Irreparable No More: Outcomes of Massive Rotator Cuff Tears Repaired with Collagen Patch and Subacromial Spacer

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INTRODUCTION:
Massive rotator cuff tears are a leading cause of shoulder pain and disability, particularly in patients with high Rotator Cuff Healing Index (RoHI) scores, who are traditionally at risk for poor outcomes following repair. Augmentation strategies, such as bioinductive collagen patches and subacromial balloon spacers, have emerged as promising technologies, but the failure rate remains high. The RoHI score was initially developed to predict healing outcomes in primary rotator cuff tears treated with standard repair techniques and may serve as a useful tool in identifying patients who could benefit from augmentation or alternative surgical interventions. This study seeks to evaluate the outcomes of patients with high RoHI scores who underwent rotator cuff repair augmented with both a collagen patch and balloon spacer.

METHODS: A retrospective analysis was conducted on 56 patients who underwent rotator cuff repair with augmentation using a bioinductive collagen patch and subacromial balloon spacer between 2022 and 2023 who had a ROHI score that would predict a minimal chance of rotator cuff healing via standard surgical technique. Inclusion criteria included a RoHI score greater than 6 and a minimum of 12 months of follow-up. The primary outcomes measured were ultrasound evaluation of tendon healing rates, acromiohumeral distance, Visual Analog Scale (VAS) for pain, and Single Assessment Numeric Evaluation (SANE) scores.
RESULTS:
There were 56 patients included in this study with a mean follow up of 23.0 months (range 12.1 - 31.8). Of those, 25 patients had a ROHI score of 7 to 9, and 31 patients had a ROHI score of 10 to 15.
In the cohort with a ROHI score of 7 to 9, 20 patients (80%) had successful tendon healing at their most recent follow up. In the cohort with a ROHI score of 10 to 15, 22 patients (71%) had successful tendon healing at their most recent follow up. **(Table 1)**

Patients in the RoHI 7 to 9 cohort reported a mean VAS score of 1.15 at the most recent follow up. **(Table 2)** Additionally, mean post operative SANE score for this cohort was 84.9. In patients with a RoHI score between 10 and 15, the mean VAS score was 0.59 at the most recent follow up. The mean post operative SANE score in this group was 89.3.

DISCUSSION AND CONCLUSION:
This study's results are compared against that original RoHI dataset and suggest that the addition of augmentation may significantly improve outcomes. In the RoHI 7–9 cohort, the observed tendon healing rate was 42% higher than predicted, while the 10–15 RoHI cohort demonstrated a 57% improvement over expected healing rates. In addition to these favorable anatomic outcomes, patients reported substantial pain reduction, as evidenced by improved VAS pain scores throughout the study. At final follow-up, the mean SANE scores were 84.9 and 89.3 in the 7–9 and 10–15 RoHI groups, respectively.

These encouraging results may be attributed to restoration of shoulder biomechanics through tissue release and repair, combined with augmentation using a bioinductive collagen patch and a subacromial balloon spacer.

Overall, this combined approach significantly enhances tendon healing, alleviates pain, and improves shoulder function in patients with large or massive rotator cuff tears and elevated RoHI scores, including revision cases. Notably, no adverse events related to the patch or spacer were identified. This technique may represent a valuable surgical option for patients who are not candidates for tendon transfer or reverse shoulder arthroplasty.

Table 1: Rotator Cuff Healing Rates Based on Preoperative RoHI Score

Rohi Score	Patients (n = 56)	Predicted Healing Rate	Observed Healing Rate
7-9	25	38%	80.0%
10-15	31	14%	71.0%

Table 2: Patient Reported Outcome Measures Following Rotator Cuff Repair

Rohi Score	Mean Preop Pain (All Patients)	Mean Postop Pain (Healed)	Mean Postop SANE (Healed)
7-9	6.52	1.15*	84.9
10-15	5.97	0.59*	89.3

* indicates $P < 0.05$