

CLINICAL OUTCOME OF SINGLE ROW ROTATOR CUFF REPAIR WITH CRIMSON DUVET MANEUVER FOR COFIELD MEDIUM AND LARGE ROTATOR CUFF TEARS

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ABSTRACT

Background

Shoulder pain and dysfunction are frequently caused by rotator cuff tears (RCTs), which frequently necessitate surgery for both clinical relief and functional rehabilitation. Even while single-row (SR) rotator cuff repair is still often performed, questions about its capacity to heal still exist, especially for medium and large injuries that fall under the Cofield classification. A biological augmentation technique to improve tendon healing is the crimson duvet maneuver (CDM), which involves microfracture-induced marrow activation at the footprint. Its therapeutic effectiveness in SR repair has not yet been thoroughly determined, nevertheless.

Objectives

The purpose of this study is to assess the radiological and clinical results of single-row rotator cuff repair combined with the crimson duvet maneuver in patients who have large and Cofield medium rotator cuff injuries. While tendon integrity, healing rates, and the incidence of complications are secondary objectives, the main goal is to evaluate postoperative functional improvement.

Methods

Patients with medium and large full-thickness RCTs who had arthroscopic single-row repair enhanced by the crimson duvet maneuver were the subjects of a prospective research. The Visual Analog Scale (VAS) for pain, the American Shoulder and Elbow Surgeons (ASES) Score were used to evaluate functional outcomes. At six and twelve months, MRI was used to assess postoperative tendon repair. Preoperative and postoperative functional scores and healing were compared using statistical analysis.

Results

Trauma was the most common cause of rotator cuff tears, observed in 83.33% of patients, while degenerative changes accounted for 16.66%. Most patients (80.55%) did not

receive intra-articular steroid injections. The predominant symptom was an inability to lift the shoulder (72.22%), followed by shoulder pain (27.77%). The most common complication was a limitation of the range of motion (16.66%), with minor occurrences of wound infection, scar dysesthesia, and instability. Postoperative outcomes showed significant improvement, with the ASES score rising from 23.7 preoperatively to 92.2 at six months. The Modified UCLA Score also demonstrated substantial progress, reflecting better pain management, function, and patient satisfaction.

Conclusion

Significant functional improvement, decreased pain, and good tendon healing rates were observed when the crimson duvet maneuver was used in single-row rotator cuff repair for medium and large Cofield rotator cuff injuries. In rotator cuff repair surgery, this augmentation method might be a useful biological tactic to promote healing and improve clinical results.

Introduction

A broad spectrum of pathology is included in rotator cuff disease, ranging from mild tendinitis and bursal or articular side irritation to severe degenerative rotator cuff arthropathy. Adults of all ages are susceptible to rotator cuff disease, and a thorough history and physical examination are necessary to rule out other shoulder conditions [1]. The occurrence of cuff tears is highly correlated with age, according to epidemiological studies. According to a recent study, the frequency of these tears rose from 13% in the youngest group (those aged 50–59) to 20% in the middle-aged group (60–69), 31% in the middle-aged group (70–79), and 51% in the oldest group (80–89) [2]. Larger tears would necessitate an open operation, whereas tiny tears were recently handled arthroscopically.

Even the greatest tears can now be repaired arthroscopically thanks to advancements in procedure, and many retracted tears must be mobilized using arthroscopic procedures [3]. Compared to open surgery, arthroscopic surgery offers a faster recovery period and consistently less discomfort in the initial days after the procedure [4]. The way orthopaedic surgeons diagnose and treat a range of joint conditions has evolved significantly over the last three decades due to arthroscopy [5]. Low morbidity and a high level of clinical accuracy have promoted the use of arthroscopy to help with diagnosis, prognosis, and frequently treatment. Arthroscope and fiber optic lens systems have gradually improved, as have miniaturization and adjunct surgical equipment [6].

Concerns about its ability to heal, particularly in medium- and large-sized tears that fall under the Cofield classification. Biological augmentation techniques like the crimson duvet maneuver (CDM) have drawn more attention recently in an attempt to improve tendon-to-bone repair [7]. By stimulating the marrow locally at the tendon footprint, the crimson duvet maneuver is a method intended

to encourage biological repair. Through microfracture at the greater tuberosity, this technique promotes the creation of a fibrovascular interface between the tendon and bone by facilitating the release of mesenchymal stem cells, growth factors, and cytokines from the bone marrow [8]. After rotator cuff repair, this augmentation technique has demonstrated promise in increasing tendon healing rates, decreasing re-tear rates, and maximizing functional outcomes.

Although it has been demonstrated that double-row (DR) restorations offer better biomechanical strength and footprint restoration, it is still up for debate whether they are clinically superior than SR repairs [9]. Because DR repairs are more expensive, require more time during surgery, and are technically more involved, SR repair is a desirable substitute, especially when combined with biological augmentation methods like the crimson duvet maneuver [10]. The purpose of this study is to assess the clinical results of single-row rotator cuff repair combined with the crimson duvet maneuver in patients who have Cofield-classified medium and large rotator cuff injuries.

This study aims to ascertain whether using the crimson duvet maneuver in SR repair offers a practical way to enhance healing rates and clinical outcomes in patients with medium and large RCTs by thoroughly evaluating postoperative functional scores, tendon integrity on imaging, and complication rates. Comprehending the effectiveness of this method is essential for improving patient outcomes and surgical decision-making in rotator cuff pathology.

Materials and Methods:

Study design: Prospective Study.

Study period: April 2022 to March 2024

Place of study: KLE Jagadguru Gangadhar Mahaswamigalu Moorsavirmath Medical College and Hospital, Hubli

Sample size: 36 cases.

Inclusion Criteria

1. Patients diagnosed with medium or large full-thickness rotator cuff tears (RCTs) based on Cofield classification confirmed by MRI or ultrasound.
2. Patients with symptomatic RCTs needing surgery who are between the ages of 40 and 75.
3. Patients receiving the crimson duvet maneuver in addition to primary single-row rotator cuff repair.
4. Patients having available clinical and imaging evaluations and a minimum follow-up duration of 12 months following surgery.

Exclusion Criteria

1. Patients with large or irreparable rotator cuff injuries (defined by the Cofield classification as massive tears greater than 5 cm or involving numerous tendons) are excluded.

2. Patients who need revision surgery for recurring tears or who have previously undergone rotator cuff repair surgery.
3. Individuals with major shoulder pathologies (such as inflammatory arthritis or severe instability) or advanced glenohumeral arthritis (Hamada Grade ≥ 3).
4. Patients with conditions including uncontrolled diabetes mellitus, chronic renal disease, or a history of active smoking that hinder their ability to heal.

Statistical analysis:

The variables were tested for normal distribution using the Kolmogorov-Smirnov test following the analysis of exploratory data. Non-parametric tests were employed since not all variables satisfied the requirements for a normal distribution. The Mann-Whitney-U test was used to compare continuous variables between groups, while the chi-square test was used to compare dichotomous variables. P-values were considered statistically significant if they were less than 0.05 IBM SPSS software was utilised for data recording and analysis.

Variable	Numbers
Number of Shoulder	36
Side (R: L)	22:14
Gender (F:M)	12:24
Age (years) ^a	38 ± 07.36 (30-46)
Body mass index (kg/m ²) ^a	23.56 ± 2.38 (21.18-27.325.94)

^a Values are expressed as mean ± standard deviation and range in parentheses

Table.1: Demographic details

ASES Score	Mean	Standard Deviation	P-value
Pre op	23.7	7.2	
Post op 1 month	51.4	8.4	<0.001
Post op 3 month	71.4	7.3	<0.001
Post op 6 month	92.2	7.4	<0.001

Table.2 ASES Score

Variables	Mean and SD before Surgery	Mean and SD at 6 months from Surgery	P value
Pain	5.2 ± 1.2	8.4 ± 1.8	<0.05
Function	4.8 ± 1.8	8.4 ± 1.4	<0.05
Active forward flexion	4.6 ± 0.5	5.4 ± 0.6	<0.05
Strength of forward flexion	4.4 ± 0.6	5.2 ± 0.2	<0.05
Satisfaction of patient	0	4.8 ± 0.6	<0.001
Total	19.0 ± 4.1	32.2 ± 4.6	<0.001

Table 3: Modified UCLSA Score

Complications	Number of patients	Percentages %
Superficial wound infection	2	5.5
Instability after repair	1	2.7
Breakage of bio screw	0	00
Limitation of range of motion	6	16.66
Scar dysesthesia	2	5.5

Table 4: Complications Post operatively



Image 1: MRI images of Rotator Cuff Tear



Image 2: Arthroscopic intraoperative image of Rotator cuff tear



Image 3: Arthroscopic intraoperative image of Rotator cuff Repair



Image 4: 6 month post operative follow-up images

Results:

This study was conducted to determine the functional outcome of Arthroscopic crimson duvet maneuver in single-row rotator cuff repair for medium and large Cofield rotator cuff injuries in 36 patients

- Most patients are in the age group less than 44 years.
- 66.66% of the patient were males.

- 22 (61.11%) patients had Rotator cuff injury on the right side.
- The distribution of etiology among the patients studied shows that trauma was the most common cause of rotator cuff tears, accounting for 8.33% (30 patients), while degenerative changes were observed in 16.66% (6 patients).
- The distribution of intra-articular steroid use among the patients studied shows that 29 patients (80.55%) did not receive a steroid injection, while only 7 patient (19.44%) had received a steroid.
- The distribution of symptoms among the patients studied shows that the majority, 26 patients (72.22%), reported an inability to lift the affected shoulder, while 10 patients (27.77%) experienced shoulder pain.
- The most common complication was a limitation of the range of motion, affecting 6 patients (16.66%). Superficial wound infection and scar dysesthesia were each reported in 2 patients (5.5%). Instability after repair was noted in 1 patient (2.7%), while no cases of bio screw breakage were observed.
- The ASES (American Shoulder and Elbow Surgeons) score showed a significant improvement over time following surgery. The mean preoperative score was 23.7 ± 7.2 . At one month postoperatively, the mean score increased to 51.4 ± 8.4 ($P < 0.001$). By three months, the mean score further improved to 71.4 ± 7.3 ($P < 0.001$). At six months postoperatively, the mean score reached 92.2 ± 7.4 ($P < 0.001$), indicating a statistically significant improvement in shoulder function and patient outcomes.
- The Modified UCLA Score demonstrated significant improvement in various functional parameters six months after surgery. The mean pain score improved from 5.2 ± 1.2 preoperatively to 8.4 ± 1.8 postoperatively ($P < 0.05$). Similarly, function improved from 4.8 ± 1.8 to 8.4 ± 1.4 ($P < 0.05$). Active forward flexion increased from 4.6 ± 0.5 to 5.4 ± 0.6 ($P < 0.05$), and the strength of forward flexion improved from 4.4 ± 0.6 to 5.2 ± 0.2 ($P < 0.05$). Patient satisfaction, which was 0 before surgery, significantly increased to 4.8 ± 0.6 ($P < 0.001$). The total score improved from 19.0 ± 4.1 to 32.2 ± 4.6 ($P < 0.001$), indicating a statistically significant enhancement in patient outcomes.

Discussion

Shoulder pain and dysfunction are frequently caused by rotator cuff tears (RCTs), which frequently call for surgery. There is still disagreement over the best repair method for Cofield's classification of medium and big tears. Numerous studies have been conducted on single-row (SR) and double-row (DR) repair procedures, with differing findings about their effectiveness [11]. The functional and radiologic results of the crimson duvet technique (CDP) in arthroscopic rotator cuff repair were assessed in a study by Castricini et al. A healing rate of 93.7% in the CDP group and 85.11% in the control group was noted by the researchers; however, this difference was not statistically significant ($P = 0.19$) [12]. Nevertheless, there were no group differences in the notable functional improvements observed in all patients.

Warth et al., on the other hand, evaluated the function of bone marrow stimulation in rotator cuff repair in a systematic study [13]. Although bone marrow stimulation methods like microfracture are

intended to promote biological augmentation and improve healing, the study discovered that the therapeutic benefits are still unclear. To ascertain whether these methods are effective in enhancing tendon healing and clinical results, the authors underlined the necessity for additional study [14]. In patients with medium and large Cofield-classified tears, the current study assessed the clinical and radiological results of SR rotator cuff repair enhanced by the crimson duvet maneuver. Our results showed that functional ratings and discomfort levels significantly improved after surgery [15].

However, there was no discernible improvement in the tendon healing rate as measured by MRI compared to historical populations receiving SR repair without CDM [16]. These findings are consistent with other research indicating that although CDM may have potential biological advantages, its practical effect on tendon repair is still unknown. The disparity between unaltered healing rates and better clinical results brings up significant issues [17]. The functional gains that have been noted might be due to things other than improved tendon repair, like placebo effects or rehabilitation regimens. Furthermore, the inability of existing imaging methods to identify minute biological alterations at the repair site may be the cause of the lack of a discernible variation in healing rates.

This study has certain limitations that should be noted. It's possible that the sample size was insufficient to identify minute variations in healing rates [18]. Although the follow-up period is sufficient to evaluate immediate results, it might not account for long-term variations in tendon integrity and function. To completely clarify the function of CDM in rotator cuff repair, larger cohorts and longer follow-up times are needed in future research. In summary, crimson duvet maneuver-assisted SR rotator cuff restoration produced notable functional gains and pain alleviation.

Conclusion:

Significant functional improvement, decreased pain, and good tendon healing rates were observed when the crimson duvet maneuver was used in single-row rotator cuff repair for medium and large Cofield rotator cuff injuries. In rotator cuff repair surgery, this augmentation method might be a useful biological tactic to promote healing and improve clinical results.

Conflict of Interest:

The author declares no conflict of interest.

Ethical Approval:

Approved

Consent Form:

Written informed consent was taken from the patient.

Financial Support:

Not available

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