

## A Comparative Study of two Different Bone Anchors Used in the Management of Scapholunate Instability

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### ABSTRACT

**AIM:** The aim of this study is to determine if there are differences related to the recurrence of instability, disability, pain, and psychosocial impact of pain in patients who have undergone surgery for scapholunate instability with either the Stryker Sonic Anchor or Depuy Mitek Anchor. When using the standard treatment of ligamentous repair and capsulodesis to repair scapholunate instability, the use of bone anchors is common practice, but there are no reports in the literature comparing clinical outcomes of different types of anchors used with this procedure.

**MATERIALS AND METHODS:** A total of 36 patients with

a diagnosis of scapholunate instability underwent scapholunate ligament repair and dorsal capsulodesis. One group was treated with the Sonic Stryker anchor (16 patients) and the other with Depuy Mitek anchor (20 patients). Both groups were followed post-operatively for an average of 12 months.

**RESULTS:** In both groups, there was no recurrence of instability during the observation period. There were significant clinical and statistical differences between the preoperative and postoperative assessments for both anchors, and both groups were improved. However, between anchor types there were no significant statistical or clinical differences postoperatively related to the recurrence of instability, disability, pain, and psychosocial impact of pain in patients who have undergone surgery for scapholunate instability with either the Stryker Sonic Anchor or Depuy Mitek Anchor.

**CONCLUSION:** Our findings suggest that the patient outcomes are equivalent using either the Stryker Sonic Anchor or Depuy Mitek Anchor in patients undergoing surgery for scapholunate instability.

**Key words:** Suture anchors; Wrist joint; Ligaments; Articular; Carpal bones

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### INTRODUCTION

The scapholunate interosseous ligament is an important stabilizer of the scaphoid and lunate bones, and disruption of this ligament leads to instability of the wrist. Scapholunate instability is the most common cause of carpal instability in clinical practice and will often result in decreased grip strength, swelling, and tenderness over the dorsal aspect of the wrist<sup>[1]</sup>. The instability is diagnosed clinically with the presence of the Watson's shift test. Fluoroscopically and by MRI, a scapholunate gap exceeding 2mm is suspicious and a gap exceeding 4mm is diagnostic of scapholunate instability.

Without treatment, chronic scapholunate disassociation leads to deteriorating function and arthritis (SLAC wrist)<sup>[2]</sup>. Standard treatment options include capsulodesis or ligament reconstruction, however the evidence available in the literature demonstrates equivalent outcomes for both procedures<sup>[3]</sup>. What is not reported in the literature is comparison of clinical outcomes of different types of anchors used with these procedures.

Both the Stryker Sonic anchor and the Depuy Mitek anchor are implants designed to aid the reattachment of soft tissue to bone fixation. The Depuy Mitek anchor has been commercially available longer than the Stryker Sonic anchor and has been widely used in open procedures of the foot, ankle, knee, hand, wrist, shoulder, and elbow. The Sonic Stryker has greater pull out strength at 222 Newtons compared to the Depuy Mitek with a pull out strength of 58 Newtons<sup>[4]</sup>.

**Aim:** The aim of this study is to determine if there are differences related to the recurrence of instability, disability, pain, and psychosocial impact of pain in patients who have undergone surgery for scapholunate instability with either the Stryker Sonic Anchor or Depuy Mitek Anchor.

## MATERIALS AND METHODS

The study was conducted as a retrospective review of previously collected prospective data. Following Institutional Review Board approval, patients who met inclusion criteria were identified. A total of 36 patients (22-66 years old) who had a diagnosis of scapholunate instability who underwent scapholunate ligament repair with dorsal capsulodesis using either a Stryker Sonic or Depuy Mitek anchor were identified. All patients were operated on by the same surgeon to minimize differences in surgical technique. Both a general anesthetic and a brachial plexus block were used, with a pneumatic tourniquet on the affected extremity. A dorsal incision was made in line with the third metacarpal and Lister's Tubercle extending from the diaphysis of the third metacarpal to about one centimeter into the distal radius at the level of the fourth dorsal compartment. The radiocarpal joint was entered through the bottom of the fourth dorsal compartment. At this time, the scapholunate joint and scaphocapitate alignment was restored, ensuring that the radius, lunate, and capitate were colinear. One or two K-wires were then used as an internal splint and tested under fluoroscopy to ensure they provided sufficient stability. Next, the scapholunate ligament was reconstructed and one or two bone anchors were placed as close as possible to the anatomical origin of the ligament at the scaphoid and lunate. Another bone anchor was then placed at the distal pole of the scaphoid. Guided by procedures described by Blatt<sup>[5]</sup> and Brunelli<sup>[6]</sup>, a flap of the dorsal intercarpal ligament was fixed to tether the flexion movement of the scaphoid. This was followed by plication in the midline of the dorsal intercarpal ligament, increasing the tension at the repair sites. The wound was closed in layers, and the pins remained in place for 4-6 weeks. However, gentle active range of motion in the AP plane was initiated as soon as three weeks to minimize residual stiffness.

A total of 16 patients received Sonic Stryker anchors and 20 received Depuy Mitek anchors. They were followed for a period averaging 12 months (maximum 5 years). After the anchor was implanted, the patients were immobilized for three weeks followed by gentle immobilization for three weeks, and then strengthening therapy for 12 to 16 weeks. The key inclusion criteria for this retrospective analysis were 3 to 12 months post injury, clinical instability of the scapholunate ligament, use of either the Stryker

**Table 1** Outcomes by Anchor Type.

Instrument	Depuy Mitek			Sonic Stryker		
	after, N = 136 <sup>1</sup>	before, N = 136 <sup>1</sup>	p-value <sup>2</sup>	after, N = 60 <sup>1</sup>	before, N = 60 <sup>1</sup>	p-value <sup>2</sup>
NPS	1.17	6	p < 0.001	2	5.6	p < 0.001
BPI	25	52	p < 0.001	20	40	p < 0.001
DASH	52	75	p < 0.001	55	62	p < 0.001
WB	2	4.5	p < 0.001	1.5	3.5	p < 0.001

1 Mean (SD), 2 Paired t-test.

Sonic anchor or Depuy Mitek anchor to repair the injury, and follow up with a minimum of 6 months postoperative.

Exclusion criteria included patients with scapholunate advanced collapse (SLAC-wrist) and patients who did not return for follow up treatment and evaluation after surgical intervention.

Preoperative and postoperative measurements included Disabilities of the Arm, Shoulder Hand (DASH)<sup>[7]</sup>, Brief Pain Inventory (BPI)<sup>[8]</sup>, Wong-Baker FACES pain rating scale (WB)<sup>[9]</sup> numeric pain scale (NPS)<sup>[10]</sup> range of motion (pronation, flexion, extension, radial deviation, ulnar deviation), grip strength, and scapholunate instability. Postoperative follow-up evaluations included in this study started at a minimum of 6 months and ranged up to 5 years, with an average of 12 months after surgical repair of the injury. Postoperative data from each group were compared to assess the difference in outcomes between the anchors. Two-sample t-tests assessed each outcome for association with anchor type. Paired t-tests assessed effectiveness of each anchor type for each measure. This analysis was performed simultaneously across all variables and individually.

## RESULTS

Of the 36 patients included in this analysis, the Sonic Stryker anchor was used to repair the scapholunate instability in 16 patients, and the Depuy Mitek anchor was used in 20 patients. In both groups, there was no recurrence of instability during the observation period. There were significant clinical and statistical differences between the preoperative and postoperative assessments for both anchors, and both groups were significantly improved. However, between anchor types there were no significant statistical or clinical differences postoperatively related to the recurrence of instability, disability, pain, and psychosocial impact of pain in patients who have undergone surgery for scapholunate instability with either the Stryker Sonic Anchor or Depuy Mitek Anchor.

Following the exploratory analysis, a multivariate ANOVA model was fit to the imputed data to assess the effect of anchor type. The differences between the pre and post scores were assessed for any effect due to anchor type. Static scapholunate recurrence was not noted during the study period. A 1 mm dynamic clenched fist view was observed in three patients at fluoroscopy without clinical significance.

There were no significant clinical or statistical difference between the anchors. There were statistically significant decreased pain scores on the DASH, BPI, Wong-Baker FACES pain scale and numeric pain scales for both anchors, and it is noteworthy that the sets of improved measures are the same between anchor type.

## DISCUSSION

This retrospective study compared the Stryker Sonic and Depuy Mitek bone anchors in patients who underwent the repair of

scapholunate ligament with capsulodesis. There were significant clinical and statistical differences between the preoperative and postoperative assessments of function and pain (DASH), the psychosocial impact of pain (BPI), pain (WB and numeric pain rating scale), and range of motion for both anchors; however, between anchor types, differences in the postoperative assessments were not significant. Additionally, five years after repair of the injury, there was no recurrence of instability and there was improvement on all measured parameters.

The pull-out strength of an anchor should provide adequate strength to support the scapholunate ligament. The natural pull-out strength of the scapholunate ligament has a mean value of  $147 \pm 54$  N (93-201)<sup>[11]</sup>. Therefore, the Stryker Sonic anchor exceeds the pull-out strength at 222 N, and the Depuy Mitek anchor does not at 58N<sup>[4]</sup>.

Our findings suggest that there are no significant statistical or clinical differences between anchors with related to the recurrence of instability, disability, pain, and psychosocial impact of pain in patients who have undergone surgery for scapholunate instability with either the Stryker Sonic Anchor or Depuy Mitek Anchor.

The increased pull-out strength of the Sonic Stryker suture anchor did not provide any additional advantages in this study. Both anchors were effective in controlling scapholunate instability. Cost or personal preference may be deciding factors.

#### Statements

1. Statement of Informed Consent. Retrospective review of previously collected prospective data. Burrell College of Medicine, Las Cruces, New Mexico, Institutional Review Board IRB # 0055\_2019.
2. Statement of Human and Animal Rights confirmed. Burrell College of Medicine, Las Cruces, New Mexico, Institutional Review Board IRB #0055\_2019.

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