Headless Compression Screws Versus Staples in Four-Corner Fusion: A Retrospective Analysis of Complication Rates and Functional Recovery

Nikita Golovachev[1], Kassem Ghayyad[2], Daniel J Fletcher[3], Abdo Bachoura, David Crandall Hirsch
[1]Rothman Orthopaedics Florida at AdventHealth, [2]Rothman Orthopedic Institute, [3]Rothman Orthopaedic Institute

INTRODUCTION:
Four-Corner Fusion (4CF) is a critical procedure employed for the treatment of advanced wrist arthritis and other complex wrist pathologies. A key aspect of this surgery involves the fixation method used, which significantly impacts both complication rates and functional recovery. Headless compression screws and staples are two widely utilized fixation techniques, each with its own set of advantages and challenges. This study aims to provide a comprehensive retrospective analysis comparing these two methods, focusing on their respective complication rates and the functional recovery of patients. Through this analysis, we seek to offer valuable insights that could inform surgical decision-making and improve patient outcomes in 4CF procedures.
METHODS:
A retrospective chart review was conducted on patients who underwent 4CF for SLAC or SNAC wrist in a single surgeon's practice over a thirteen-year period. Primary functional outcomes included postoperative complications, subsequent surgery, wrist flexion and extension range of motion (ROM), Quick Disabilities of Arm, Shoulder & Hand (QDASH) score, and the Short-Form 12 (SF-12) survey. Statistical analysis was performed using an unpaired or paired t-test for continuous data and the Fisher exact test for categorical data.
RESULTS:
Thirty-nine patients were identified with an average follow-up of 9.1 months in the HCS group and 9.2 months in the ST group. 21 patients were treated with HCS, and 18 were treated with ST. Most patients were male (82%), with an average age of 56.9 ± 17.0 and 58.7 ± 14.2 in the HCS and ST groups, respectively. In the HCS and ST groups, postoperative complications were experienced by 38% (n=8) and 44% (n=8) of patients, respectively ($p=0.75$). In the HCS group, the main complications were pain (n=4), nonunion (n=3), and subsequent surgeries for revision or hardware removal (n=3). For the ST group, these were pain (n=5), hardware loosening (n=4), and subsequent surgeries (n=4). Postoperatively, wrist flexion and extension ROM did not significantly change in either group. QDASH improved significantly from 38.6 ± 19.0 to 21.2 ± 20.0 ($p=0.003$) in the HCS group and from 44.5 ± 20.2 to 16.2 ± 20.5 ($p=0.001$) in the ST group. The ST group significantly improved in the SF-12 physical component from 37.1 ± 9.8 to 45.6 ± 11.0 postoperatively ($p=0.01$), whereas the HCS group had no significance.
DISCUSSION AND CONCLUSION:
The findings of this retrospective analysis indicate that the choice between Headless Compression Screws (HCS) and Staples (ST) for fixation in Four-Corner Fusion (4CF) surgery, particularly in the treatment of Scapholunate Advanced Collapse (SLAC) or Scaphoid Nonunion Advanced Collapse (SNAC), does not significantly influence postoperative complication rates or functional recovery outcomes. This suggests that both fixation methods are viable options, offering comparable efficacy in terms of patient recovery and complication profiles. The decision on which technique to employ can therefore be guided by other factors such as surgeon preference, cost considerations, and specific patient circumstances. In conclusion, this study provides valuable insights that can aid in the decision-making process for 4CF surgeries, promoting more personalized and effective patient care without being constrained by concerns over significant differences in outcomes between the two fixation methods. Future research could further explore any nuanced differences and long-term effects to refine these findings.

Table 1: Demographic and Radiographic Comparison of 2 Patient Groups

	HCS (n=21)			ST (n=18)		
Male	17			15		
Female	4			3		
Age at 4CF	56.9 ± 17.0			58.7 ± 14.2		
Postoperative complications	8			8		
	Pre-op	Post-op	p-value	Pre-op	Post-op	p-value
Wrist flexion	30.4° ± 17.0	28.6° ± 15.5	0.87	29.6 ± 19.6	30.0 ± 16.3	0.76
Wrist extension	30.0 ± 17.4	26.2 ± 16.0	0.09	36.7 ± 19.2	31.0 ± 12.9	0.19
QDASH	38.6 ± 19.0	21.2 ± 19.5	0.003	44.5 ± 20.3	16.2 ± 20.5	0.001
SF-12 physical component	41.9 ± 8.0	43.2 ± 10.8	0.24	37.1 ± 9.8	45.6 ± 11.0	0.01

HCS: headless compression screws; ST: staples; 4CF: Four-corner fusion