

Duncan S. Van Nest MD, Asif M. Ilyas MD
 The Rothman Institute at Thomas Jefferson University Hospital | Philadelphia, PA

INTRODUCTION & OBJECTIVES

Headless compression screw fixation with bone grafting has been the mainstay of treatment for scaphoid nonunion for the past several decades. Volar plate fixation, however, has gained popularity as a technique for scaphoid fixation, especially for recalcitrant or multifragmented nonunions. The purpose of this meta-analysis was to compare union rates and clinical outcomes between volar plate fixation and headless compression screw fixation for the treatment of scaphoid nonunions.

MATERIALS & METHODS

We performed a literature search of studies documenting outcomes for scaphoid nonunion treatment with either screw fixation, plate fixation, or both using PubMed, SCOPUS, Cochrane Library, and Google Scholar from 2000 to 2020. Inclusion criteria consisted of (1) adult patients with average age > 18 years, (2) primary study using either screw fixation, plate fixation or both, with discrete data reported for each procedure, (3) average follow up of at least 3 months. Exclusion criteria consisted of (1) studies with incomplete or missing data on union rates. Data from each study was weighted, combined within treatment groups, and compared across treatment groups using generalized linear models.

Variable	Screw Fixation	Plate Fixation	P Value
Preoperative Data			
Mean (95% Confidence Interval)			
Age	27.3 (25.4 – 29.3)	30.4 (27.9 – 32.7)	0.056
Gender (Male)	91.2% (84.1% - 95.3%)	90.3% (82.2% - 94.9%)	0.834
Injury to Surgery Time (months)	13.4 (10.2 – 16.6)	22.2 (18.4 – 26.0)	0.001
Prior Scaphoid Surgery	0.6% (0.05% - 6.8%)	15.1% (7.5% - 28.0%)	0.011
Avascular Necrosis	0.5% (0.02% - 13.1%)	4.1% (0.2% - 52.9%)	0.383
Postoperative Outcomes			
Union Rate	92.0% (82.4% - 96.6%)	93.9% (86.5% - 97.4%)	0.642
Time to Union (months)	2.7 (2.3 – 3.1)	4.4 (3.4 – 5.5)	0.002
Modified Mayo Wrist Score	90.5 (88.6 – 92.5)	71.6 (63.5 – 79.8)	<0.001
Complication Rate	1.5% (0.1% - 14.4%)	6.1% (1.5% - 21.8%)	0.314
Reoperations Rate	3.6% (1.0% - 12.5%)	18.4% (5.0% - 49.2%)	0.076

Table 1: Continuous and categorical outcomes for demographic and preoperative data, as well as postoperative outcomes data for screw fixation versus plate fixation.

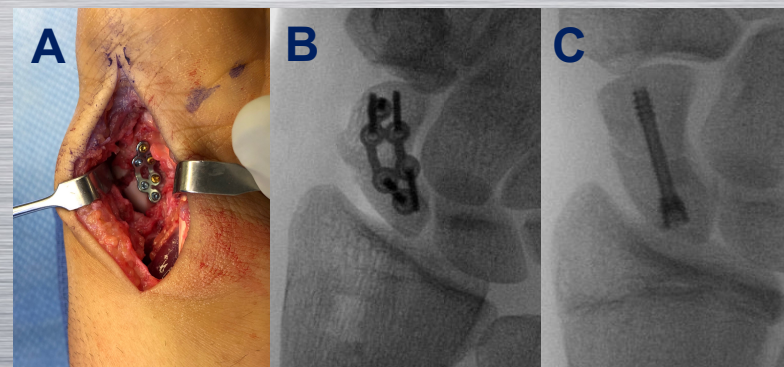


Figure 1: (A) intraoperative photograph of locking volar plate (Medartis, Basel). (B) Postoperative radiograph following fixation with locking volar plate. (C) Postoperative radiograph following headless compression screw fixation.

RESULTS

A literature search resulted in 925 articles from 2000 to 2020 before inclusion and exclusion criteria were applied. Ultimately, 23 articles were included for analysis. These articles consisted of 14 distinct cohorts treated with screw fixation and 12 cohorts treated with plate fixation. In total, 395 patients treated with screw fixation and 209 with plate fixation were included for final analysis. Preoperatively, patients treated with plate fixation had significantly longer time from injury to surgery ($p=0.001$) and were more likely to have had prior surgical intervention ($p=0.011$). There was no significant difference between union rates at 92% and 94% for screw and plate fixation, respectively ($p=0.642$). However, plate fixation resulted in longer time to union ($p=0.02$) and lower modified Mayo wrist scores ($p=0.001$).

CONCLUSIONS

Patients treated with plate fixation were more likely to present with recalcitrant nonunions. There was no statistically significant difference in union rates between screw and plate fixation. The results from this meta-analysis support the use of plate fixation for scaphoid nonunion, especially recalcitrant nonunions and those that have failed prior surgical intervention.