SCIENTIFIC ARTICLE

Treatment Outcomes of 4-Corner Arthrodesis for Patients With Advanced Carpal Collapse: An Average of 4 Years' Follow-Up Comparing 2 Different Plate Types

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Purpose The objective was to investigate the clinical and subjective outcomes of patients after 4-corner arthrodesis (FCA) for scapholunate advanced collapse (SLAC) or scaphoid nonunion advanced collapse (SNAC) and to analyze complications. Furthermore, we compared the long-term results of a first-generation nonlocking plate (Spider) and a plate with a locking screw design (Flower plate).

Methods In a retrospective cohort study, we included 39 patients with stage II or III SLAC or SNAC who underwent FCA. Twenty wrists were treated with a nonlocking plate and 19 with a locking plate. Patients completed the Patient-Rated Wrist Evaluation (PRWE) and the Michigan Hand Outcomes Questionnaire (MHQ). Active range of wrist motion, radiological signs such as impingement, and signs of implant loosening and nonunion, as well as postoperative complications, were assessed.

Results After a median postoperative follow-up time of 4.1 years, the PRWE score was 18 and the total MHQ score 79. Patient-reported and clinical outcomes were similar for the 2 plate types. Wrists fixed with the nonlocking plate had more dorsal impingements and loosening than wrists fixed with a locking plate. One nonunion was noted in the nonlocking plate group, and a single case of implant failure was seen for each plate type. A total of 5 patients with a nonlocking plate incurred postoperative complications that required further medical treatment.

Conclusions FCA for patients with stage II or III SLAC or SNAC yields positive clinical and subjective outcomes. Based on the high complication rate following FCA with a nonlocking plate, we no longer use this implant and recommend fixation with a locking screw plate. *(J Hand Surg Am. 2018;43(5):487.e1-e6. Copyright © 2018 by the American Society for Surgery of the Hand. All rights reserved.)*

Type of study/level of evidence Therapeutic IV.

Key words Four-corner arthrodesis, scapholunate advanced collapse, scaphoid nonunion advanced collapse, wrist.

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Scaphoid excision with 4-corner arthrodesis (FCA) is a common salvage procedure for the treatment of stage II and stage III scapholunate advanced collapse (SLAC) or scaphoid nonunion advanced collapse (SNAC) wrists.[1–3] Four-corner arthrodesis leads to good patient-rated outcomes, although complications such as nonunion have been reported.[4,5] Plate fixation with various circular plates has resulted in disappointing outcomes, particularly nonunion.[6–9] The reported nonunion rates for the first-generation Spider plate with nonlocking screws (Integra LifeSciences Corp., Plainsboro, NJ) range from 25% to 63%.[6–8] Another plate with locking stainless steel (polyether-ether-ketone [PEEK]-Optima) screws (Xpode cup; TriMed Inc., Santa Clarita, CA) has been shown to be associated with union rates of 80% to 96%.[10,11] Furthermore, studies using headless compression screws for FCA have reported high union rates from 89% to 100%.[12–15] In comparison, no such data exist for other systems that use locking screws, such as the Flower plate (KLS Martin Group, Tuttlingen, Germany).

The objective of our study was to investigate the long-term clinical and subjective outcomes of patients after FCA for stage II or III SLAC or SNAC and to analyze complications. Furthermore, we compared the results of a first-generation nonlocking plate with a newer locking screw design.

MATERIALS AND METHODS

In this retrospective cohort study, we included patients with stage II or III SLAC or SNAC who underwent FCA between March 2002 and September 2012. A total of 57 operations were completed in 54 patients (Fig. 1). At least 1 year after surgery, patients were invited to participate in a scheduled follow-up examination. The study was approved by the local ethics committee, and all patients provided written informed consent for their data to be used for this analysis.

Intervention

At the beginning of this series, we used the Spider plate (Integra LifeSciences Corp., Plainsboro, NJ), which was later replaced by the Flower plate (KLS Martin Group, Tuttlingen, Germany).

The FCA was performed according to a standard technique. After inspection of the joint surface, the scaphoid and the cartilage and subchondral bone between the capitate, the hamate, the lunate, and the triquetrum were removed. After repositioning the carpus, correction of dorsal intercalated segment instability of the lunate and provisional fixation with a K-wire, we inserted the plate with nonlocking (Spider plate) or locking (Flower plate) screws, without a bone graft and removed the K-wire. Finally, the capsule was closed, the tendons repositioned and the extensor retinaculum and skin were sutured. All patients wore a removable orthosis for 6 weeks and began active movement 2 weeks after surgery.

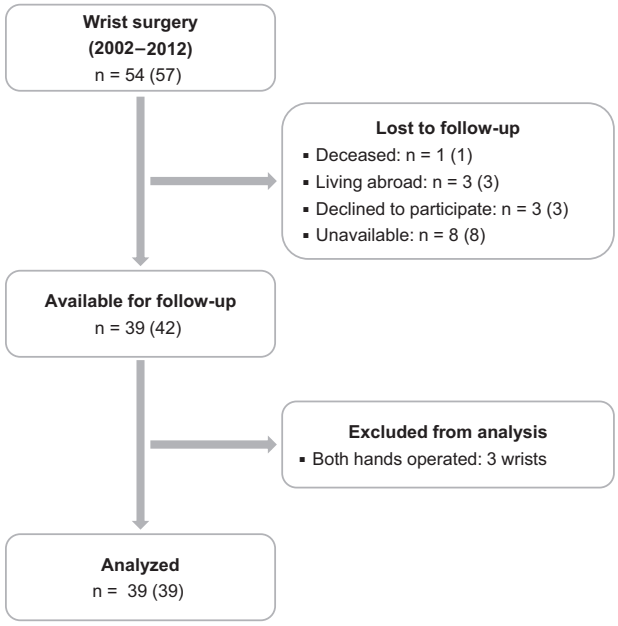

FIGURE 1: Patient flow chart indicates the number of patients (wrists) receiving FCA.

TABLE 1. Characteristics Of 39 Patients (39 Wrists) Treated With FCA

Patient Characteristics	Number (%)	Mean (SD)
Age at surgery (y)		58.8 (11.1)
Age at examination (y)		62.9 (11.9)
Follow-up (y)		4.1 (2.0)
Sex		
Female	13 (33)	
Male	26 (67)	
Indication*		
SLAC stage II	1 (3)	
SLAC stage III	26 (67)	
SNAC stage II	4 (10)	
SNAC stage III	8 (21)	
Plate type		
Spider plate	20 (51)	
Flower plate	19 (49)	

*The sum of the percentages is more than 100 due to rounding of the figures.