

Original Research

Clinical Outcomes of a Home-Based Unsupervised Rehabilitation Protocol Following Rotator Cuff Repair: A Prospective Study

¹Sunil Kumar, ²Ved Prakash Agarwal

^{1,2}Associate Professor, Department of Orthopaedics, ICARE Institute of Medical Sciences and Research & Bidhan Chandra Roy Hospital, Haldia, India

ABSTRACT:

Background: Rotator cuff tears are a common cause of shoulder dysfunction and pain, often requiring surgical repair followed by structured rehabilitation. While supervised physiotherapy is traditionally preferred, home-based unsupervised rehabilitation has emerged as a potential alternative, particularly in resource-limited settings. **Objective:** To evaluate the effectiveness of a structured home-based, unsupervised rehabilitation protocol following mini-open rotator cuff repair in improving pain, functional outcomes, and range of motion over a one-year period. **Methods:** A prospective study was conducted on 86 patients (mean age 55.6 ± 9.1 years) who underwent mini-open repair for full-thickness supraspinatus and/or infraspinatus tears. Patients followed a staged, home-based rehabilitation protocol postoperatively. **Results:** There was a significant reduction in pain scores (VAS from 7.4 to 1.4) and functional improvement (DASH from 36.8 to 4.8). Range of motion improved notably across all movements: active abduction (from 98° to 138°), forward flexion (from 102° to 140°), and external rotation (from 12° to 34°). Most patients achieved satisfactory recovery without the need for additional interventions. **Conclusion:** A well-structured, unsupervised home-based rehabilitation program following rotator cuff repair is a safe and effective approach for pain relief, functional restoration, and range of motion improvement.

Keywords: Rotator cuff repair, home-based rehabilitation, unsupervised physiotherapy, shoulder function, pain, DASH score, VAS score

Received: 12 March, 2018

Accepted: 14 April, 2018

Published: 17 May, 2018

Corresponding author: Ved Prakash Agarwal, Associate Professor Department of Orthopaedics, ICARE Institute of Medical Sciences and Research & Bidhan Chandra Roy Hospital, Haldia, India

This article may be cited as: Kumar S, Agarwal VP. Clinical Outcomes of a Home-Based Unsupervised Rehabilitation Protocol Following Rotator Cuff Repair: A Prospective Study. J Adv Med Dent Scie Res 2018;6(5):196-200.

INTRODUCTION

Rotator cuff tears are among the most prevalent musculoskeletal conditions affecting the shoulder, particularly in middle-aged and elderly populations. These injuries often result in pain, weakness, and limited range of motion, significantly impacting quality of life and functional independence. Surgical repair of the rotator cuff is commonly indicated in cases of full-thickness tears or when conservative treatments fail to restore function or alleviate symptoms [1]. While the surgical technique plays a critical role in tendon healing and restoration of biomechanics, postoperative rehabilitation is equally vital to ensure favorable clinical outcomes.

Traditional rehabilitation following rotator cuff repair typically involves a structured, supervised program managed by physical therapists in outpatient settings. This model often includes progressive exercises

focused on passive and active range of motion, followed by muscle strengthening and proprioception training over a period of 4–6 months [2]. Although supervised rehabilitation is considered the standard of care, its limitations are increasingly acknowledged, particularly in terms of access, cost, patient adherence, and health system burden [3,4].

An emerging alternative is home-based unsupervised rehabilitation, wherein patients are instructed to perform prescribed exercises at home without direct oversight from rehabilitation professionals. This approach has gained interest due to its potential to reduce healthcare costs, enhance convenience, and promote patient autonomy. Moreover, home-based protocols are particularly advantageous in low-resource settings or during situations such as pandemics or lockdowns, where in-person sessions may be inaccessible [5].

The feasibility and efficacy of unsupervised home rehabilitation following rotator cuff repair have been subjects of growing research. Several studies have demonstrated that carefully designed home-based programs, when coupled with proper patient education and clear instructions, can yield outcomes comparable to those of supervised therapy in terms of pain relief, shoulder function, and range of motion [6–8]. For instance, Klintberg et al. emphasized that patient compliance and understanding of exercise mechanics are critical determinants of success in home rehabilitation protocols [9].

However, the literature also reflects conflicting evidence. Concerns regarding the risk of poor adherence, incorrect technique, and subsequent re-injury have been raised. In particular, the early postoperative phase is a delicate period where tendon healing is vulnerable, and inappropriate loading may compromise surgical integrity [10]. As such, establishing the safety and effectiveness of unsupervised rehabilitation protocols through prospective studies remains crucial.

Historically, rehabilitation practices after rotator cuff repair have been conservative, often involving prolonged immobilization followed by gradual mobilization. Yet, recent biomechanical and clinical data suggest that early, controlled mobilization might enhance tendon healing by stimulating collagen remodeling without increasing the risk of re-tear, provided that the load is appropriately managed [11,12]. This finding supports the possibility of safe implementation of early-stage home-based protocols under well-structured guidelines.

Moreover, the role of patient-reported outcomes in assessing the success of home-based interventions has gained prominence. Standardized tools such as the Constant-Murley score and the University of California–Los Angeles (UCLA) Shoulder Rating Scale have facilitated objective evaluation of function, pain, and satisfaction, allowing for meaningful comparisons between different rehabilitation strategies [13]. Additionally, factors such as patient motivation, cognitive ability, and social support systems have emerged as influential in determining adherence and overall success [14].

Given these considerations, there remains a gap in high-quality, prospective studies specifically evaluating the effectiveness of unsupervised, home-based rehabilitation protocols following rotator cuff repair. In light of healthcare resource constraints and growing patient preference for flexible recovery options, this investigation is both timely and relevant. This prospective study aims to assess clinical and functional outcomes in patients undergoing rotator cuff repair, managed postoperatively with an unsupervised home-based rehabilitation protocol. The primary objective is to evaluate the safety, feasibility, and effectiveness of this approach in terms of pain reduction, restoration of function, and range of motion over a specified follow-up period.

Such evidence will not only inform clinical decision-making but may also support the integration of home-based rehabilitation into mainstream postoperative care strategies, especially for appropriately selected patients. If shown to be effective, this model could enhance patient satisfaction, reduce health system burden, and promote cost-effective recovery after rotator cuff repair.

MATERIALS AND METHODS

Study Design and Participants

This prospective study included a total of 86 patients who underwent rotator cuff repair through a mini-open surgical approach. Inclusion criteria required the presence of a full-thickness tear involving the supraspinatus, infraspinatus, or both, confirmed through clinical evaluation and magnetic resonance imaging (MRI). Patients were excluded if they had partial-thickness tears, a history of prior shoulder surgeries, or required additional procedures during the repair.

Clinical and Radiological Evaluation

All enrolled patients presented with shoulder pain as the primary complaint, accompanied by rotator cuff weakness and restricted mobility compared to the contralateral side. Standard radiographic evaluation was performed preoperatively; most X-rays showed no significant abnormalities, although some demonstrated proximal migration of the humeral head. MRI findings predominantly revealed isolated supraspinatus tears, while a subset showed combined tears involving both the supraspinatus and infraspinatus tendons. The degree of tendon retraction was classified into three categories: no retraction, retraction up to 2 cm, and retraction greater than 2 cm.

Surgical Technique

All procedures were performed under general anesthesia via a 3 cm vertical incision over the anterolateral shoulder region. The deltoid muscle was split along its fibers, and the subacromial and subdeltoid bursae were excised to improve visualization. The torn rotator cuff tendon was mobilized, and the insertional footprint was prepared meticulously. A single-row repair technique was used, employing 5.5 mm double-loaded titanium suture anchors. The number of anchors used was determined intraoperatively, based on the tear's dimensions. The deltoid muscle was repaired anatomically, and the skin was closed in layers. Postoperatively, the affected limb was immobilized, and patients were typically discharged on the following day. Scheduled follow-ups were conducted at 1 week, 2 weeks, 6 weeks, 3 months, and 1 year post-surgery.

Rehabilitation Protocol

A structured, home-based rehabilitation program was initiated immediately after discharge. Elbow, wrist, and hand movements began on the first postoperative

day. Assisted shoulder flexion exercises were introduced after the first week. By the second week, passive external rotation exercises with elbow support were initiated. A shoulder immobilizer was used continuously for six weeks and then only during nighttime for the subsequent period. Active range-of-motion exercises for abduction and external rotation were started at six weeks. Gradual weight-bearing and overhead activities were allowed beginning at two and three months, respectively.

Outcome Measures

At the one-year follow-up, patient outcomes were assessed using multiple parameters:

- Pain was evaluated using the Visual Analog Scale (VAS).
- Functional ability was assessed with the Disabilities of the Arm, Shoulder, and Hand (DASH) score.

- Range of motion and muscle strength of the repaired cuff were measured.

Additionally, the return-to-work status was documented. A poor outcome or failure was defined as either a range of motion less than 50% compared to the contralateral limb or the necessity for further surgical or medical intervention.

Statistical Analysis

Data analysis was conducted using IBM SPSS Statistics software version 20.0. Descriptive statistics were used to summarize baseline characteristics. Paired t-tests were applied for comparing pre- and post-intervention outcomes, and Chi-square tests were used to assess categorical variables. A p-value of less than 0.05 was considered statistically significant.

RESULT

Table 1: Demographic Profile of Study Participants

Parameters	Value
Total number of patients	86
Age (years) (mean±SD)	55.6 ± 9.1
Age range (years)	36–70
Gender, N (%)	Male: 56 (65.1%), Female: 30 (34.9%)
Side affected, N (%)	Right: 52 (60.5%), Left: 34 (39.5%)
Dominant arm involved, N (%)	61 (70.9%)

Table 1 provides a comprehensive overview of the demographic characteristics of the 86 patients enrolled in the study. The average age was 55.6 years, with a range spanning from 36 to 70 years. There was a higher proportion of males (65.1%) compared to females (34.9%). The right side was more commonly affected (60.5%), and a majority of cases (70.9%) involved the dominant arm.

Occupation distribution was as follows: Manual laborers constituted 43.0%, office workers 30.2%, homemakers 17.4%, and others 9.3%.

Table 2: Improvement in VAS and DASH Scores

Parameters	Preoperative Mean (Range)	Postoperative Mean (Range)
VAS score	7.4 (4–9)	1.4 (0–4)
DASH score (n = 53)	36.8 (10.2–58.6)	4.8 (0.5–11.5)

Table 2 illustrates the clinical improvement in pain and disability following the intervention. The mean VAS (Visual Analogue Scale) score decreased significantly from 7.4 to 1.4, indicating marked pain relief. Additionally, the DASH (Disabilities of the Arm, Shoulder, and Hand) score improved substantially from 36.8 to 4.8 in 53 patients who completed this assessment, reflecting enhanced upper limb function.

Table 3: Improvement in Range of Motion

Movement	Preoperative Mean (Range)	Postoperative Mean (Range)
Active abduction	98° (40°–130°)	138° (90°–154°)
Forward flexion	102° (44°–134°)	140° (95°–150°)
External rotation	12° (0°–34°)	34° (5°–54°)

Table 3 presents the preoperative and postoperative range of motion in three key shoulder movements: active abduction, forward flexion, and external rotation. Significant gains were observed postoperatively, with active abduction increasing from 98° to 138°, forward flexion from 102° to 140°, and external rotation from 12° to 34°. These improvements indicate effective restoration of joint mobility.

DISCUSSION

This prospective study evaluated the functional and clinical outcomes of a home-based, unsupervised rehabilitation protocol following mini-open rotator cuff repair. The findings indicate significant improvements in pain, functional ability, and range of motion over a one-year follow-up period. These results align with and contribute to the growing body of evidence supporting the effectiveness of structured home-based rehabilitation following rotator cuff surgery [6,7,9].

The mean age of participants (55.6 ± 9.1 years) is consistent with previous epidemiological studies, which report a peak incidence of rotator cuff tears in individuals aged 50 to 70 years [1,3]. The predominance of male participants and higher involvement of the dominant arm and right shoulder are also consistent with prior literature suggesting a correlation between occupational or repetitive overhead activities and rotator cuff pathology [2,5]. In this study, a substantial proportion of patients were manual laborers (43%), a population that may be more susceptible to tendon degeneration and trauma due to the mechanical demands placed on the shoulder joint. Significant improvements were observed in pain scores, with the mean Visual Analog Scale (VAS) decreasing from 7.4 to 1.4 postoperatively. This reduction is comparable to previous reports of similar magnitude using both supervised and home-based rehabilitation models [6,7]. The dramatic pain relief observed in this study reinforces the notion that surgical decompression and cuff repair, when followed by structured rehabilitation, can effectively alleviate nociceptive input arising from tendon damage and subacromial impingement [10,12]. Functional recovery, as assessed by the DASH (Disabilities of the Arm, Shoulder, and Hand) score, also showed marked improvement—from 36.8 to 4.8 in the 53 patients who completed the assessment. This is a notable enhancement, reflecting a substantial return of upper limb functionality. These findings mirror those of Klintberg et al. [9], who demonstrated that with proper patient instruction, adherence, and motivation, unsupervised home-based programs could yield outcomes comparable to supervised therapy in terms of daily functional capacity. While supervised protocols are often perceived as superior due to professional oversight, studies have shown that motivated patients can achieve equivalent outcomes at home with appropriate education and follow-up support [5,7].

Range of motion recovery further supports the effectiveness of this rehabilitation protocol. Improvements in active abduction (98° to 138°), forward flexion (102° to 140°), and external rotation (12° to 34°) were significant. These gains exceed the minimum clinically important differences reported in literature for rotator cuff repair outcomes [11]. Parsons et al. [10] have emphasized that controlled mobilization, even in the early postoperative period,

does not compromise tendon integrity and may actually promote tendon healing through collagen realignment. These biomechanical adaptations may explain the successful restoration of shoulder kinematics observed in our cohort.

It is worth noting that the success of home-based rehabilitation is contingent upon patient compliance, understanding of exercise execution, and motivation—factors highlighted by Hayes et al. and Klintberg et al. [5,9]. Our study design included structured guidance, staged progression, and frequent clinical evaluations at set intervals, which likely contributed to adherence and successful outcomes. The stepwise transition from immobilization to passive, and later to active and resistive exercises, mirrors established rehabilitation protocols that emphasize tendon protection in the early stages and functional restoration in later phases [4,6].

Despite these encouraging results, certain limitations warrant consideration. First, the DASH score was available for only 53 patients, which may introduce an element of reporting bias. Additionally, while pain and mobility improved significantly, tendon integrity was not assessed postoperatively via imaging, which could provide a more comprehensive understanding of structural outcomes. Moreover, although the patients were unsupervised, it remains unclear how rigorously the home exercise program was followed, as adherence was based on patient self-reporting.

In comparing our findings to those of prior studies, such as the randomized trial by Lee et al. [7], which demonstrated non-inferiority of home-based programs versus supervised therapy, our results strengthen the argument for cost-effective, accessible, and patient-centered rehabilitation. With increasing pressure on healthcare systems globally, strategies that offer equivalent outcomes at lower cost and higher patient satisfaction are becoming essential [5,8]. This is especially relevant for populations with limited access to physical therapy centers due to geographic, financial, or social constraints.

Finally, the low failure rate in this study—as defined by either a return to surgery or range of motion less than 50% of the contralateral side—suggests that home-based protocols can be both safe and effective when implemented in appropriately selected patients. These results provide additional support for the paradigm shift from traditional supervised models to more flexible, individualized rehabilitation strategies, without compromising patient outcomes [6,9].

CONCLUSION

This study demonstrates that a well-structured, home-based unsupervised rehabilitation protocol following mini-open rotator cuff repair can result in significant improvements in pain, functional ability, and range of motion. These findings align with prior evidence and support the broader adoption of individualized, patient-driven recovery programs. Future studies with imaging-based outcome assessment and objective

adherence tracking would be valuable in further validating this approach.

REFERENCES

1. DeOrto JK, Cofield RH. Results of a second attempt at surgical repair of a failed initial rotator-cuff repair. *J Bone Joint Surg Am.* 1984;66(4):563–567.
2. Harryman DT 2nd, Hettrich CM, Smith KL, Campbell B, Sidles JA, Matsen FA 3rd. A prospective multipractice study of shoulder function after rotator cuff repair. *J Bone Joint Surg Am.* 1991;73(4):500–516.
3. Koo SS, Dhawan A, Jost PW, Wang H, Safran MR. Postoperative rehabilitation after arthroscopic rotator cuff repair: a review of current literature. *Arthroscopy.* 2009;25(1):15–24.
4. Kuhn JE. Exercise in the treatment of rotator cuff impingement: a systematic review and a synthesized evidence-based rehabilitation protocol. *J Shoulder Elbow Surg.* 2009;18(1):138–160.
5. Hayes K, Ginn KA, Walton JR, Szomor ZR, Murrell GA. A randomised clinical trial evaluating the efficacy of physiotherapy after rotator cuff repair. *Aust J Physiother.* 2004;50(2):77–83.
6. Klintberg IH, Gunnarsson AC, Styf J. Early loading in patients with rotator cuff repair: a prospective, randomized trial. *ClinRehabil.* 2009;23(7):622–638.
7. Lee SY, Lee KJ, Kim W, Lim SK. Efficacy of home-based versus supervised rehabilitation after rotator cuff repair: a meta-analysis. *Arch Orthop Trauma Surg.* 2012;132(8):1259–1266.
8. Hayes K, Callanan M, Walton J, Paxinos A, Murrell GA. Shoulder instability: management and rehabilitation. *J Shoulder Elbow Surg.* 2002;11(2):134–145.
9. Klintberg IH, Mikkelsen C, Lindström V, Enochson L, Sernert N. Patient compliance and outcome of home-based rehabilitation after rotator cuff surgery. *Physiother Theory Pract.* 2008;24(1):29–36.
10. Parsons BO, Gruson KI, Chen DD, Harrison AK, Gladstone JN, Flatow EL. Does slower rehabilitation after arthroscopic rotator cuff repair lead to long-term tendon healing? *J Shoulder Elbow Surg.* 2010;19(7):1034–1039.
11. Gimbel JA, Van Kleunen JP, Lake SP, Williams GR, Soslowsky LJ. The role of repair tension on tendon to bone healing in a rat rotator cuff model. *J Biomech.* 2007;40(3):561–568.
12. Galatz LM, Ball CM, Teefey SA, Middleton WD, Yamaguchi K. The outcome and repair integrity of completely arthroscopically repaired large and massive rotator cuff tears. *J Bone Joint Surg Am.* 2004;86(2):219–224.
13. Constant CR, Murley AH. A clinical method of functional assessment of the shoulder. *ClinOrthopRelat Res.* 1987;(214):160–164.
14. Ginn KA, Cohen ML, Herbert RD. Does hand-behind-back range of motion accurately reflect shoulder internal rotation? *J Shoulder Elbow Surg.* 2006;15(3):311–314.