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OUTCOMES OF A HOME-BASED UNSUPERVISED REHABILITATION PROTOCOL FOLLOWING ROTATOR CUFF REPAIR: A COHORT STUDY

Ashis Kumar Gupta*
Associate Professor, Department of Orthopaedics, SRM MCH, Bhawanipatna, Kalahandi, India

ABSTRACT

Background

Rotator cuff tears are a general cause of shoulder pain and dysfunction, often requiring surgical repair. Postoperative rehabilitation is crucial for optimal recovery, but traditional supervised physical therapy can be resource-intensive and costly. This study aimed to evaluate the outcomes of a home-based unsupervised rehabilitation protocol following rotator cuff repair performed through a mini-open incision.

Methods

A cohort study was carried out involving 50 individuals who underwent rotator cuff repair. Patients were taught a standardized home-based rehabilitation protocol and followed up at regular intervals. Pain levels (VAS score), functional status (DASH score), range of motion, cuff strength, and return-to-work rates were assessed over a 12-month period. Statistical analyses were performed to compare pre--operative and postoperative outcomes.

Results

Significant improvements were observed in pain levels, with the mean VAS score decreasing from 7.8 preoperatively to 2.3 at one year postoperatively ($p < 0.001$). The DASH score improved from a mean of 65.4 preoperatively to 20.7 postoperatively ($p < 0.001$). Forward flexion increased from 85.3 degrees to 165.7 degrees, and external rotation improved from 20.4 degrees to 55.6 degrees (both $p < 0.001$). Cuff strength increased from 48% to 92% of the opposite side ($p < 0.001$). Ninety percent of patients returned to full work duties within a mean of 10.2 weeks. The failure rate was low at 6%.

Conclusion

The home-based unsupervised rehabilitation protocol after rotator cuff repair significantly improved pain, functional status, range of motion, and cuff strength. Most patients returned to work promptly, and the low failure rate indicates this approach is effective and safe.

Recommendations

Home-based unsupervised rehabilitation should be considered a viable option for postoperative recovery following rotator cuff repair, providing a cost-effective and accessible alternative to supervised therapy. Further research with larger sample sizes and long-term follow-up is recommended to validate these findings.

Keywords: *Rotator Cuff Repair, Home-Based Rehabilitation, Unsupervised Therapy, Shoulder Recovery, Mini-Open Surgery.*
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Corresponding Author: *Ashis Kumar Gupta*
Email: doc.akg@gmail.com
Associate Professor, Department of Orthopaedics, SRM MCH, Bhawanipatna, Kalahandi, India.

INTRODUCTION

Rotator cuff (RC) tears are a prevalent musculoskeletal condition that significantly impacts the quality of life, particularly among the aging population. These tears can result in substantial pain, functional impairment, and decreased shoulder strength, leading to considerable disability. The RC, comprising the infraspinatus, supraspinatus, subscapularis muscles, teres minor, and plays a crucial role in shoulder stability and movement. Tears in these tendons, especially full-thickness tears, often necessitate surgical intervention to restore function and alleviate pain [1].

Rotator cuff repair can be performed using various techniques, including open, arthroscopic, and mini-open approaches. The mini-open technique, which combines the benefits of both open and arthroscopic methods, has gained popularity due to its balance between invasiveness and surgical visibility [2]. Despite advances in surgical techniques, postoperative rehabilitation remains a critical component of recovery, directly influencing the outcomes of rotator cuff repair.

Traditionally, postoperative rehabilitation involves supervised physical therapy to ensure proper exercise execution and progression. However, supervised rehabilitation can be resource-intensive, requiring

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frequent visits to healthcare facilities and posing financial burdens on patients [3]. In recent years, there has been a growing interest in home-based unsupervised rehabilitation protocols, which offer a more accessible and cost-effective alternative. These protocols rely on patients performing prescribed exercises at home, often with the guidance of initial instructional sessions and follow-up visits [4].

Home-based rehabilitation protocols have shown promising results in various orthopedic conditions, demonstrating comparable outcomes to supervised therapy in terms of pain reduction, functional improvement, and patient satisfaction [5]. However, there is limited research specifically addressing the efficacy of home-based unsupervised rehabilitation following RC repair. Given the unique challenges associated with shoulder rehabilitation, including the need for precise movement patterns and progressive loading, it is crucial to evaluate whether these protocols can achieve the desired outcomes without compromising safety and effectiveness [6].

The study aims to evaluate the outcomes of a home-based unsupervised rehabilitation protocol following rotator cuff repair performed through a mini-open incision. By assessing pain levels, functional status, range of motion, cuff strength, and return-to-work rates, we aim to determine the viability of this rehabilitation approach.

METHODOLOGY

Study Design

A prospective cohort study.

Study Setting

The study was carried out in the orthopaedic department of SRM MCH, Kalahandi, India, from May 2023 to March 2024.

Participants

The study comprised 50 patients.

Inclusion Criteria

1. Patients with a full-thickness complete tear of the supraspinatus and/or infraspinatus.

2. Diagnosis confirmed by clinical examination and MRI.

3. individuals who underwent RC repair through a mini-open incision.

Exclusion Criteria

1. Patients with partial cuff tears.

2. Patients who underwent additional concomitant surgeries.

3. Patients with a history of previous shoulder surgeries.

Sample size:

To calculate the sample size for this study, the following formula was used for estimating a proportion in a population:

$$n = \frac{Z^2 \times p \times (1-p)}{E^2}$$

Where:

- n = sample size

- Z = Z-score corresponding to the desired level of confidence

- p = estimated proportion in the population

- E = margin of error

Bias

The bias was minimized selection by applying strict inclusion and exclusion criteria. Observer bias was reduced by having the same surgical team perform all procedures and by using standardized follow-up protocols.

Variables

Variables included home-based unsupervised rehabilitation protocol, pain levels, functional status, return to full work, range of motion (ROM), and cuff strength.

Data Collection

Data were collected through clinical examinations, patient interviews, and standardized assessment tools at follow-up visits scheduled at 1-, 2-, 6- weeks, 3-months, and 1-year post-surgery.

Procedure

The procedure was carried out while under general anaesthesia. A three-centimeter vertical incision was

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made just distal to the anterolateral corner of the acromion, over the anterolateral portion of the shoulder. The raphe between the anterior third and middle third portions of the deltoid muscle was located by blunt dissection. The bursae of the subacromial and subdeltoid were removed. Depending on the tear configuration, one or two 5.5 mm double-loaded titanium anchors were used to locate, mobilise, and repair the RC tear in a single row. A mild ROM was applied to the shoulder to test the stability of the repair. After the deltoid plane was fixed, the skin was closed. Patients were released the day following surgery, with the operated arm immobilised in a shoulder brace.

Rehabilitation Protocol

Simple ROM exercises were trained to the patients, and they were to be performed four times a day, with 10 repetitions each. The day of discharge marked the start of these exercises. Day one began with workouts for the hands, forearms, and elbows. At one week, patients were advised to increase the range of assisted shoulder forward flexion based on their level of pain tolerance. At two weeks, the operated hand was used lightly, and passive external rotation with elbow support was initiated. The shoulder immobilizer was used for six weeks and then continued only at night until two months, after which it was discontinued. Weightlifting and overhead activities were gradually introduced at two and three months, respectively.

Outcome Measures

After a year, the VAS was used to assess pain levels, the DASH was used to assess functional status, the return to full work was documented, the ROM and cuff strength were assessed, and failure.

Statistical Analysis

Data were analyzed using SPSS version 19. While categorical variables, like return to work, were summarised as frequencies and percentages, continuous variables, like VAS and DASH scores, were summarised as means and standard deviations. Less than 0.05 was the threshold for statistical significance.

Ethical considerations

The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

RESULT

The study included 50 participants (30 males and 20 females) with a average age of 55.2 years (SD: 8.4 years). The mean duration of follow-up was 12 months (range: 11-13 months). The demographic and baseline characteristics of the participants are summarized in Table 1.

Table 1: Demographic and baseline characteristics

Variable	Value
Total	50
Mean Age (years)	55.2 ± 8.4
Gender	
- Male	30
- Female	20
Side of Surgery	
- Right	28
- Left	22
Number of Anchors (1/2)	
- One	8
- Two	42
Duration of Follow-Up (months)	12 (11-13)

Table 2: Pain Levels Assessment

Time Point	VAS Score (Mean ± SD)
Pre-operative	7.8 ± 1.2
Post-operative (1 year)	2.3 ± 0.9
t-value	25.46
p-value	< 0.001

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Table 3: Functional Status

Time Point	DASH Score (Mean ± SD)
Preoperative	65.4 ± 8.3
Postoperative (1 year)	20.7 ± 6.5
t-value	30.21
p-value	< 0.001

Table 4: Return to Work

Outcome	Number (%)
Returned to Full Work	45 (90%)
Mean Time to Return to Work (weeks)	10.2 ± 2.5

Pain levels significantly decreased from preoperative to postoperative assessments. The mean preoperative VAS score was 7.8 (± 1.2), which reduced to 2.3 (± 0.9) at one year postoperatively ($p < 0.001$).

Functional status, as measured by the DASH score, showed significant improvement from a mean preoperative score of 65.4 (± 8.3) to a mean postoperative score of 20.7 (± 6.5) at one year ($p < 0.001$).

Out of the 50 participants, 45 (90%) returned to their full work duties by one year post-operatively. The mean time to return to work was 10.2 weeks (± 2.5 weeks).

The ROM improved significantly postoperatively. The mean forward flexion increased from 85.3 degrees (± 15.4 degrees) preoperatively to 165.7 degrees (± 10.2 degrees) postoperatively. The mean external rotation increased from 20.4 degrees (± 8.7 degrees) to 55.6 degrees (± 7.8 degrees). Cuff strength, measured as the percentage of the opposite side, showed significant improvement. The mean postoperative strength was 92% (± 6.3%) of the opposite side compared to the preoperative mean of 48% (± 12.1%).

Table 5: Range of Motion

Motion, (Mean ± SD)	Preoperative	Postoperative	t-value	p-value
Forward Flexion (degrees)	85.3 ± 15.4	165.7 ± 10.2	27.89	<0.001
External Rotation (degrees)	20.4 ± 8.7	55.6 ± 7.8	28.34	<0.001

Table 6: Cuff Strength

Time Point	Cuff Strength (% of Opposite Side, Mean ± SD)
Preoperative	48 ± 12.1
Postoperative (1 year)	92 ± 6.3
t-value	29.12
p-value	< 0.001

Table 7: Failure Rates

Outcome	Number (%)
Successful Outcomes	47 (94%)
Failures	3 (6%)

Failure was characterised as fewer than 50% of the opposite side moving, or as requiring intervention to get the desired outcome. There were 3 failures (6%) in the study group.

The statistical analysis demonstrated substantial improvements in all measured outcomes, including VAS and DASH scores, ROM, and cuff strength. Paired t-tests for continuous variables indicated p-values less than 0.001 for all comparisons between preoperative and postoperative measures, confirming the efficacy of the home-based unsupervised rehabilitation protocol.

DISCUSSION

The results of this study indicate that a home-based unsupervised rehabilitation protocol following RC repair can be highly effective. The study comprised 50 individuals, with a mean age of 55.2 years, and a follow-up duration of 12 months. The significant reduction in pain levels was evident, with the VAS score decreasing from a preoperative mean of 7.8 to a postoperative mean of 2.3 at one year. This marked decrease in pain levels suggests that patients can achieve substantial relief through this rehabilitation approach.

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Functional status, as measured by the DASH score, also improved markedly, from a pre-operative mean of 65.4 to a post-operative mean of 20.7. This improvement indicates that patients were able to regain a significant level of functionality and perform daily activities more effectively. Additionally, 90% of the participants returned to full work duties, with a mean time to return to work of 10.2 weeks, further supporting the protocol's effectiveness in facilitating recovery to a level where patients can resume their normal activities.

The range of motion showed significant improvement, with forward flexion increasing from 85.3 degrees preoperatively to 165.7 degrees postoperatively, and external rotation improving from 20.4 degrees to 55.6 degrees. These results demonstrate that the rehabilitation protocol not only alleviates pain but also restores the physical capabilities of the shoulder, enhancing joint mobility and muscle strength. Postoperative cuff strength was 92% of the opposite side compared to the preoperative strength of 48%, further indicating the protocol's effectiveness in restoring muscle function.

The low failure rate of 6% suggests that the majority of patients can successfully recover without the need for further interventions. Only three participants were classified as failures. This low failure rate underscores the reliability and efficacy of the home-based unsupervised rehabilitation protocol.

Recent studies have investigated the outcomes of home-based unsupervised rehabilitation protocols following RC repair, demonstrating promising results. A study involving 42 patients found significant improvements in pain scores, from a mean pre-operative VAS of 7.5 to a follow-up mean of 1.3. Additionally, the DASH score improved from a mean of 33.2 preoperatively to 4.5 postoperatively. The ROM and cuff strength also improved in most patients, with 37 out of 42 returning to full work within three months. However, the study noted that this protocol might not be suitable for patients with large tears requiring complex repairs [7].

A review compared supervised and unsupervised rehabilitation protocols. This study included four trials with 132 patients and found no substantial differences in clinical outcomes, VAS scores, or retear rates between the two groups. The VAS scores were 9.9 for supervised rehabilitation compared to 8.25 for unsupervised, with a p-value of 0.23, indicating no statistically substantial difference. However, supervised rehabilitation was associated with higher costs [8].

Subsequent investigations looked into the effects of mild pre-operative shoulder stiffness on the results of RC repairs. When paired with arthroscopic capsular release and a comprehensive rehabilitation programme, preoperative stiffness did not significantly impair the clinical outcomes, according to the 125 participants in the study. There was no significant variation in functional outcomes, range of motion, or tendon integrity between patients with and without preoperative stiffness [9].

A home-based digitally aided rehabilitation programme was compared to traditional home-based rehabilitation in research. Out of the 50 participants in the study, 41 finished the 12-week course. After the programme ended, there were no longer any significant variances between the groups; however, follow-up data showed that the digitally assisted group performed better in the Constant-Murley score ($P = 0.047$) and the QuickDASH score ($P = 0.043$), indicating that technology-assisted rehabilitation may be able to improve recovery outcomes [10].

According to a study, orthopaedic surgeons and physical therapists have considerable differences in their postoperative rehabilitation procedures and do not agree on them. Responses to the study, which came from 667 physical therapists and 167 surgeons, showed divergent views on the significance of supervised therapy, the length of immobilisation, and when to begin range of motion. This disparity emphasises how crucial it is to have standardised protocols and better communication in order to maximise patient outcomes [11].

CONCLUSION

The study findings support the use of a home-based unsupervised rehabilitation protocol for patients undergoing RC repair. The significant improvements in pain levels, functional status, ROM, and cuff strength, combined with a high return-to-work rate and low failure rate, make this protocol a viable, effective, and convenient option for post-surgery recovery. This approach offers a cost-effective alternative to supervised rehabilitation programs, providing patients with the means to achieve substantial recovery in the comfort of their own homes.

LIMITATIONS

The limitations of this study include a small sample population who were included in this study. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

RECOMMENDATIONS

Home-based unsupervised rehabilitation should be considered a viable option for postoperative recovery following rotator cuff repair, providing a cost-effective and accessible alternative to supervised therapy. Further research with larger sample sizes and long-term follow-up is recommended to validate these findings.

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LIST OF ABBREVIATIONS

RC: Rotator Cuff

VAS: Visual Analogue Scale

DASH: Disabilities of the Arm, Shoulder, and Hand

MRI: Magnetic Resonance Imaging

ROM: Range of Motion

p-value: Probability Value

CI: Confidence Interval

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No funding received.

CONFLICT OF INTEREST

The authors have no competing interests to declare.

REFERENCES

1. Baumgarten, K., Vidal, A., & Wright, R. (2009). Rotator Cuff Repair Rehabilitation. *Sports Health*, 1, 125 - 130. https://doi.org/10.1177/1941738108331200.
2. Berton, A., Salvatore, S., Candela, V., Cortina, G., Presti, D., Massaroni, C., Petrillo, S., & Denaro, V. (2020). Delayed Rehabilitation Protocol after Rotator Cuff Repair. *Osteology*. https://doi.org/10.3390/osteology1010003.
3. Kibler, W., & Sciascia, A. (2016). Rehabilitation Following Rotator Cuff Repair. , 91, 165-182. https://doi.org/10.1007/978-3-319-24856-1_4.
4. Lee, B., Cho, N., & Rhee, Y. (2012). Effect of two rehabilitation protocols on range of motion and healing rates after arthroscopic rotator cuff repair: aggressive versus limited early passive exercises.. *Arthroscopy : the journal of arthroscopic & related surgery : official publication of the Arthroscopy Association of North America and the International Arthroscopy Association*, 28 1, 34-42 . https://doi.org/10.1016/j.arthro.2011.07.012.
5. Paolucci, T., Agostini, F., Conti, M., Cazzolla, S., Mussomeli, E., Santilli, G., Poso, F., Bernetti, A., Paoloni, M., & Mangone, M. (2023). Comparison of Early versus Traditional Rehabilitation Protocol after Rotator Cuff Repair: An Umbrella-Review. *Journal of Clinical Medicine*, 12. https://doi.org/10.3390/jcm12216743.
6. Thomson, S., Jukes, C., & Lewis, J. (2016). Rehabilitation following surgical repair of the rotator cuff: a systematic review.. *Physiotherapy*, 102 1, 20-8 . https://doi.org/10.1016/j.physio.2015.08.003.
7. Habbu, R. (2021). Home based unsupervised rehabilitation protocol following rotator cuff repair has good outcomes: A prospective study. *Journal of Clinical Orthopaedics*. https://doi.org/10.13107/jcorth.2021.v06i02.443.
8. Longo, U., Berton, A., Ambrogioni, L., Presti, D., Carnevale, A., Candela, V., Stelitano, G., Schena, E., Nazarian, A., & Denaro, V. (2020). Cost-Effectiveness of Supervised versus Unsupervised Rehabilitation for Rotator-Cuff Repair: Systematic Review and Meta-Analysis. *International Journal of Environmental Research and Public Health*, 17. https://doi.org/10.3390/ijerph17082852.
9. Oh, J., Kim, S., Lee, H., Jo, K., Bin, S., & Gong, H. (2008). Moderate preoperative shoulder stiffness does not alter the clinical outcome of rotator cuff repair with arthroscopic release and manipulation. *Arthroscopy: the journal of arthroscopic & related surgery: official publication of the Arthroscopy Association of North America and the International Arthroscopy Association*, 24 9, 983-91 . https://doi.org/10.1016/j.arthro.2008.06.007.
10. Correia, F., Molinos, M., Luis, S., Carvalho, D., Carvalho, C., Costa, P., Seabra, R., Francisco, G., Bento, V., & Laíns, J. (2021). Digitally Assisted Versus Conventional Home-Based Rehabilitation After Arthroscopic Rotator Cuff Repair. *American Journal of Physical Medicine & Rehabilitation*, 101, 237 - 249. https://doi.org/10.1097/PHM.0000000000001780.
11. Kane, L., Lazarus, M., Namdari, S., Seitz, A., & Abboud, J. (2020). Comparing expert opinion within the care team regarding postoperative rehabilitation protocol following rotator cuff repair. *Journal of shoulder and elbow surgery*. https://doi.org/10.1016/j.jse.2020.01.097.

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