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Original Article

Functional Outcome of Lower-Third Trapezius Transfer for Chronic Irreparable Massive Rotator Cuff Tear

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ABSTRACT

Background: Chronic irreparable massive rotator cuff tears cause pain, loss of active elevation and external rotation of affected shoulder and reduced quality of life. Lower-third trapezius transfer has emerged as a tendon transfer option to restore external rotation and shoulder function when primary repair is not possible.
Purpose: To evaluate functional outcomes of lower third trapezius transfer in case of chronic irreparable massive rotator cuff tear.
Methods: A prospective study was conducted over a period of around 18 months. 10 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 lower third trapezius transfer in case of chronic irreparable massive rotator cuff tear.
Results: 6 male and 4 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. No major complications were noted in any patients.Two patients (7%) developed superficial wound infection treated successfully with oral antibiotics; No neurovascular injuries or tendon transfer failures requiring removal were observed.
Conclusion: Lower-third trapezius transfer provides significant and clinically meaningful improvements in pain, external rotation, forward elevation, and validated functional scores at 2-year follow-up for selected patients .Complication rates are acceptable. Long-term studies and comparative trials with alternative procedures (latissimus dorsi transfer, superior capsule reconstruction, or reverse shoulder arthroplasty) are warranted.

Keywords*: lower trapezius transfer, massive rotator cuff tear, irreparable rotator cuff, tendon transfer, functional outcome.*

INTRODUCTION

Massive rotator cuff tears—particularly those that are chronic and associated with significant muscle atrophy and fatty infiltration—commonly lead to persistent pain, weakness in external rotation, and loss of active arm elevation. When compromised tendon integrity or advanced muscular degeneration precludes primary repair, available management strategies include arthroscopic debridement, partial repair, tendon transfers (such as latissimus dorsi or lower trapezius transfer), superior capsular reconstruction, biologic augmentation, and salvage procedures, including reverse shoulder arthroplasty.

The lower trapezius transfer has gained increasing attention for its ability to restore external rotation and reconstitute the posterior–superior force couple, owing to its more physiologic and anatomic line of pull compared with the latissimus dorsi transfer. The present study reports our institution's consecutive series and evaluates the clinical and functional outcomes of lower trapezius transfer in the treatment of chronic, irreparable massive rotator cuff tears.

AIM

To assess clinical outcomes, shoulder range of motion, pain relief and complications following lower-third trapezius transfer in patients with chronic irreparable posterosuperior massive rotator cuff tears.

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 January 2024 to July 2025 conducted in the Department of Orthopaedics at Tertiary Care Hospital, Surat.

Study Poplation

All patients between 40-60 years of age with chronic irreparable massive 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 irreparable massive 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

-MRI or ultrasound confirmation of massive tear of the rotator cuff tendon with tear size and retraction suitable for lower third trapezius transfer .

Exclusion criteria

-Active infection

-Neuromuscular disorders

-Accessory nerve palsy

-Significant comorbidities or conditions that contraindicate surgery or anesthesia (e.g.,
severe cardiovascular or pulmonary disease).

-patient not willing to give consent.

SAMPLE SIZE

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

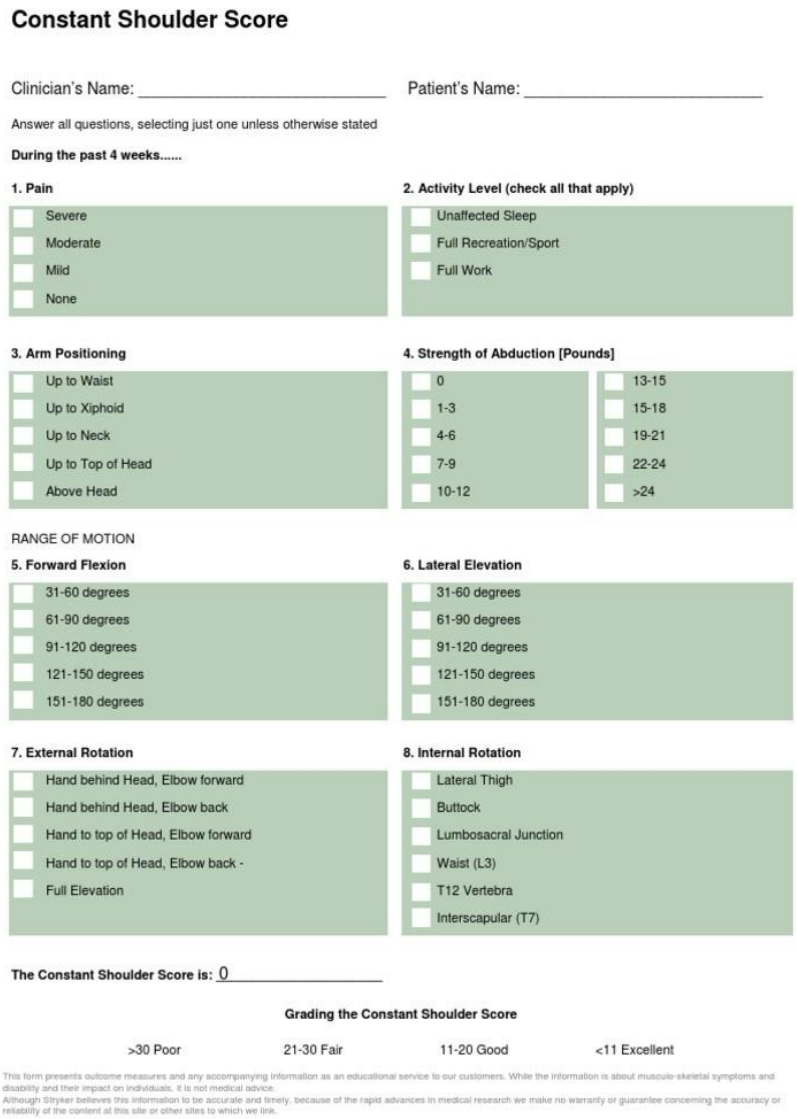
Scoring System

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

This form presents outcome measures and any accompanying information as an educational service to our customers. While the information is about musculo-skeletal symptoms and disability and their impact on individuals, it is not medical advice.
Although Stryker believes this information to be accurate and timely, because of the rapid advances in medical research we make no warranty or guarantee concerning the accuracy or reliability of the content at this site or other sites to which we link.

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

LTT(Lower Trapezius Tendon Transfer) technique is an arthroscopically assisted surgical procedure that is combined with a partial repair of the rotator cuff whenever possible. Our preference is to perform the procedure in the beach-chair position and to use an Achilles tendon allograft as the intercalary graft.. When the decision to proceed with a LTT has been made preoperatively, we prefer to harvest the lower trapezius first; however, there are shoulders when the final decision to proceed with a LTT is based in the intraoperative assessment of cuff repairability, and in those shoulders, harvesting is performed later in the procedure.

Patient Position

As mentioned, we prefer to perform this procedure in the beach-chair position (Fig. 1). The surgical field should be prepared and draped to include the posterior aspect of the shoulder medial to the medial border of the scapular body. Use of an arthroscopic arm holder is very helpful and strongly recommended.

Fig.1 Beach Chair Position

Lower Trapezius Harvest

A horizontal skin incision is placed just inferior and parallel to the medial half of the spine of the scapula and across the location of the medial edge of the scapular body. In certain individuals, substantial adipose tissue covers the tendon of the lower trapezius and needs to be excised. The inferior edge of the lower trapezius tendon appears falciform from this exposure, and lifting the trapezius with forceps can reveal the edge of the tendon and the plane between the lower trapezius and the underlying infraspinatus.

Once that dissection plane is established bluntly, the tendon of the lower trapezius can be followed laterally to its attachment on the inferior and dorsal aspect of the spine of the scapula. We typically detach the lower trapezius subperiosteally from lateral to medial, dividing it horizontally from the middle trapezius . Once the lower trapezius is completely detached, care must be taken to avoid further dissection medially deep to the trapezius muscle, since the neurovascular pedicle is in close proximity, and could be accidentally damaged.
On the contrary, subcutaneous dissection superficial to the trapezius is safe and typically provides additional excursion

The narrower (calcaneal) end of the Achilles allograft is prepared to receive two non-absorbable sutures in a running locking configuration . It is useful to use sutures of different colors. In addition, a marking pen can be used to color the side of the allograft that will be facing superiorly, so that the orientation of the graft is easier to visualize arthroscopically.

The fascia of the infraspinatus needs to be opened to pass the graft, but that step is delayed until the arthroscopic portion of the procedure is completed to avoid constant loss of arthroscopic irrigation solution through the fascial opening.

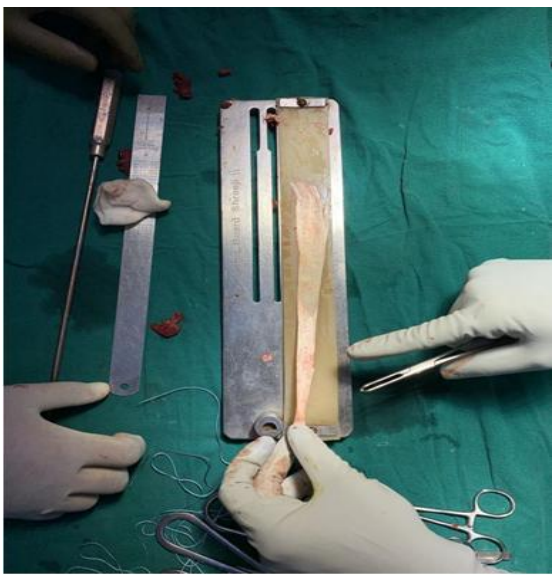


Fig.2 Graft preparation

Arthroscopically Assisted Graft Fixation

The arthroscopic camera is introduced into the subacromial space through a posterolateral portal. A lateral subacromial portal is used to clear the subacromial bursa. Our preference is to associate a partial repair of the rotator cuff whenever possible. Some of the sutures or tapes used for partial cuff repair can be saved for additional fixation of the graft. If the severity of the rotator cuff tear is such that it does not lend itself to partial repair, one anchor with sutures or tapes may be inserted at the junction between the articular cartilage and the greater tuberosity to be used for the same purpose.

At that point, the superficial fascia of the infraspinatus is divided in line with its fibers to communicate the lower trapezius harvest site with the subacromial space. The sutures placed at the narrower end of the graft are passed through the split of the infraspinatus into the subacromial space and retrieved anteriorly; this can be accomplished with a large metallic clamp or shuttle sutures. Care is taking to pass these leading sutures of the graft lateral to any sutures or tapes that may have been saved for additional graft fixation.

Our preference is to have the graft wrap around the humerus horizontally and fix it to the anterior aspect of the greater tuberosity just posterior to the bicipital groove . This is easily accomplished with knotless anchors to secure the leading sutures of the graft, one medial and one more lateral. Further fixation and compression are achieved by anchoring any saved sutures or tapes over the graft and into another knotless anchor while the graft is kept under tension.

Graft to Lower Trapezius Repair

The wider end of the graft is then repaired to the lower trapezius. With the arm in maximal abduction and external rotation, traction is applied laterally to the lower trapezius and medially to the allograft. The repair can be performed in multiple ways. Our current preference is to pierce the graft end through the lower trapezius in a Pulvertaft fashion and complete the repair with multiple nonabsorbable and absorbable sutures . Alternatively, the graft can be secured to the undersurface or the dorsal aspect of the trapezius. Repair to the dorsal aspect is probably the easiest, but leaves the allograft in a subcutaneous position, possibly prone to subcutaneous adhesions. Otherwise, we do not believe there are major merits or drawbacks to these different repair techniques.

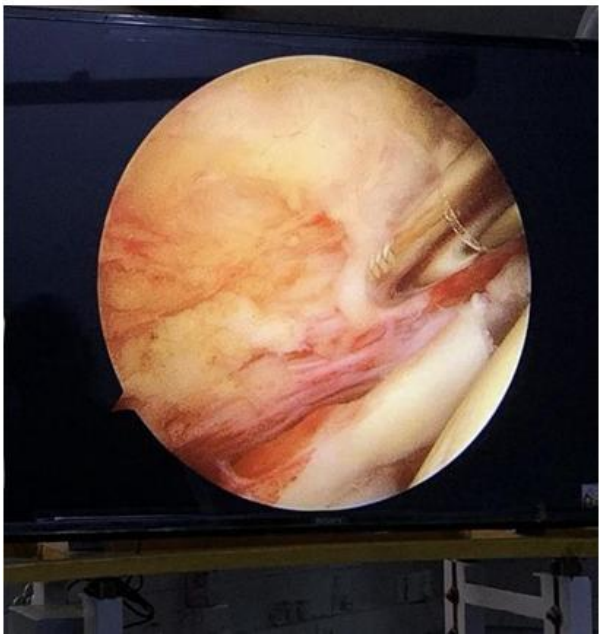


Fig. 3 Intra operative photo

REHABILITATION PROTOCOL

Phase I: Protection	0–6 Weeks	Protect healing tendon	Sling use, Pendulums, Wrist/Elbow movement
Phase II: Mobility	6–12 Weeks	Restore motion (PROM/AAROM)	Table slides, Cane elevation, Pulleys
Phase III: Initial Strength	12–18 Weeks	Active motion & Isometrics	Scapular rows, Wall isometrics, Bands
Phase IV: Functional	18+ Weeks	Return to activities	Progressive resistance, Sports/Work specific

CASE-1

Fig.4

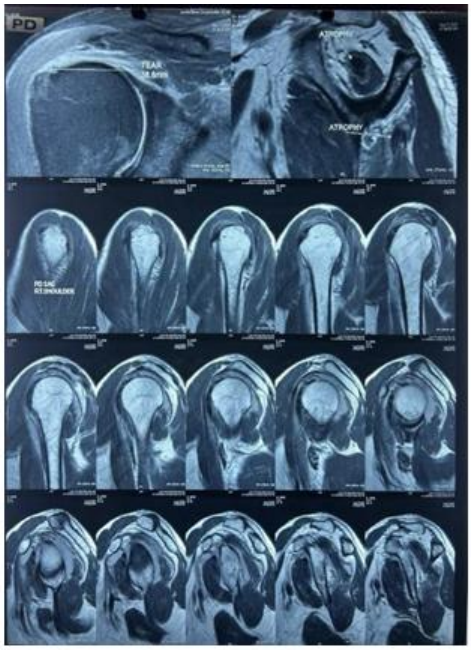


Fig.5

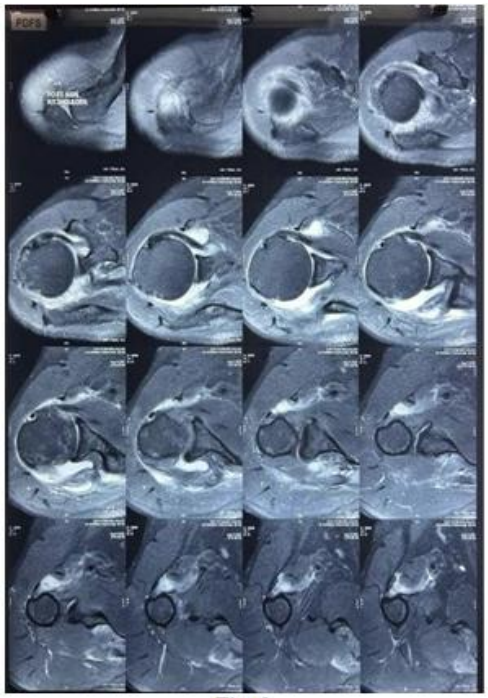


Fig.6

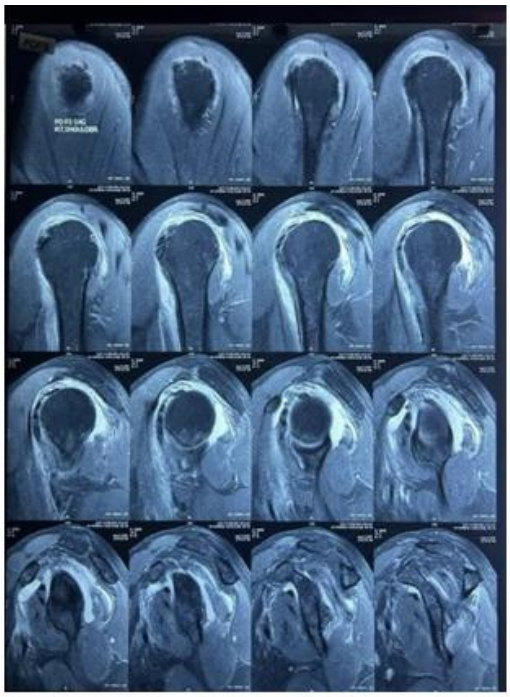


Fig.7

EXAMINATION : MRI STUDY OF RIGHT SHOULDER JOINT

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

OBSERVATION:

Full thickness full width tear of distal supraspinatus and infraspinatus tendon is noted with retraction up to the level of superior glenoid margin. Length of the retraction measures approximately 4 cm. Moderate to severe (grade II to near grade III) atrophy of supraspinatus and infraspinatus muscles is noted with grade I fatty infiltration.

There is seen superior migration of head of humerus with reduced acromiohumeral distance.

Moderate to gross joint effusion is noted in gleno-humeral joint with mild periarticular soft tissue oedema.

Moderate loculated subcoracoid Bursitis is noted.

Rest of the rotator cuff tendon appears normal.

Rest of the musculature surrounding shoulder joint appears normal.

The biceps tendon in the bicipital groove shows normal signal intensity.

Capsule and labrum appears normal. No evidence of abnormal synovial thickening.

Acromio-clavicular joint appears normal.

The articular cartilage of the shoulder joint appears mildly thinned out.

The humeral head reveals normal contour. The humeral head and proximal shaft reveals normal signal intensity.

The visualized scapula appears normal. No bone erosion or destruction is noted.

IMPRESSION :

- **Full thickness full width tear of distal supraspinatus and infraspinatus tendon is noted with 3.5-4 cm retraction up to the level of superior glenoid margin.**
- **Moderate to severe (grade II to near grade III) atrophy of supraspinatus and infraspinatus muscles is noted with grade I fatty infiltration.**
- **Superior migration of head of humerus with reduced acromiohumeral distance.**
- **Moderate to gross joint effusion is noted in gleno-humeral joint with mild periarticular soft tissue oedema.**

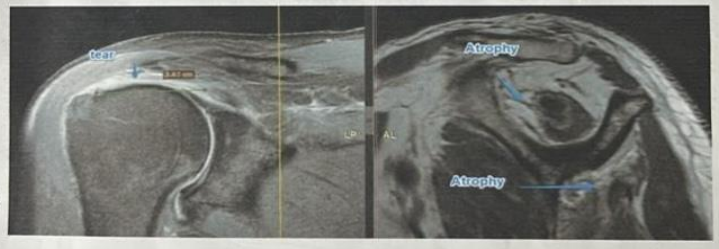


Fig.8 Fig.9

Pre- operative MRI

Fig.10- Pre-op Xray

Fig.11- Post Op Xray

Fig. 12

Fig.13

Fig.14

CASE- 2

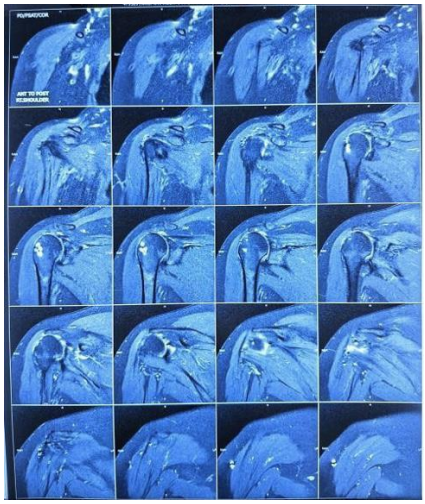


Fig.15

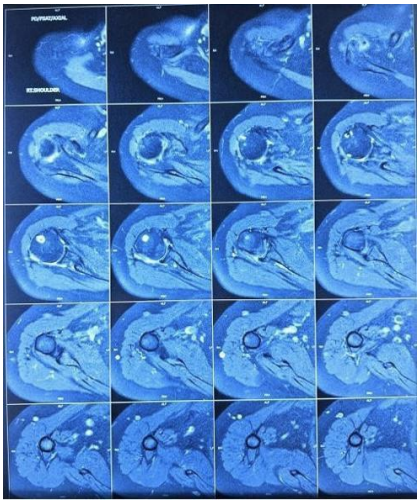


Fig.16

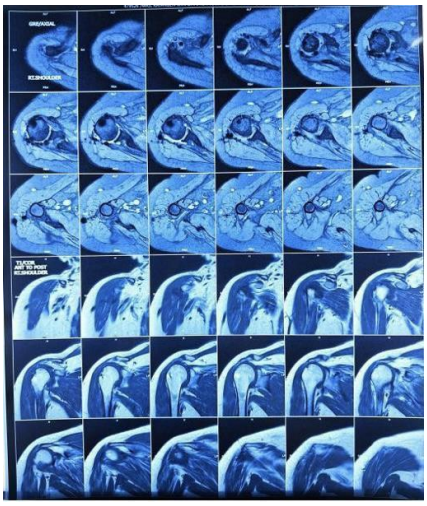


Fig.17

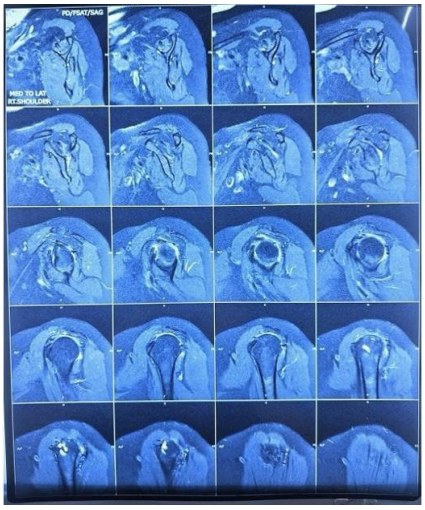
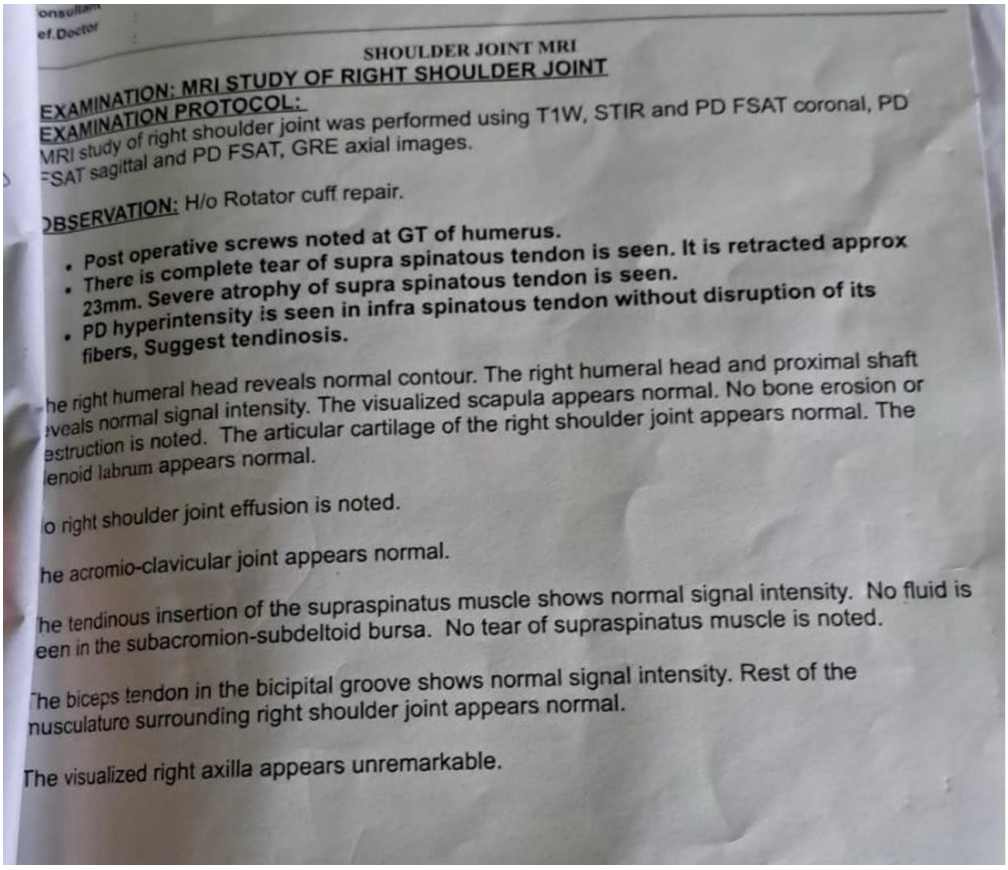


Fig.18



SHOULDER JOINT MRI

EXAMINATION: MRI STUDY OF RIGHT SHOULDER JOINT

EXAMINATION PROTOCOL:

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

OBSERVATION: H/o Rotator cuff repair.

- **Post operative screws noted at GT of humerus.**
- **There is complete tear of supra spinatous tendon is seen. It is retracted approx 23mm. Severe atrophy of supra spinatous tendon is seen.**
- **PD hyperintensity is seen in infra spinatous tendon without disruption of its fibers, Suggest tendinosis.**

The right humeral head reveals normal contour. The right humeral head and proximal shaft reveals normal signal intensity. The visualized scapula appears normal. No bone erosion or destruction is noted. The articular cartilage of the right shoulder joint appears normal. The glenoid labrum appears normal.

No right shoulder joint effusion is noted.

The acromio-clavicular joint appears normal.

The tendinous insertion of the supraspinatus muscle shows normal signal intensity. No fluid is seen in the subacromion-subdeltoid bursa. No tear of supraspinatus muscle is noted.

The biceps tendon in the bicipital groove shows normal signal intensity. Rest of the musculature surrounding right shoulder joint appears normal.

The visualized right axilla appears unremarkable.

Fig.19

Pre- operative MRI

Fig.20

Fig.21

Fig.22

Fig.23- Pre- op Xray

Fig.24- Post op Xray

RESULTS

The functional outcomes of lower third trapezius transfer in case of chronic irreparable massive rotator cuff tear are generally positive, but outcomes can vary depending on several factors such as tear size, patient age, tissue quality, and adherence to rehabilitation protocols.

Here's a summary of common findings:

1. Pain Relief-Most patients report significant pain reduction after surgery.Improvement is typically noted larger ithin the first few months and continues as healing progresses.
2. Improved Shoulder Function ,Restoration of shoulder strength and range of motion is commonly achieved.Recovery of full function may take 6–12 months, depending on the tear's severity and rehabilitation.
3. Patient Satisfaction-Most patients report high satisfaction with the results.Return to normal daily activities, including sports and work, is common

4. Rehabilitation

A well-structured rehabilitation program is critical to success, emphasizing gradual restoration of motion, strength, and shoulder stability.

DISCUSSION

Lower trapezius transfer significantly reduces pain, improves shoulder-specific functional outcomes, and restores external rotation. Its main advantage is that it more closely recreates the normal anatomy and physiology of the posterior rotator cuff force vector.

CONCLUSION

Lower trapezius transfer represents a viable therapeutic option for carefully selected patients with chronic, irreparable massive rotator cuff tears, yielding substantial analgesic benefit and meaningful functional restoration, particularly with respect to external rotation. Rigorous patient selection, meticulous surgical execution, and a structured, protocol-driven rehabilitation program are imperative to achieving optimal clinical outcomes.

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