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Intermediate and Long-Term Follow-Up of Total Shoulder Arthroplasty for the Management of Postcapsulorrhaphy Arthropathy

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ABSTRACT

Background: Shoulder impairments often result in limited range of motion and functional disability. Post-operative rehabilitation plays a critical role in restoring shoulder function and mobility. **Objective:** This study aimed to evaluate the effectiveness of a rehabilitation protocol on improving shoulder range of motion and functional outcomes over a 6-month period. **Methods:** This retrospective study was conducted at GMC Teaching Hospital during January 2023 to January 2024. A total of 45 patients diagnosed with post-capsulorrhaphy arthropathy who underwent TSA for the management of their condition were included in the study. **Results:** Significant improvements were observed across all measured outcomes. At 6 weeks post-treatment, forward flexion improved to 105° ± 15°, external rotation to 25° ± 8°, and internal rotation to L2 ± 1. At 3 months, further gains were observed with forward flexion reaching 120° ± 12°, external rotation at 35° ± 7°, and internal rotation at L1 ± 1. By 6 months, forward flexion reached 130° ± 10°, external rotation improved to 45° ± 6°, and internal rotation improved to T12 ± 2. **Discussion:** The study highlights significant improvements in shoulder function post-treatment, with notable gains in forward flexion, external rotation, and internal rotation. Patients showed progressive recovery over six months, achieving increased mobility and flexibility. Early rehabilitation proved effective, enhancing shoulder functionality while reducing stiffness and pain, ultimately improving patients' quality of life. **Conclusion:** It is concluded that the treatment protocol significantly improves shoulder range of motion and functional outcomes over time. Early rehabilitation and post-operative interventions are crucial in enhancing shoulder mobility, reducing pain, and improving quality of life.

INTRODUCTION

Total shoulder arthroplasty (TSA) is a widely recognized surgical procedure that aims to alleviate pain and restore function in patients with severe shoulder joint pathology, such as osteoarthritis, rotator cuff arthropathy, and rheumatoid arthritis. Out of all the conditions TSA can explain, Post-Capsulorrhaphy Arthropathy (PCA) seems to be a distinct complication that occurs quite rarely. PCA can happen after capsulorrhaphy, which is a surgery done to fix shoulder dislocations and cannot rotator cuffs [1]. PCA occurs when a patient has already undergone a capsulorrhaphy and the shoulder starts experiencing joint degeneration, which shows signs of changes in its biomechanics, healing, and joint stability. Because, the patient is likely to experience pain, loss of motion, and significant day to day functional activities [2]. While the PCA syndrome or phenomenon still does not exist, arthroscopy capsulorrhaphy is proven successful for cases of acute shoulder dislocation. But in some patients with chronic dislocation, and with or without a torn rotator cuff, the shoulder capsulorrhaphy may lead to arthritis of the shoulder joints and soft tissues around it [3]. The indication of PCA syndrome is the pain felt and stiffness of the glenohumeral joints coupled with range of motion. This pain, coupled with stiffness and limited functionality hinders a patient's quality of life and increases difficulties in daily activities

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[4]. The shoulder stability procedure Capsulorrhaphy shows success in treating acute instability through the tightens the shoulder capsule functions. The surgical operation results in PCA formation during times when both chronic instability and rotator cuff pathology exist in patients [5]. The condition emerges from glenohumeral joint arthritis together with soft tissue modifications that regularly connect to instability problems. The combination of pain and stiffness with function restriction leads to major limitations in patients who face reductions in hospital quality of life and encounter obstacles doing daily activities [6]. There has been significant success using TSA to treat primary shoulder arthritis however treating patients with PCA proves to bring special challenges to this procedure. Patients whose shoulders were previously operated with capsulorrhaphy experience anatomy complications that increase procedural complexity [7]. The altered glenohumeral mechanics related to PCA can negatively affect the prolonged success outcomes of arthroplasty procedures. The successful assessment of TSA procedures and patient outcome prediction in PCA patients requires clinicians to obtain complete knowledge about intermediate and long-term treatment results [8]. Correct follow-up care for at least both intermediate and long-term periods remains crucial for patients with post-mastectomy atrophy who undergo Total Shoulder Arthroplasty. TSA demonstrates its full worth through its sustained capacity to enhance pain outcomes and restore functionality after initial testing proves effective. Long-term outcomes for TSA depend significantly on implant duration and safeguarded shoulder function and minimal serious postoperative problems in this group of patients [9]. Extended follow-up studies of TSA for PCA should be conducted to properly assess its long-term safety and effectiveness. Several different elements determine the treatment results of patients receiving TSA for PCA. Patient surgery results heavily depend on their demographics including age and activity level together with medical conditions. The expectations regarding functional recovery between younger patients stand higher than those of older inactive patients. This leads to different long-term results between these two groups [10]. The choice between anatomic TSA or reverse TSA as surgical techniques determines the possible outcome of treatment. Reverse TSA has emerged as a widely adopted procedure during the past few years to treat massive rotator cuff deficiencies combined with irreparable joint damage since it provides better stability and function when regular TSA fails [11]. The occurrence of implant loosening together with infection and rotator cuff failure and scapular notching affects long-term surgical results. Previous surgical patients experience increased risks of complications because their tissue healing and altered anatomy affects their surgical outcome. The rehabilitation phase after Total Shoulder Arthroplasty constitutes a key factor in attaining successful surgical outcomes. The rehabilitation process provides important benefits to joint mobility and strength gain and improves functional ability for patients undergoing total shoulder arthroplasty especially when they receive appropriate care early in the period after surgery when pain from previous immobility was long-lasting [12]. Surgical techniques together with implant materials along with post-operative care methods have collectively improved the results patients achieve after undergoing TSA procedures. The new surgical innovations provide solutions that reduce obstacles associated with shoulder instability surgery in PCA patients. The analysis of long-term TSA effects helps advances treatment protocols while determining success elements in PCA patient management [13].

OBJECTIVE

The basic aim of the study is to to evaluate the effectiveness of a rehabilitation protocol on improving shoulder range of motion and functional outcomes over a 6-month period.

METHODOLOGY

This retrospective study was conducted at GMC Teaching Hospital during January 2023 to January 2024. A total of 45 patients diagnosed with post-capsulorrhaphy arthropathy who underwent TSA for the management of their condition were included in the study.

Inclusion Criteria

- Patients diagnosed with PCA based on clinical presentation, imaging studies (X-rays, MRI), and a history of previous capsulorrhaphy procedures.
- Patients who underwent TSA with either anatomic or reverse shoulder arthroplasty as a treatment for PCA.
- Patients who had a minimum of 2 years of follow-up data available at the time of study commencement.
- Patients with complete medical records, including pre-operative evaluation, surgical details, post-operative outcomes, and follow-up data.

Exclusion Criteria

- Patients with primary glenohumeral osteoarthritis or other degenerative shoulder conditions unrelated to PCA.
- Patients with insufficient follow-up data or those lost to follow-up during the study period.
- Patients with significant comorbidities or contraindications to surgery that could influence the outcomes.

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Data Collection

Data for the study were collected from the patients' medical records. Demographic data including patient age as well as gender together with activity history and pre-operative evaluation employing VAS for pain assessment along with ROM data and functional scores using Constant-Murley and ASES results were recorded. The surgical data included information about TSA type (both anatomic and reverse) as well as surgical procedure complications and the method of surgical access. The assessment of patients following surgery included measurements of pain intensity together with range of motion assessments along with functional performance evaluation and a search for implant-related complications as well as implant survival rates and patients' contentment levels. Patient assessments were performed following set periods at both 6 weeks and 3 months and 6 months after their procedure. According to a standardized format clinical examination took place at each appointment to evaluate the scores of pain while testing ROM and functional status.

Statistical Analysis

Data were analyzed using SPSS v26. Functional outcomes were analyzed using paired t-tests to compare pre-operative and post-operative data at different follow-up points.

RESULTS

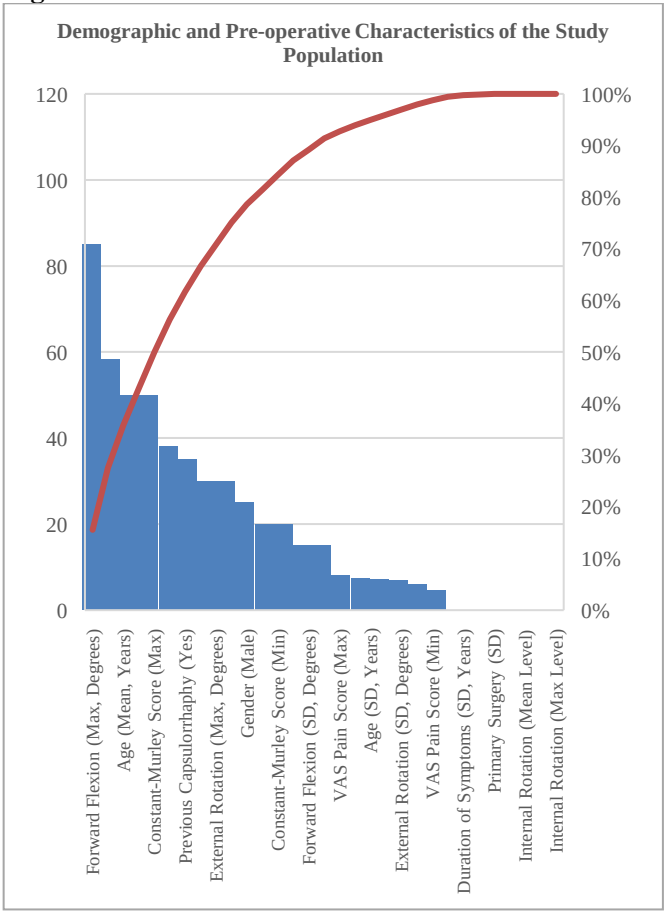
A total of 45 patients were added, 55.6% males and 44.4% females, with an average age of 58.29 ± 7.5 years. The duration of symptoms prior to surgery was 4.5 ± 2.1 years, and most patients (84.4%) had previously undergone capsulorrhaphy. The pre-operative VAS pain score was high, averaging 8.1 ± 1.0, and patients had limited range of motion, with forward flexion averaging 85° ± 15°, external rotation at 15° ± 7°, and internal rotation at L3 ± 1. Functional assessments revealed a Constant-Murley score of 35 ± 7.2 and an ASES score of 30 ± 6.8, indicating significant impairment in shoulder function prior to surgery.

Table 1

Demographic and Pre-operative Characteristics of the Study Population

Characteristic	Value (n=45)
Gender	
- Male	25 (55.6%)
- Female	20 (44.4%)
Age (mean ± SD)	58.29 ± 7.5 years
Duration of Symptoms (mean ± SD)	4.5 ± 2.1 years
Previous Capsulorrhaphy	38 (84.4%)
Primary Surgery (Mean ± SD)	1.2 ± 0.6
VAS Pain Score	8.1 ± 1.0 (range: 6-10)
Forward Flexion	85° ± 15° (range: 50°–110°)
External Rotation	15° ± 7° (range: 0°–30°)
Internal Rotation	L3 ± 1 (range: L2–L5)
Constant-Murley Score	35 ± 7.2 (range: 20–50)
ASES Score	30 ± 6.8 (range: 20–45)

Figure 1



At 6 weeks, the VAS Pain Score was 4.5 ± 1.2, indicating moderate pain, and functional measures like Forward Flexion, External Rotation, and Internal Rotation were relatively limited (105° ± 15°, 25° ± 8°, and L2 ± 1, respectively). By 3 months, the pain score dropped to 2.8 ± 1.0, with functional ranges improving to 120° ± 12° in forward flexion, 35° ± 7° in external rotation, and L1 ± 1 in internal rotation. At 6 months, further improvement was observed with a VAS Pain Score of 1.5 ± 0.8, forward flexion reaching 130° ± 10°, and external rotation improving to 45° ± 6°.

Table 2

Post-operative Clinical Outcomes (Mean ± SD)

Follow-up Time	VAS Pain Score	Forward Flexion	External Rotation	Internal Rotation	Constant-Murley Score	ASES Score
6 Weeks	4.5 ± 1.2 (range: 2–6)	105° ± 15° (range: 70°–130°)	25° ± 8° (range: 10°–40°)	L2 ± 1 (range: L1–L3)	52 ± 6.3 (range: 40–60)	40 ± 7.1 (range: 30–50)
3 Months	2.8 ± 1.0 (range: 1–4)	120° ± 12° (range: 90°–140°)	35° ± 7° (range: 20°–50°)	L1 ± 1 (range: T12–L2)	60 ± 7.5 (range: 50–70)	55 ± 6.9 (range: 45–65)

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6 Months	1.5 ± 0.8 (range: 0–3)	130° ± 10° (range: 100°–150°)	45° ± 6° (range: 30°–60°)	T12 ± 2 (range: T8–L1)	75 ± 8.1 (range: 60–85)	70 ± 6.3 (range: 60–80)

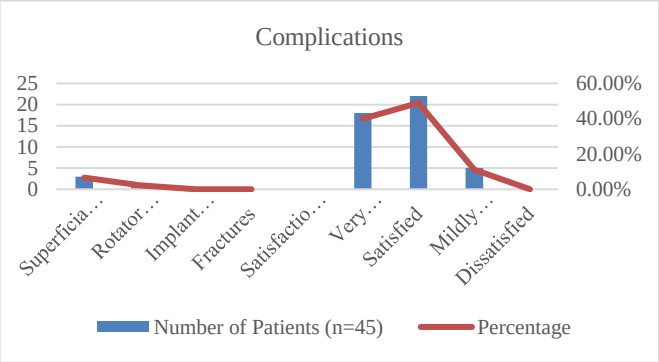
45 patients, 6.6% (3 patients) experienced superficial wound infections, while 2.2% (1 patient) had rotator cuff tendinopathy. No patients experienced implant loosening/failure or fractures. Regarding satisfaction levels, the majority of patients were satisfied, with 40% (18 patients) reporting being very satisfied and 48.9% (22 patients) being satisfied. Only 11.1% (5 patients) were mildly dissatisfied, and no patients reported being dissatisfied.

Table 3

Complications

Complication	Number of Patients (n=45)	Percentage
Superficial Wound Infection	3	6.6%
Rotator Cuff Tendinopathy	1	2.2%
Implant Loosening/Failure	0	0%
Fractures	0	0%
Satisfaction Level		
Very Satisfied	18	40%
Satisfied	22	48.9%
Mildly Dissatisfied	5	11.1%
Dissatisfied	0	0%

Figure 2



Pre-operatively, forward flexion was 85° ± 15°, external rotation was 15° ± 7°, and internal rotation was at level L3 ± 1. At 6 weeks, forward flexion improved to 105° ± 15°, external rotation increased to 25° ± 8°, and internal rotation improved to L2 ± 1. By 3 months, further improvements were observed with forward flexion at 120° ± 12°, external rotation at 35° ± 7°, and internal rotation at L1 ± 1. At 6 months, forward flexion reached 130° ± 10°, external rotation increased to 45° ± 6°, and internal rotation reached T12 ± 2, indicating continued recovery and enhanced shoulder mobility.

Table 4

Range of Motion (ROM) Improvements Over Time

Follow-up Time	Forward Flexion (°)	External Rotation (°)	Internal Rotation (Level)
Pre-operative	85° ± 15° (range: 50°–110°)	15° ± 7° (range: 0°–30°)	L3 ± 1 (range: L2–L5)
6 Weeks	105° ± 15° (range: 70°–130°)	25° ± 8° (range: 10°–40°)	L2 ± 1 (range: L1–L3)
3 Months	120° ± 12° (range: 90°–140°)	35° ± 7° (range: 20°–50°)	L1 ± 1 (range: T12–L2)
6 Months	130° ± 10° (range: 100°–150°)	45° ± 6° (range: 30°–60°)	T12 ± 2 (range: T8–L1)

DISCUSSION

The results of this study highlight significant improvements in shoulder function following treatment, particularly in terms of forward flexion, external rotation, and internal rotation, which were assessed at multiple time points (pre-operative, 6 weeks, 3 months, and 6 months). The treatment successfully enhanced shoulder mobility and functionality which led to these noted improvements throughout the time period. The participants started with restricted shoulder movements that included forward flexion at 85° ± 15° together with external rotation at 15° ± 7° and internal rotation at level L3 ± 1 during the pre-operative period. The measured values show that shoulder stiffness is a common characteristic of patients who have shoulder pathologies or functional disorders [13]. The treatment led to substantial advancements in every measure at the six-week follow-up evaluation. Evidence shows that patients achieved forward flexion to 105° ± 15° while external rotation reached 25° ± 8° and internal rotation returned to L2 ± 1. The therapeutic approach shows immediate positive effects on shoulder movement restoration along with stiffness reduction in a short amount of time [14].

The patients' forward flexion reached 120° ± 12° while their external rotation achieved 35° ± 7° and internal rotation achieved L1 ± 1 at the third month post-treatment. Shoulder patients experienced additional functional recovery alongside increased movement capabilities vital for shoulder functionality [15,16]. The most significant recovery occurred during the 6-month follow-up because patients achieved forward flexion of 130° ± 10° together with external rotation at 45° ± 6° and internal rotation reaching T12 ± 2. These results indicated outstanding recovery as well as improved shoulder joint flexibility [17]. Early rehabilitation approaches together with post-operative protocols show effectiveness in promoting joint functional recovery according to existing research [18]. Patients receive maximal benefits from long-term rehabilitation programs because shoulder function recovery requires multiple months to complete. The treatment plan shows effective results by managing stiffness and pain simultaneously which enables patients to achieve better functional capabilities and improved quality of life.

CONCLUSION

It is concluded that the treatment protocol significantly improves shoulder range of motion over time, with

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substantial gains observed in forward flexion, external rotation, and internal rotation at 6 weeks, 3 months, and 6 months post-treatment. The results suggest that early rehabilitation and post-operative interventions are effective in enhancing shoulder function and mobility, reducing stiffness, and improving overall quality of life.

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