International Journal of Medical and Pharmaceutical Research

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Case Report

Functional Outcomes of Arthroscopic Double Row Repair Technique for Full Thickness Rotator Cuff Tear

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Received: 15-02-2026
Accepted: 05-03-2026
Available online: 16-03-2026

ABSTRACT

Background: As full thickness rotator cuff tear cause pain, loss of active elevation and external rotation of affected shoulder and reduced quality of life; Arthroscopic double row repair technique emerged as primary surgical technique to address it despite of surgical complexity. Two distinct rows of suture anchors medial and lateral, are employed to optimize the biological and mechanical environment required for successful tendon to bone healing.
Purpose: To evaluate Functional outcomes of Arthroscopic double row repair technique for full thickness Rotator cuff tear
Methods: A prospective study was conducted over a period of around 18 months. 15 patients within 40-60 years with rotator cuff tear fulfilling the selection criteria admitted in Department of Orthopaedics at tertiary health care hospital, Surat were operated using arthroscopic double row repair technique in case of full thickness rotator cuff tear.
Results: 10 male and 5 female patients were recruited with an age of 40 - 60 years. Road traffic accidents (RTA) were the most common mechanism of injury. Majority of cases were operated within 1 year of the injury. The low retear rate observed in this study is consistent with previously published literature, which reports comparable or lower retear rates for quadriceps tendon autografts. No major complications were noted in any patients. No neurovascular injuries noted.
Conclusion: Arthroscopic Double row repair technique provides statistically significant and clinically meaningful improvements in pain and movements. This technique effectively restores anatomical foot print. Complication rates are acceptable.

Keywords*: Double row technique, Full Thickness Rotator Cuff Tear,Rotator Cuff Repair, Foot Print Restoration.*

INTRODUCTION

Rotator cuff tears remain one of the most prevalent causes of shoulder pain and occupational disability, affecting approximately 20% of the population over age 60. While arthroscopic repair has become the global gold standard—replacing traditional open techniques. Historically, focused on simple mechanical fixation of the tendon edge to the bone. The Double-Row technique emerged as a solution to these limitations. Byutilizing both a medial row (near the articular margin) and a lateral row (on the greater tuberosity), the procedure creates a "compression envelope" or Transosseous Equivalent construct. This design aims to maximize the tendon-to-bone contact area, distribute mechanical stress more evenly across the repair, restore the pressurized footprint required for biological integration.

AIM

To assess clinical outcomes, shoulder range of motion, pain relief and complications following arthroscopic double row repair technique in patients with full thickness rotator cuff tear.

METHODS

Study design and setting, patients, preoperative assessment, surgical technique, postoperative rehabilitation, outcome measures, and statistical analysis are described.

Study Design

This was a prospective observational study done over a period of 18 months from june 2024 to december 2025 conducted in the Department of Orthopaedics at Tertiary Care Hospital, Surat.

Study Poplation

All patients between 40-60 years of age with full thckness rotator cuff tear admitted in Department of Orthopaedics at Tertiary Care Hospital, Surat, Gujarat, during the mentioned study period and fulfilling the selection criteria mentioned below were recruited for the study.

Study Duration: 18 months

Inclusion criteria

- Age 40–60 years
- Symptomatic full thickness rotator cuff tear
- Persistent shoulder pain unresponsive to conservative treatment (e.g., physical therapy, medications, or corticosteroid injections) for at least 6 months.
- High functional demand, such as athletes or manual laborers, who require restoration of shoulder strength and range of motion.
- Patient's giving consent
- Patient compliant and willing to have their surgery

Exclusion criteria

- Active infection
- Neuromuscular disorders
- Significant comorbidities or conditions that contraindicate surgery or anesthesia (e.g.,
- severe cardiovascular or pulmonary disease).
- patient not willing to give consent.

SAMPLE SIZE

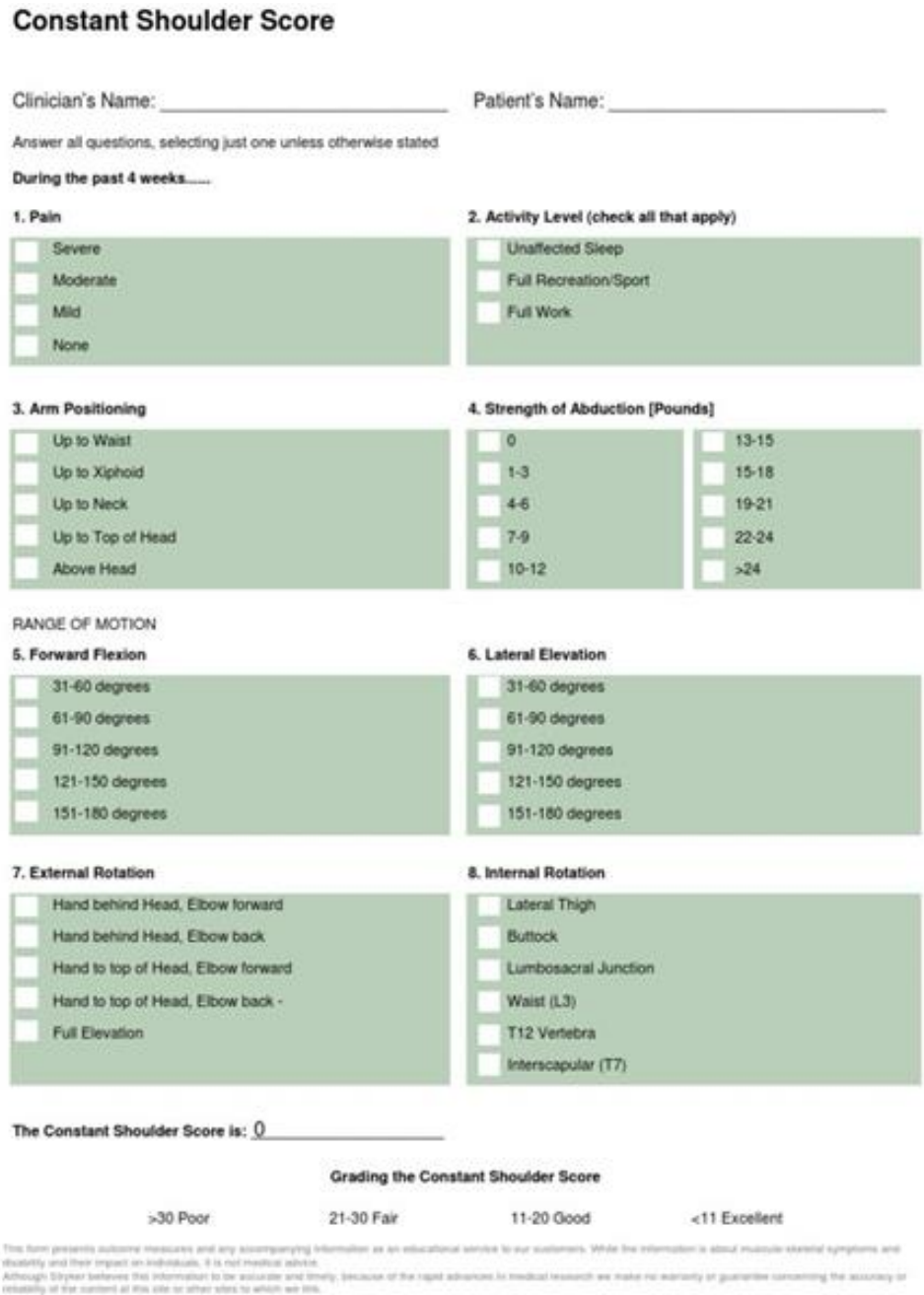
15 patients were recruited for this study. Informed written consent was obtained from the patient before recruitment.

Scoring System

The Constant-Murley Score (CMS) is a standardized scoring system that assesses shoulder function. It has a maximum score of 100 points and is divided into four subscales:

Pain: 15 points

Activities of daily living (ADL): 20 points Range of motion (ROM): 40 points Strength: 25 points
The CMS is a combination of patient-reported outcomes, performance measurement, and clinician-reported outcomes. The patient self-reports pain and ADL, while the clinician tests ROM and strength. The CMS is widely used in international studies.



Constant Shoulder Score

Clinician's Name: _____ Patient's Name: _____

Answer all questions, selecting just one unless otherwise stated

During the past 4 weeks.....

1. Pain

- ☐ Severe
- ☐ Moderate
- ☐ Mild
- ☐ None

2. Activity Level (check all that apply)

- ☐ Unaffected Sleep
- ☐ Full Recreation/Sport
- ☐ Full Work

3. Arm Positioning

- ☐ Up to Waist
- ☐ Up to Xiphoid
- ☐ Up to Neck
- ☐ Up to Top of Head
- ☐ Above Head

4. Strength of Abduction [Pounds]

- ☐ 0
- ☐ 1-3
- ☐ 4-6
- ☐ 7-9
- ☐ 10-12
- ☐ 13-15
- ☐ 15-18
- ☐ 19-21
- ☐ 22-24
- ☐ >24

RANGE OF MOTION

5. Forward Flexion

- ☐ 31-60 degrees
- ☐ 61-90 degrees
- ☐ 91-120 degrees
- ☐ 121-150 degrees
- ☐ 151-180 degrees

6. Lateral Elevation

- ☐ 31-60 degrees
- ☐ 61-90 degrees
- ☐ 91-120 degrees
- ☐ 121-150 degrees
- ☐ 151-180 degrees

7. External Rotation

- ☐ Hand behind Head, Elbow forward
- ☐ Hand behind Head, Elbow back
- ☐ Hand to top of Head, Elbow forward
- ☐ Hand to top of Head, Elbow back -
- ☐ Full Elevation

8. Internal Rotation

- ☐ Lateral Thigh
- ☐ Buttock
- ☐ Lumbosacral Junction
- ☐ Waist (L3)
- ☐ T12 Vertebra
- ☐ Interscapular (T7)

The Constant Shoulder Score is: 0

Grading the Constant Shoulder Score

>30 Poor 21-30 Fair 11-20 Good <11 Excellent

constant scoring system

2.The American Shoulder and Elbow Surgeons (ASES) score is a patientreported outcome measure that assesses shoulder function and pain: Scoring: The ASES score is a 100-point scale that combines a patient-rated questionnaire with a physician-rated section. The patient-rated section includes a pain visual analog scale (VAS) and 10 questions about activities of daily living (ADL). The pain score is calculated by subtracting the VAS from 10 and multiplying by 5. The functional score is calculated by multiplying the sum of the 10 ADL questions by 5/3. The pain and function scores are then added together to get the final ASES score. Interpretation: Higher ASES scores indicate better outcomes.

American Shoulder and Elbow Surgeons Score (ASES)

American Shoulder and Elbow Surgeons Score (ASES)
Patient Name: _____
Date: _____

Dominant Hand: R L Both (Circle One)
Affected Shoulder: R L (Circle One)

Pain Questionnaire

1. Usual Work

_____

2. Usual Sport/Leisure Activity

_____

3. Do you have shoulder pain at night (circle one)?

Yes No

4. Do you take pain killers such as paracetamol (acetaminophen), diclofenac, or ibuprofen (circle one)?

Yes No

5. Do you take strong pain killers such as codeine, tramadol, or morphine (circle one)?

Yes No

6. How many pills do you take on an average day?

Activities of Daily Living Questionnaire

8. Is it difficult for you to put on a coat?

☐ Unable to do	+0
☐ Very difficult to do	+1
☐ Somewhat difficult	+2
☐ Not difficult	+3

9. Is it difficult for you to sleep on the affected side?

☐ Unable to do	+0
☐ Very difficult to do	+1
☐ Somewhat difficult	+2
☐ Not difficult	+3

10. Is it difficult for you to wash your back/do up bra?

☐ Unable to do	+0
☐ Very difficult to do	+1
☐ Somewhat difficult	+2
☐ Not difficult	+3

11. Is it difficult for you to manage toileting?

☐ Unable to do	+0
☐ Very difficult to do	+1
☐ Somewhat difficult	+2
☐ Not difficult	+3

ASES scoring system

Surgical technique:
Patient Position:

Arthroscopic double-row repair in the **lateral decubitus** position combines specialized limb traction with a multi-anchor construct to optimize tendon-to-bone healing. The patient is placed on their non-operative side on a vaccum sealed benbag .A well-padded axillary roll is inserted under the non-operative axilla to protect the brachial plexus.

Traction:
The operative arm is suspended in approximately 15° of forward flexion and 45° of abduction using a traction device with roughly 10–15 lbs of weight.

Portals:
Posterior (Viewing): Established slightly more laterally than in the beach-chair position, typically in line with the posterolateral acromion.

Anterior (Working): Created just lateral to the coracoid process.

Lateral/Anterosuperior-Lateral: Positioned to provide a perpendicular trajectory for anchor insertion.

Fig.1

Footprint Preparation:

Debridement: Clear the subacromial bursa using a shaver through the lateral portal.

Decortication: Lightly abrade the greater tuberosity with a burr to create a bleeding bone bed while preserving the dense cortical bone needed for anchor stability

Marrow Stimulation (Crimson Duvet): Create small vents or "microfractures" in the footprint using an awl or K-wire. This releases mesenchymal stem cell and growth factor form a blood clot (the "crimson duvet") to enhance tendon-to-bone healing.

Tendon Mobilization:

Debride the frayed edges of the SSP and release any adhesions to ensure the tendon can be reduced to the lateral margin of the footprint without excessive tension

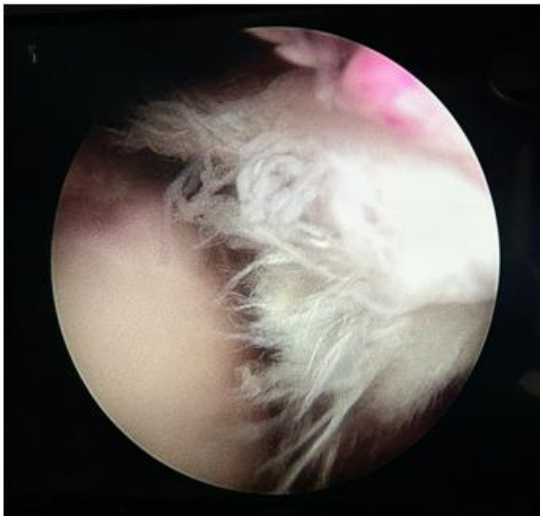


Fig.2

Medial Row Fixation:

Anchor Placement: Insert 2–3 suture anchors (often double- or triple-loaded) at articular margin (medial edge of the footprint).

Suture Passing: Use a suture passer to pass limbs through the tendon approximately 10–12 mm medial to its lateral edge. Research often recommends a horizontal mattress configuration to improve load distribution.

Tying (Optional): In conventional double-row techniques, medial row knots are tied before proceeding laterally; however, knotless "suture-bridge" techniques bypass thisto preserve tendon vascularity.

Lateral Row Fixation (Suture-Bridge Technique)

- Suture Retrieval: Retrieve one or more suture limbs from each medial anchor through the lateral portal.
- Anchor Insertion: Load these sutures into knotless anchors (e.g., SwiveLock).
- Compression: Use the sutures to "bridge" and compress the tendon down onto the footprint as the lateral anchors are fully seated into the lateral greater tuberosity.
- Final Inspection: Confirm the repair covers the entire footprint without "dog-ear" deformities.

Fig. 3 Intra operative photo

REHABILITATION PROTOCOL

Phase I. Immediate postoperative period (weeks 0-6)

Maintain integrity of the repair
Exercises
1. Active Finger, wrist, and elbow ROM exercises
2. Gradually, begin passive shoulder ROM exercises to tolerance should be reasonably pain free
   1) Flexion scapular plane 2) External or internal rotation
3. Abduction brace
   Continue full-time until end of week 5

Phase II. Protection and active motion (weeks 6-12)

Do not overstress healing tissue
Exercises
1. Begin active-assisted or active shoulder ROM exercises
   1) Forward flexion 2) External/internal rotation 3) Abduction

Phase III. strengthening (weeks 12-20)

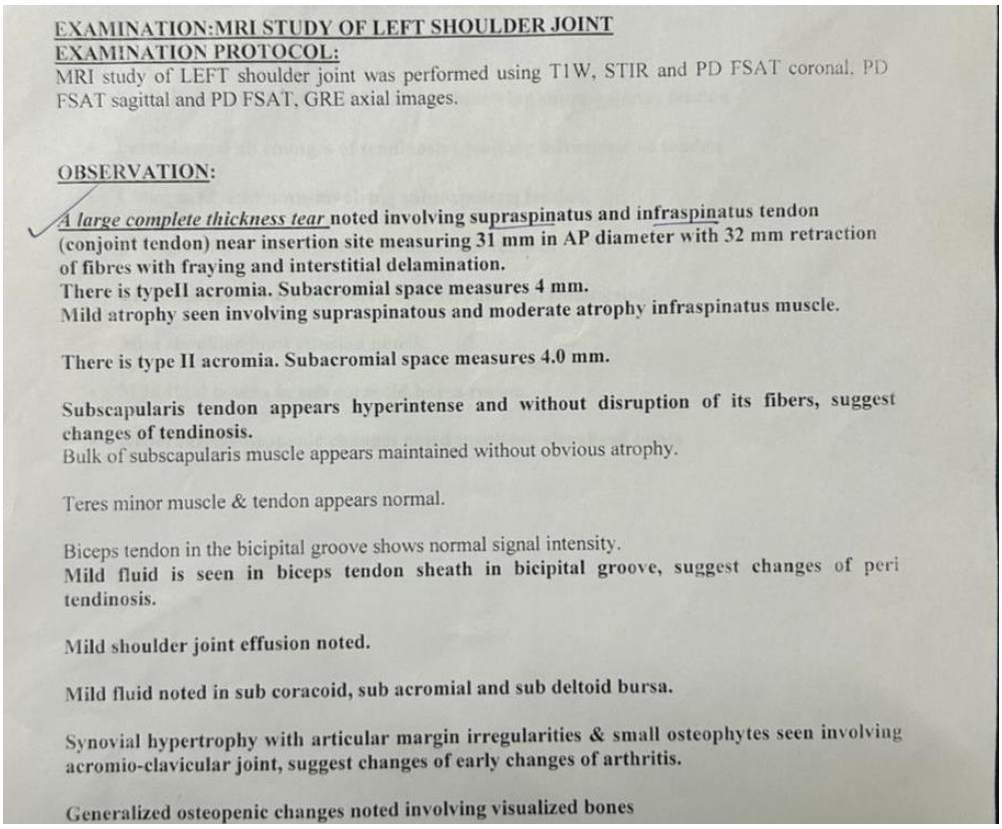
Gradual restoration of shoulder strength, power, and endurance
Gradual return to activities
Exercises
1. Continue stretching and active and passive ROM exercises, as needed
2. Initiate strengthening program
   1) External or internal rotation with exercise bands
   2) External rotation side-lying 3) Lateral raises
3. Initiate interval sports program

case 1

Fig 4

Fig.5

Fig. 6



EXAMINATION:MRI STUDY OF LEFT SHOULDER JOINT

EXAMINATION PROTOCOL:

MRI study of LEFT shoulder joint was performed using T1W, STIR and PD FSAT coronal, PD FSAT sagittal and PD FSAT, GRE axial images.

OBSERVATION:

A large complete thickness tear **noted involving supraspinatus and infraspinatus tendon (conjoint tendon) near insertion site measuring 31 mm in AP diameter with 32 mm retraction of fibres with fraying and interstitial delamination.**
There is typeII acromia. Subacromial space measures 4 mm.
Mild atrophy seen involving supraspinatous and moderate atrophy infraspinatus muscle.

There is type II acromia. Subacromial space measures 4.0 mm.

Subscapularis tendon appears hyperintense and without disruption of its fibers, suggest changes of tendinosis.
Bulk of subscapularis muscle appears maintained without obvious atrophy.

Teres minor muscle & tendon appears normal.

Biceps tendon in the bicipital groove shows normal signal intensity.
Mild fluid is seen in biceps tendon sheath in bicipital groove, suggest changes of peri tendinosis.

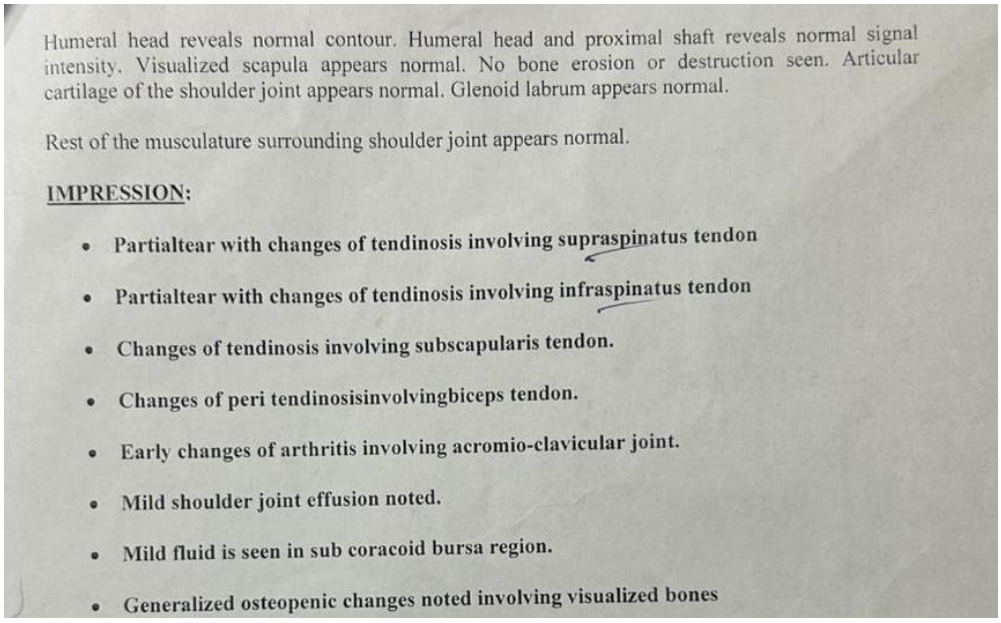
Mild shoulder joint effusion noted.

Mild fluid noted in sub coracoid, sub acromial and sub deltoid bursa.

Synovial hypertrophy with articular margin irregularities & small osteophytes seen involving acromio-clavicular joint, suggest changes of early changes of arthritis.

Generalized osteopenic changes noted involving visualized bones

Fig. 7



Humeral head reveals normal contour. Humeral head and proximal shaft reveals normal signal intensity. Visualized scapula appears normal. No bone erosion or destruction seen. Articular cartilage of the shoulder joint appears normal. Glenoid labrum appears normal.

Rest of the musculature surrounding shoulder joint appears normal.

IMPRESSION:

- **Partialtear with changes of tendinosis involving supraspinatus tendon**
- **Partialtear with changes of tendinosis involving infraspinatus tendon**
- **Changes of tendinosis involving subscapularis tendon.**
- **Changes of peri tendinosisinvolvingbiceps tendon.**
- **Early changes of arthritis involving acromio-clavicular joint.**
- **Mild shoulder joint effusion noted.**
- **Mild fluid is seen in sub coracoid bursa region.**
- **Generalized osteopenic changes noted involving visualized bones**

Fig. 8

Fig.9- Pre-op Xray

Fig.10- Post Op Xray

Fig. 11

Fig.12

Fig.13

RESULTS

The functional outcomes in case of arthroscopic massive rotator cuff tear using double row technique are generally positive, but outcomes can vary depending on several factors such as tear size, patient age, and adherence to rehabilitation protocols.

Here's a summary of common findings:

1. Most patients experience significant pain reduction following surgery. While improvement continues throughout the healing process, the most substantial relief is typically noted within the first months.
2. Surgery commonly restores shoulder strength and range of motion. Depending on the severity of tear and the dedication to rehabilitation, a full recovery of function generally takes between 6 and 12 months.
3. Most patients report high level of satisfaction with their surgical outcomes. A successful return to daily activities, including work and sports, is common result.
4. Rehabilitation Clinical success relies on comprehensive post operative rehabilitation that prioritizes the gradual recovery of shoulder kinematics, strength and functional stability.

DISCUSSION

The double-row (DR) technique achieves superior anatomical footprint restoration, re-establishing up to 100% of the native insertion area. This expanded contact area and increased interface pressure provide a more robust environment for biological tendon-to-bone healing

Biomechanical studies confirm that the double row construct provides enhanced mechanical stability, characterized by increased ultimate load to failure, greater stiffness, and reduced gap formation under cyclic loading. These superior biomechanical properties may facilitate more accelerated postoperative rehabilitation protocols by minimizing early strain at the repair site.

CONCLUSION

Arthroscopic rotator cuff repair performed using the double-row technique represents a reliable and effective surgical approach, resulting in significant improvements in pain **relief**, shoulder function, and range of motion. Restoration of the native tendon footprint combined with enhanced biomechanical stability may facilitate superior tendon healing **and** lower re-tear rates, particularly in patients with medium to large rotator cuff tears.

Although favorable functional outcomes have been demonstrated, optimal results depend on appropriate patient selection and surgical expertise. Further high-quality comparative studies are warranted to define clear indications and to determine the long-term superiority of the double-row technique.

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