

Increased Nonunion Rates for Scaphoid Fractures Treated Nonoperatively with Recent NSAID Use

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INTRODUCTION:

Acute scaphoid fractures constitute up to 80% of all carpal bone fractures with reported union rates of nondisplaced scaphoid fractures between 90-95% after casting and immobilization.¹ Delayed diagnosis, fracture displacement, avascular necrosis, and fractures involving the proximal pole are all factors that contribute to the development of nonunion of scaphoid fractures.³ Identifying nonunion is paramount, as it can result in carpal malalignment and progressive radiocarpal arthrosis.² The purpose of our study was to evaluate the relationship of usage of non-steroidal anti-inflammatory drugs (NSAIDs) and nonunion rates in nonoperatively and operatively managed scaphoid fractures.

METHODS:

We queried the TriNetX database for all patients diagnosed with scaphoid fractures between January 1, 2010 and December 31, 2023, using a combination of International Classification of Diseases (ICD) and Current Procedural Terminology (CPT) codes. We then stratified all patients with scaphoid fractures by treatment (nonoperative vs open reduction and internal fixation (ORIF)), and by those who received a prescription for NSAIDs within one month after scaphoid fracture diagnosis. These patient cohorts were then evaluated for the incidence of scaphoid nonunion and for the incidence of salvage procedures for scaphoid nonunion two years after initial diagnosis or scaphoid ORIF. Matched cohorts were also created, controlling for diabetes, obesity, malnutrition, heart disease, kidney disease, nicotine dependence, and alcohol use disorder. Chi squared and odds ratio analysis (with 95% confidence intervals (CI)) were used to evaluate the statistical significance of trends observed across these groups. Statistical significance was set as $p < 0.05$.

RESULTS:

Before matching, there were 104,437 patients with scaphoid fractures treated nonoperatively without peri-injury NSAID use, and 16,495 nonoperative patients with peri-injury NSAID use (Table 1). In addition, there were 4,621 patients with operatively treated scaphoid fractures without recent NSAID use, and 1,836 patients with recent NSAID use (Table 1). After matching, there were 17,241 patients in the nonoperative group and 1,410 patients in the operative group (Tables 2 and 3). Within the matched nonoperative treatment cohort, patients with NSAID use had a significantly increased incidence of scaphoid nonunion (3.6% vs. 1.7%, odds ratio (CI): 2.17 (1.88-2.51)) and significantly increased incidence of salvage procedures (1.2% vs. 0.6%; odds ratio (CI): 1.98 (1.56-2.52)) (Table 4). In contrast, within the matched operative fracture group with and without recent NSAID use, there was not a significant difference between the incidence of scaphoid nonunion (7.0% vs. 8.1%; OR (CI): 1.18 (0.89-1.56)), or the incidence of salvage procedures (2.5 vs. 2.8%, OR (CI): 0.90 (0.56-1.42)) (Table 4).

DISCUSSION AND CONCLUSION:

The results of this study suggest an increased risk of scaphoid nonunion for patients with scaphoid fractures treated nonoperatively who were also prescribed NSAIDs within one month of initial diagnosis. After matching, there is an approximate two-fold increase in nonunion risk and subsequent salvage procedures in nonoperatively managed scaphoid fractures with peri-injury NSAID use. This effect on nonunion and salvage procedures is not seen in patients with operatively managed scaphoid fractures with peri-injury NSAID use, suggesting that mechanical fixation may mitigate the potential negative effects of NSAIDs on fracture healing. Physicians may need to advise patients against NSAID use in the peri-injury period after a scaphoid fracture, especially if it is expected to be managed nonoperatively.

Table 1: Demographic and Comorbidity Data for Patients with Nonoperatively and Operatively Managed Scaphoid Fractures with and without Peri-Injury NSAID Use

	Nonoperative Scaphoid Fractures without NSAID Use (N=104,437)	Nonoperative Scaphoid Fractures with NSAID Use (N=16,495)	Operative Scaphoid Fractures without NSAID Use (N=4,621)	Operative Scaphoid Fractures with NSAID Use (N=1,836)
Age (SD)	44.8 (14.0)	42.2 (14.9)	50.4 (12.7)	50.1 (12.7)
Sex				
Male (%)	53,304 (51)	9,272 (56)	3,315 (75)	1,281 (70)
Female (%)	43,362 (42)	6,839 (41)	1,286 (28)	482 (26)
Unknown (%)	6,771 (7)	884 (5)	120 (3)	73 (4)
Ethnicity				
Hispanic or Latin (%)	8,837 (8)	1,444 (9)	539 (12)	224 (12)
Not Hispanic or Latin (%)	42,869 (40)	10,631 (64)	3,127 (70)	1,247 (68)
Unknown (%)	12,811 (12)	4,220 (26)	855 (19)	325 (18)
Race				
White (%)	71,362 (68)	10,579 (64)	3,275 (75)	1,241 (68)
Black or African American (%)	9,435 (9)	2,448 (15)	412 (9)	181 (10)
Asian (%)	2,260 (2)	347 (2)	147 (3)	29 (2)
Native Hawaiian or other Pacific Islander (%)	577 (1)	105 (1)	17 (0)	10 (1)

Table 2: Matched Demographic and Comorbidity Data for Patients with Scaphoid Fractures Treated Nonoperatively with and without Peri-Injury NSAID Use

	Nonoperative Scaphoid Fractures without NSAID Use (N=17,241)	Nonoperative Scaphoid Fractures with NSAID Use (N=1,410)
Age (SD)	42.1 ± 17.1	42.1 ± 16.8
Sex		
Male (%)	8,756 (50.8%)	9,746 (69.1%)
Female (%)	8,582 (49.2%)	6,066 (42.9%)
Ethnicity		
Hispanic or Latin (%)	1,420 (8.2%)	1,440 (10.2%)
Not Hispanic or Latin (%)	11,800 (67.7%)	11,400 (80.9%)
Unknown (%)	4,219 (24.1%)	4,260 (30.4%)
Race		
White (%)	11,130 (64.0%)	11,040 (78.6%)
Black or African American (%)	2,857 (16.6%)	2,880 (20.5%)
Asian (%)	306 (1.8%)	306 (2.2%)
Native Hawaiian or other Pacific Islander (%)	100 (0.6%)	100 (0.7%)
American Indian or Alaska Native (%)	98 (0.6%)	94 (0.7%)
Other Race (%)	476 (2.8%)	464 (3.3%)
Unknown Race (%)	3,087 (17.8%)	3,070 (21.9%)
Comorbidities		
Diabetes (%)	1,280 (7.4%)	1,248 (8.8%)
Obesity (%)	2,028 (11.8%)	2,060 (14.6%)
Malnutrition (%)	292 (1.7%)	291 (2.1%)
Ischemic Heart Disease (%)	865 (5.0%)	843 (6.0%)
Renal Disease (%)	452 (2.6%)	451 (3.2%)
Nicotine Dependence (%)	3,600 (21.2%)	3,636 (25.8%)
Alcohol Use Disorder (%)	3,367 (19.6%)	3,346 (23.8%)

Table 3: Matched Demographic and Comorbidity Data for Patients with Scaphoid Fractures Treated Operatively with and without Peri-Injury NSAID Use

	Operative Scaphoid Fractures without NSAID Use (N=4,621)	Operative Scaphoid Fractures with NSAID Use (N=1,836)
Age (SD)	52.8 ± 13.3	52.8 ± 13.9
Sex		
Male (%)	1,281 (27.8%)	1,266 (68.4%)
Female (%)	1,261 (27.3%)	377 (20.6%)
Ethnicity		
Hispanic or Latin (%)	312 (6.7%)	312 (17.0%)
Not Hispanic or Latin (%)	4,219 (90.8%)	4,219 (23.0%)
Unknown (%)	315 (6.8%)	314 (17.0%)
Race		
White (%)	3,710 (80.5%)	3,624 (19.7%)
Black or African American (%)	484 (10.5%)	484 (26.4%)
Asian (%)	26 (0.6%)	26 (1.4%)
Native Hawaiian or other Pacific Islander (%)	10 (0.2%)	10 (0.5%)
American Indian or Alaska Native (%)	12 (0.3%)	12 (0.6%)
Other Race (%)	51 (1.1%)	46 (2.5%)
Unknown Race (%)	151 (3.3%)	151 (8.2%)
Comorbidities		
Diabetes (%)	342 (7.4%)	53 (2.8%)
Obesity (%)	497 (10.7%)	497 (26.9%)
Malnutrition (%)	21 (0.5%)	21 (1.1%)
Ischemic Heart Disease (%)	221 (4.8%)	221 (11.9%)
Renal Disease (%)	22 (0.5%)	29 (1.5%)
Nicotine Dependence (%)	271 (5.8%)	271 (14.6%)
Alcohol Use Disorder (%)	254 (5.5%)	254 (13.8%)

Table 4: Rates of Nonunion and Salvage Procedures for Nonoperatively and Operatively Treated Scaphoid Fractures Before Matching

Fracture Cohort	Nonunion Rate (%)	OR (95% CI)	Salvage Rate (%)	P-Value
Nonoperative	19.1 (2.0)	1.00	1.1 (0.8-1.5)	<0.001
Operative	19.1 (2.0)	1.00	1.1 (0.8-1.5)	<0.001
Nonoperative with NSAID	36.2 (3.6)	2.17 (1.88-2.51)	1.2 (0.9-1.6)	<0.001
Operative with NSAID	8.1 (1.2)	1.18 (0.89-1.56)	2.8 (2.1-3.8)	<0.001

Bolded values indicate statistically significant differences with $p < 0.05$.

Table 4b: Rates of Nonunion and Salvage Procedures for Nonoperatively and Operatively Treated Scaphoid Fractures After Matching

Fracture Cohort	Nonunion Rate (%)	OR (95% CI)	Salvage Rate (%)	P-Value
Nonoperative	19.1 (2.0)	1.00	1.1 (0.8-1.5)	<0.001
Operative	19.1 (2.0)	1.00	1.1 (0.8-1.5)	<0.001
Nonoperative with NSAID	3.6 (0.6)	2.17 (1.88-2.51)	1.2 (0.9-1.6)	<0.001
Operative with NSAID	7.0 (1.0)	1.18 (0.89-1.56)	2.8 (2.1-3.8)	<0.001

Bolded values indicate statistically significant differences with $p < 0.05$.