaneous screw fixation results in bony union, favorable outcomes, with minimal pain and excellent patient reported outcomes. This can help to serve as a foundation for future studies attempting to establish an algorithm to treat scaphoid nonunions

Table 1. Demographics

Case	Age	Sex	Lateralite	Fracture (AO/OTA type)	Type of Nonunion	Radiographic Displacement (mm)	Time to Bony Union (weeks)	Displacement at Final Follow-up (mm)	Follow-up (months)
1	31	F	L	Proximal pole, distal	Hyperplastic	2	none	0.1	48
2	21	F	R	Volar, distal	Hyperplastic	1	Cast for 10 weeks	0.4	14
3	17	M	R	Volar, proximal	Hyperplastic	1	Cast for 10 weeks	0.1	1
4	30	M	L	Proximal pole, proximal	Oligoepiphyseal	1	Cast for 6 weeks and 10 weeks	0.4	10
5	20	M	L	Proximal pole, proximal	Oligoepiphyseal	2	Open and 12 weeks	0.2	48
6	30	M	R	Volar, proximal	Oligoepiphyseal	2	Open and 6 weeks	0.1	36
7	26	M	L	Proximal pole, proximal	Oligoepiphyseal	2	Cast for 6 weeks	0.1	30
8	21	M	L	Proximal pole, proximal	Oligoepiphyseal	2	Cast for 6 weeks	0.4	1
9	30	M	L	Volar, proximal	Oligoepiphyseal	2	Open for 1 week and 10 weeks	0.1	1

Table 2. Patient Reported Outcomes

Case	Preoperative PROMs			Postoperative PROMs			
	VAS Pain Score	SWV (%)	QDASH	PRWE	VAS Pain Score	SWV (%)	
1	4		2.3	8.5	0	97	
2	7	50	0	0	0	100	
3	3	25	0	0	0	65	
4	1	5	0	0	0	100	
5	0	40	0	0	0	100	
6	7	80	0	0	0	100	
7	3	30	2.3	5.5	0	90	
8					0	80	
9	4				1		
Average (±SD)	3.63±2.50	38.33±25.43	0.77±1.19	2.33±3.74	0.11±0.33	91.5±12.85	

QDASH: Quick Disabilities of Arm, Shoulder and Hand; PRWE: Patient Rated Wrist Evaluation; VAS: Visual Analog Scale; SWV: Subjective Wrist Value; SD: Standard Deviation.

Table 3. Range of Motion

Case	Preoperative ROM				Postoperative ROM				Contralateral ROM			
	Flexion	Extension	Ulnar Deviation	Radial Deviation	Flexion	Extension	Ulnar Deviation	Radial Deviation	Flexion	Extension	Ulnar Deviation	Radial Deviation
1					80	50	25	10				
2	70	10	10	10					80	70	40	30
3	70	70	40	30	50	40	30	20	80	70	40	30
4	60	10	10	10					80	70	40	30
5					80	70	40	30	80	70	40	30
6					50	60	25	25				
7					80	70	40	30	80	70	40	30
8												
9					80	80						

All range of motion measurements are reported in degrees (°)