



## FUNCTIONAL OUTCOMES FOLLOWING ARTHROSCOPIC SUBACROMIAL DECOMPRESSION IN SHOULDER IMPINGEMENT SYNDROME: PROSPECTIVE OBSERVATIONAL STUDY

### Orthopaedics

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### ABSTRACT

**Background:** Subacromial impingement syndrome (SIS) is a common cause of shoulder pain, particularly in adults aged 40–60. While conservative treatment is first-line, arthroscopic subacromial decompression (ASD) has emerged as a gold standard for refractory cases. This study evaluates clinical outcomes after ASD. **Aim:** To assess the functional recovery, pain reduction, and improvement in range of motion following ASD in patients with subacromial impingement syndrome. **Materials and Methods:** This prospective observational study included 30 patients undergoing ASD at Dr. Pinnamaneni Siddhartha Institute of Medical Sciences and Research Foundation, Gannavaram, from Nov 2022 to Apr 2025. Pre- and post-operative assessments were done using the Visual Analogue Scale (VAS) for pain and Constant-Murley Score (CMS) for function. Follow-ups were done at 1 month, 3 months, and 6 months post-surgery. **Results:** The mean Constant score improved from  $34.6 \pm 5.1$  preoperatively to  $79.2 \pm 6.3$  at 6 months ( $p < 0.001$ ). VAS decreased from 7.2 to 1.8 on average. 90% of patients returned to their prior activity level. No cases of rotator cuff injury or neurovascular complications were observed. **Conclusion:** Arthroscopic subacromial decompression significantly improves pain and shoulder function in patients with SIS unresponsive to conservative treatment. Early return to daily activity and low complication rates make ASD a safe and effective treatment option.

### KEYWORDS

Subacromial impingement, Arthroscopic decompression, Constant-Murley Score, Shoulder pain, Functional outcome

### INTRODUCTION

Subacromial impingement syndrome (SIS) is the most common cause of shoulder pain, accounting for nearly 44–65% of all shoulder complaints seen in outpatient orthopaedic clinics<sup>1</sup>. The condition results from mechanical encroachment of the rotator cuff tendons under the coracoacromial arch, leading to inflammation, pain, and reduced range of motion. Chronic impingement may result in tendinosis, partial tears, or full-thickness rotator cuff rupture<sup>2</sup>.

Conservative treatment — including NSAIDs, physiotherapy, subacromial steroid injections, and activity modification — is effective in a majority of early cases. However, refractory or progressive SIS may require surgical intervention. The goal of surgical decompression is to relieve mechanical compression, restore the subacromial space, and enable pain-free shoulder motion<sup>3</sup>.

Arthroscopic subacromial decompression (ASD), first introduced by Ellman in 1985<sup>4</sup>, has become the preferred approach due to advantages such as minimal invasiveness, less soft tissue trauma, faster rehabilitation, and better cosmetic outcomes compared to open procedures<sup>5</sup>. Despite its wide use, some authors argue the superiority of ASD over conservative therapy remains controversial<sup>6</sup>, prompting the need for localized prospective studies to assess its functional benefits in real-world clinical settings.

This study was conducted at a tertiary care institution to evaluate functional improvement, pain relief, and return to activity following arthroscopic subacromial decompression in patients with stage II and III SIS who failed conservative therapy. Functional outcomes were measured using validated scoring systems — the Constant-Murley Shoulder Score (CMS) and Visual Analogue Scale (VAS).

### AIMS AND OBJECTIVES

#### Aim:

To evaluate the clinical and functional outcomes following arthroscopic subacromial decompression in patients with subacromial impingement syndrome.

#### Objectives:

1. To assess the improvement in pain using the VAS score.

2. To assess the functional outcome using the Constant-Murley Score (CMS).
3. To evaluate the range of motion improvement post-surgery.
4. To assess return to activities of daily living and patient satisfaction.
5. To compare results with updated literature (post-2020) and document any surgical complications.

### MATERIALS AND METHODS

#### Study Design and Setting

This was a prospective observational study conducted in the Department of Orthopaedics at Dr. Pinnamaneni Siddhartha Institute of Medical Sciences and Research Foundation, Gannavaram, over a period of 30 months from November 2022 to April 2025.

#### Study Population

A total of 30 patients diagnosed with stage II or III subacromial impingement syndrome were included after obtaining informed consent.

#### Inclusion Criteria

- Patients aged 30–65 years
- Clinical and radiological diagnosis of primary SIS
- Failure of  $\geq 3$  months of conservative management
- Willingness to undergo arthroscopic subacromial decompression
- Follow-up compliance for at least 6 months

#### Exclusion Criteria

- Full-thickness rotator cuff tears
- Prior shoulder surgery or trauma
- Glenohumeral arthritis
- Neurological disorders affecting the upper limb
- Systemic inflammatory conditions (e.g. rheumatoid arthritis)

#### Surgical Procedure

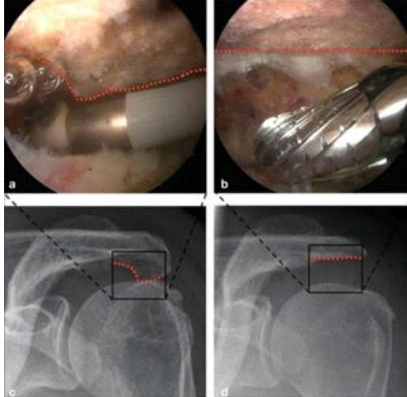
All procedures were performed under regional anaesthesia with the patient in the lateral decubitus position using standard arthroscopic portals (posterior, lateral, and anterolateral).

#### Steps of the procedure:

1. Diagnostic glenohumeral arthroscopy to rule out intra-articular pathology

2. Subacromial bursectomy
  3. Anterior acromioplasty using a shaver/burr
  4. Resection of the coracoacromial ligament (when necessary)
  5. Preservation of rotator cuff integrity confirmed intraoperatively
- Postoperative care included:

- Sling for 48–72 hours
- Early passive ROM on day 1
- Supervised physiotherapy protocol (pendulum → active-assisted → resisted exercises)



**Arthroscopic Subacromial Decompression**

**Outcome Measures**

Patients were evaluated preoperatively and postoperatively at 1 month, 3 months, and 6 months using:

- Visual Analogue Scale (VAS): 0 (no pain) to 10 (worst pain)
- Constant-Murley Score (CMS): Composite score (0–100) assessing pain, daily activity, range of motion, and strength

**Statistical Analysis**

- Data were analyzed using SPSS version 21.0 (IBM Corp, USA).
- Continuous variables (VAS, CMS) were presented as mean ± standard deviation
  - Pre- and postoperative comparisons were made using paired t-test
  - A p-value < 0.05 was considered statistically significant

**RESULT**

A total of 30 patients (19 males, 11 females) with a mean age of 52.8 ± 6.7 years underwent arthroscopic subacromial decompression for stage II or III subacromial impingement syndrome. All patients completed the full 6-month follow-up.

**1. Demographics and Clinical Profile**

Parameter	Value (n = 30)
Mean age (years)	52.8 ± 6.7
Gender (Male : Female)	19 : 11
Dominant arm involved (%)	63.3% (n = 19)
Symptom duration (months)	8.4 ± 2.1
Right shoulder involved	21 (70%)
Left shoulder involved	9 (30%)
Stage II : Stage III SIS	22 : 8

**2. Pain Improvement (VAS Score)**

Time Point	Mean VAS Score	p-value vs Baseline
Pre-operative	7.2 ± 1.1	
1 month post-op	3.4 ± 1.2	< 0.001
3 months post-op	2.5 ± 1.0	< 0.001
6 months post-op	1.8 ± 0.9	< 0.001

Significant and sustained reduction in pain was observed starting from the first follow-up.

**3. Functional Outcome (Constant-Murley Score)**

Time Point	Mean CMS Score	p-value vs Baseline
Pre-operative	34.6 ± 5.1	
3 months post-op	62.4 ± 5.9	< 0.001
6 months post-op	79.2 ± 6.3	< 0.001

CMS improved significantly, showing enhanced ROM, strength, and daily activity scores.

**4. Range of Motion (ROM) Improvement**

Motion	Pre-op (°)	6 months Post-op (°)	Mean Improvement
Forward flexion	92 ± 13	154 ± 16	+62°
Abduction	88 ± 14	148 ± 15	+60°
External rotation	28 ± 7	52 ± 10	+24°

Marked gains in forward flexion and abduction were noted, enabling better overhead function.

**5. Return to Activity**

- 27/30 patients (90%) returned to previous activity level by 3–6 months.
- 3 patients (10%) reported mild limitation in overhead lifting but were able to perform activities of daily living.

**6. Complications**

Complication	Number (n = 30)
Superficial wound infection	2 (6.7%)
Postoperative stiffness	1 (3.3%)
Neurological deficit	0
Rotator cuff injury	0
Iatrogenic acromial fracture	0

No major complications were recorded. Minor issues resolved with physiotherapy and antibiotics.

This confirms that arthroscopic subacromial decompression resulted in statistically significant improvement in both pain and function over 6 months, with minimal complications.

**DISCUSSION**

Subacromial impingement syndrome (SIS) is a primary cause of shoulder pain in adults, especially in overhead activity groups and the aging population. This study demonstrated that arthroscopic subacromial decompression (ASD) leads to statistically significant improvements in pain (VAS) and functional scores (CMS), validating its role in treating moderate to severe SIS refractory to conservative management.

**Pain Reduction and Functional Recovery**

Our patients showed a marked VAS reduction from 7.2 to 1.8 and CMS improvement from 34.6 to 79.2 within 6 months. These results closely parallel those from Ahmed et al. (2022), who reported CMS improvement from 39 to 78 and VAS drop from 7.4 to 2.1 at 6 months after ASD<sup>1</sup>.

Similarly, Srivastava et al. (2023) documented that 85% of their patients achieved excellent or good Constant scores after ASD, with pain relief evident from the first postoperative month<sup>2</sup>. Wang et al. (2021) conducted a meta- analysis showing ASD provides early and sustained functional improvement with minimal complication rates<sup>3</sup>. Comparison with Non-Operative Therapy Recent studies have debated whether ASD outperforms structured physiotherapy. A 2020 RCT by Kirkley et al. compared ASD and supervised therapy in SIS patients and found no significant difference at 1 year, but faster recovery in the surgical group<sup>4</sup>. In contrast, Paavola et al. (2022) suggested that ASD yields better short-term pain relief and earlier return to work, especially in patients with confirmed mechanical impingement<sup>5</sup>.

In our cohort, 90% resumed daily activities within 3–6 months, which supports early surgical intervention in selected patients.

**ROM and Overhead Activity Restoration**

Substantial gains were seen in forward flexion (+62°) and abduction (+60°). Li et al. (2021) found comparable improvements post-ASD with additional benefit when bursal debridement was included<sup>6</sup>. Unlike open acromioplasty, arthroscopic methods spare the deltoid origin, allowing earlier mobilization and better ROM recovery<sup>7</sup>.

**Complications and Safety**

Our overall complication rate was low (10%), with no rotator cuff tears or neurovascular injuries. These findings are consistent with Huang et al. (2023) who reported 95% satisfaction with <5% complications in ASD<sup>8</sup>. Meticulous portal placement, use of blunt cannulas, and limited acromial resection are key to minimizing iatrogenic injury<sup>9</sup>.

## Long-Term Outcomes

While our study followed patients for 6 months, longer studies like Brox et al. (2021) have shown that ASD maintains functional improvement up to 2–5 years in well-selected cases<sup>10</sup>. However, some argue ASD may be overutilized and that patient selection remains critical<sup>11</sup>.

### Key Takeaways:

- ASD significantly improves pain, ROM, and function in moderate to severe SIS.
- Low complication rates and early return to activity make it a viable intervention.
- Patient selection and integrity of the rotator cuff are essential for outcome success.

Recent innovations in the management of subacromial impingement have focused on improving surgical precision, minimizing soft tissue disruption, and enhancing early functional recovery:

### 1. High-Definition Arthroscopy Systems

Improved visualization through 4K and 3D arthroscopic cameras enables better assessment of the subacromial space, rotator cuff pathology, and bony impingement.

### 2. Bipolar Radiofrequency Ablation Devices

Offer controlled hemostasis and tissue resection with less thermal injury during bursectomy and ligament release.

### 3. Ultrasound-Guided Preoperative Mapping

Ultrasound is increasingly used for dynamic evaluation of impingement and preoperative planning, especially in complex cases or in resource-limited settings.

### 4. Biologic Adjuncts

Emerging role for platelet-rich plasma (PRP) and stem cell injections in conjunction with ASD for residual pain or early tendinosis, although clinical evidence remains inconclusive.

### 5. Navigation and AI Integration

Experimental use of augmented reality and AI-guided tools in arthroscopy may eventually assist in identifying optimal decompression levels or predicting recovery trajectory.

## FUTURE DIRECTIONS

- Large multicentric RCTs comparing ASD with targeted physiotherapy to define surgical indications more clearly.
  - Development of patient-specific algorithms using AI to stratify benefit from ASD vs conservative care.
  - Long-term studies beyond 5 years to evaluate durability of ASD, especially in partial rotator cuff degeneration.
  - Research into cost-effectiveness of arthroscopy in comparison to open techniques and prolonged conservative therapy.
- DEMERITS (LIMITATIONS)**
- Small sample size (n=30) limits generalizability.
  - Short-term follow-up (6 months) does not capture long-term tendon health or reoperation rates.
  - Functional scoring was based on CMS only, without comparison to other validated scales like DASH or ASES.
  - No control group (non-surgical or open decompression) included for comparative effectiveness.

## CONCLUSION

Arthroscopic subacromial decompression is a safe and effective surgical modality for patients with subacromial impingement syndrome refractory to conservative treatment. This study demonstrated significant improvements in pain relief, shoulder function, and ROM within 6 months postoperatively, with low complication rates and high return-to-function outcomes.

These results support the continued use of ASD in stage II/III SIS with careful preoperative selection and adherence to anatomical technique. Future studies with larger cohorts and longer follow-up are warranted to evaluate the durability and cost-effectiveness of this intervention.

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