Scoping Review

Identifying Conservative Interventions for Individuals with Subacromial Pain Syndrome Prior to Undergoing a Subacromial Decompression: A Scoping Review

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Keywords: decompression, shoulder impingement syndrome, shoulder pain, surgical

https://doi.org/10.26603/001c.73312

Background

Subacromial decompression (SAD) surgery remains a common treatment for individuals suffering from subacromial pain syndrome (SAPS), despite numerous studies indicating that SAD provides no benefit over conservative care. Surgical protocols typically recommend surgery only after exhausting conservative measures; however, there is no consensus in the published literature detailing what constitutes conservative care “best practice” before undergoing surgery.

Purpose

To describe conservative interventions received by individuals with SAPS prior to undergoing a SAD.

Study Design

Scoping review.

Methods

An electronic search using MEDLINE, CINAHL, PubMed, and Scopus databases was conducted. Peer-reviewed randomized controlled control trials and cohort studies published between January 2000 and February 2022 that included subjects diagnosed with SAPS who progressed to receive a SAD were eligible. Subjects who received previous or concurrent rotator cuff repair with SAPS were excluded. Conservative interventions and treatment details that subjects received prior to undergoing a SAD were extracted.

Results

Forty-seven studies were included after screening 1,426 studies. Thirty-six studies (76.6%) provided physical therapy (PT) services, and six studies (12.8%) included only a home exercise program. Twelve studies (25.5%) specifically detailed the delivered PT services, and 20 studies (42.6%) stated who provided the PT interventions. Subacromial injections (SI) (55.3%, n=26) and non-steroidal anti-inflammatories (NSAIDs) (31.9%, n=15) were the next most frequently delivered interventions. Thirteen studies (27.7%) included combined PT and SI. The duration of conservative care varied from 1.5 months to 16 months.

Conclusion

Conservative care that individuals with SAPS receive to prevent advancement to SAD appears inadequate based on the literature. Interventions, such as PT, SI, and NSAIDs, are either underreported or not offered to individuals with SAP prior to advancing to surgery. Many questions regarding optimal conservative management for SAPS persists.
Level of Evidence

n/a

INTRODUCTION

Shoulder pain affects approximately one-third of individuals in a lifetime, and 36–70% of those who experience shoulder pain are diagnosed with either subacromial impingement syndrome or subacromial pain syndrome (SAPS).1–3 Subacromial decompression (SAD) surgery is one of the most common orthopedic procedures utilized to address SAPS with rates increasing 117–254% between 1990 to the early 2000s in the United States.4,5 In the United Kingdom, 21,000 SAPS procedures were performed in 2010 costing nearly £50 million.6 Individuals with shoulder pain who receive a SAD exhibit significant clinical outcomes in pain, function, and quality of life when compared to those who receive conservative management, yet the procedure is frequently performed when individuals fail conservative management.5,6–9

There is no accepted definition for "adequate nonoperative treatment." This requires judgment by the medical team and patient to determine if conservative treatment was sufficient before progressing to surgery.10 Completing conservative care is a common inclusion criterion to receive a SAD in the literature; however, studies seldom describe the provided interventions. This omission does not assist clinicians or patients in determining if adequate care was exhausted, a common clinical challenge, prior to recommending SAD. Standard care for SAPS is outlined in a recent clinical practice guideline (CPG) suggesting the exhaustion of conservative interventions prior to performing a SAD, and recommending that individuals only receive a SAD if functional loss persists following completion of conservative care.5,6 The CPG recommendations include physical therapy (PT), a guided home exercise program (HEP), non-steroidal anti-inflammatory drugs (NSAIDs), education, and subacromial injections (SI).6

PT intervention has high-level supportive evidence to treat individuals suffering from SAPS.11 Several randomized control trials exist highlighting equivalent outcomes and cost savings when individuals receive supervised exercise compared to receiving a SAD.12,13 Additional authors have found enhanced benefits from combined manual therapy (MT) and exercise over exercise alone.14–17 However, to date, PT is not always delivered to individuals with SAPS prior to undergoing a SAD.11,18 Therefore, identifying the PT interventions offered to people with SAPS prior to undergoing a SAD is needed in the attempt to understand why individuals continue on to surgery.19

Based on the current evidence, it is unclear if adequate conservative management is provided to individuals with SAPS prior to considering a SAD. Therefore, the purpose of this review was to describe the conservative interventions received by individuals with SAPS prior to undergoing a SAD in the published research. This information will allow for future critical appraisals (e.g. systematic reviews) in attempt to define adequate management to prevent SAD as well as assist clinicians and patients to determine if adequate care was exhausted before advancing to surgery. A scoping review allows for data extraction without the need for a critical analysis, and it can provide an overview of the available evidence without producing an answer to a discrete research question.20

METHODS

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses - Extension for Scoping Reviews (PRISMA-ScR) Checklist guided the design for this scoping review.21 The question was registered with the Open Science Framework and OSF Registries (Identification: https://doi.org/10.17605/OSF.IO/EUP9C).

SEARCH STRATEGY

A librarian assisted with the creation of a database specific search strategy for MEDLINE, CINAHL, PubMed, and Scopus. Keywords, boolean operators, MeSH terms, and MeSH subheadings were used. The search was conducted on February 11, 2022. The search strategy for PubMed is as follows and was adjusted to support each database search criteria:

```
((((((shoulder[MeSH Terms]) OR ("shoulder impingement syndrome"[MeSH Terms]))) OR (shoulder pain[MeSH Terms]))) OR (shoulder[Title/Abstract])) OR (shoulder impingement syndrome)[Title/Abstract])) OR (shoulder impingement syndrome)) OR (subacromial pain syndrome)) OR ("subacromial pain syndrome"[Title/Abstract])) AND (((subacromial decompression) OR ("SAD")) OR ("subacromial decompression")) AND (orthopedics[MeSH Terms]) OR (surgery[MeSH Subheading])) OR (surgery[Title/Abstract]))
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ELIGIBILITY CRITERIA

Peer-reviewed randomized control and cohort studies with subjects diagnosed with SAPS, subacromial impingement syndrome, or subacromial shoulder pain were included since these terms are interchangeable.15,22–24 Both open or arthroscopic SAD procedures were included.

Studies published between January 2000 and February 2022 were considered since literature from the early to late 2000’s began to highlight non-superior results associated with SAD outcomes.9,15,25 Other inclusion criteria consisted of studies: (1) evaluating conservative interventions for SAPS, subacromial impingement syndrome, or subacromial shoulder pain when compared to SAD, (2) including subjects listed as having completed conservative care but ultimately received a SAD, and (3) subjects who did not receive any conservative care prior to undergoing a SAD. There was no language restriction in order to maximize study inclusion. An attempt to identify a translated study was made if not published in English.

If one or more of the following conditions were present, the study was excluded: (1) subjects had a concurrent
acromioclavicular or glenohumeral joint separation or dislocation, rotator cuff muscle tear(s), humeral head avascular necrosis, humerus or clavicle fracture, glenohumeral labral tear or insufficiency, calcified tendinopathy, or glenohumeral joint osteoarthritis, (2) subjects had a history of undergoing a prior SAD or rotator cuff repair, a surgical procedure other than a SAD for shoulder pain, a procedure to address either a complete or partial rotator cuff repair concurrently with a SAD, or a total or reverse shoulder replacement, (3) cadaver studies, (4) subjects with SAPS receiving conservative management but unclear if advancement to surgery occurred, (5) follow-up studies performed on the same study population as the initial publication, (6) pharmacological studies focusing on pain management for consecutively scheduled SAD procedure, or (7) the study design was a systematic review, protocol, conference abstract, case study, narrative review, treatment clinical practice guidelines, or was published in a non-peer reviewed journal.

**DATA EXTRACTION AND ANALYSIS**

Title/abstract and full-text screening was performed independently by two reviewers (JS and GT). Disagreements regarding inclusion were resolved by discussion, and a third reviewer (JY) resolved the discrepancy if no consensus occurred. A quality assessment was not conducted given the purpose of this scoping review.

The same reviewers independently extracted the data meeting the inclusion criteria and collaborated to organize and validate the findings. The data extracted from each included study were: (1) the types and number of conservative interventions (if provided) completed by subjects prior to undergoing a SAD, and (2) duration of care (months) and/or treatment sessions completed, if available. Details for each extracted intervention were collected, such as the number of SI and/or injected medications, NSAIDs dosage and frequency, interventions and exercises used during PT, and exercises prescribed in the HEP as the details were available.

PT specificity was captured since it is a common conservative intervention received by individuals with SAPS. PT was defined as an intervention or a group of interventions provided by a physical therapist or physiotherapist. Additionally, only a licensed physical therapist can offer PT services, and the PT provider was identified to ensure a licensed professional rendered PT services. An intervention including no specific provider was categorized as an independent intervention. For example, if PT and ultrasound were separately listed but the provider delivering these interventions remained absent, these were identified as two separate interventions. If there was or was not a specific description of the treatment provided during PT services, it was categorized into specific-PT or non-specific PT, respectively.

For the purposes of this review, a HEP was defined as an unsupervised exercise regimen prescribed by any healthcare provider. The HEP compliance rate, if available, was collected since intervention adherence is associated with improved outcomes. If a physical therapist delivered the

**Figure 1. Flow diagram for study inclusion**

HEP, it would be categorized as a part of PT. For example, if a study mentioned PT and a HEP separately but did not clearly state the HEP was provided during PT services, then these were classified as two separate interventions. If PT included a HEP, then it was combined with PT and considered one intervention.

The data were subsequently reviewed to identify intervention clusters. Intervention clusters were defined post hoc as the most common combinations of interventions (e.g. both PT and SI is one intervention cluster).

**RESULTS**

The electronic database searches identified 1,426 studies. The scoping review included 47 studies after duplicate removal, title/abstract screen, and full-text review (Figure 1). A hand search produced one additional study. Two protocol studies were excluded; the two primary results studies based on the initial protocol publications were included. Lastly, Haahr and Anderson was excluded as this was a follow-up study on the same subject population from Haahr et al. The reviewer interrater agreement for the title/abstract screen was strong (κ = .76) and moderate for the full-text review (κ = .66). The two reviewers discussed and resolved all discrepancies. See Table 1 for a summary of results.

**PHYSICAL THERAPY**

Thirty-six studies identified in MEDLINE, CINAHL, PubMed, and Scopus.
### Table 1. Extracted interventions and details per study for scoping review.

<table>
<thead>
<tr>
<th>Study</th>
<th>Conservative interventions and dosing, if provided*</th>
<th>Number of conservative interventions provided</th>
<th>Physical therapy description and provider*</th>
<th>Amount and duration of conservative treatment</th>
</tr>
</thead>
</table>
| Aydin et al. 201427   | • Physiotherapy:  
  ◦ ROM  
  ◦ Isometric strengthening exercises  
  • NSAIDs                                                                 | 2                                             | Specific, performed by physiotherapist                                                                     | 6 months                                      |
| Back et al. 202128    | • Conservative treatment                                                                                                                                                      | 1                                             | None Listed                                                                                              | 3 months                                      |
| Baltaci et al. 200770 | • Physiotherapy  
  ◦ Stretching  
  ◦ Strengthening  
  ◦ Activity modification  
  • NSAIDs  
  • Steroidal anti-inflammatory medication                                                                 | 4                                             | Non-specific, performed by unknown provider                                                            | 6 months                                      |
| Basharat et al. 202129| • Moist heat  
  • NSAIDs  
  • HEP including isometric contractions for 6-10 seconds, 10-20 repetitions per day for 5-6 days per week up to 12; then for 12-24 weeks progressive resistance exercise 5 times per week | 3                                             | None Listed                                                                                             | 6 months                                      |
| Beard et al. 20187    | • Physiotherapy:  
  ◦ Remedial exercise regimen  
  • At least one steroid injection                                                                                   | 2                                             | Non-specific, performed by unknown provider                                                            | 3 months                                      |
| Bengtsson et al. 200630| • At least one steroid injection  
  • Physiotherapy                                                                                                              | 2                                             | Non-specific, performed by physiotherapist                                                            | 6 months                                      |
| Bhattacharyya et al. 201431| • Physiotherapy  
  • At least one subacromial steroid injection  
  • Local anesthetic injection                                                                                      | 3                                             | Non-specific, performed by physiotherapist                                                            | 6 months                                      |
| Biberthaler et al. 201332| • Physiotherapy:  
  ◦ Heat/cold pack  
  ◦ Soft tissue treatment  
  ◦ Active training of the periscapular muscles and strengthening of the stabilizing muscles of the shoulder joint  
  ◦ HEP (2-3 times per week)                                                                                         | 1                                             | Specific, performed by unknown provider                                                               | 16 sessions for 60 minutes for 3 months       |
| Bjornsson Hallgren et al. 201733| • Physiotherapy:  
  ◦ Eccentric exercise for the rotator cuff  
  ◦ Eccentric and concentric exercise for scapula-stabilizing musculature                                                                 | 1                                             | Specific, performed by physiotherapist in Physical Therapy Department                                   | 3 months                                      |
| Butt et al. 201534    | • One or more steroid injections  
  • Physiotherapy                                                                                                             | 2                                             | Non-specific, performed by unknown provider                                                            | 6 months                                      |
| Cederqvist et al. 202035| • Physical Therapy:  
  ◦ Cold pack 10-15 minutes prior to exercise  
  ◦ Specific exercises following a protocol  
  ◦ Joint mobilization with muscle energy techniques  
  ◦ Cross friction massage                                                                                           | 1                                             | Specific, performed by physical therapists                                                            | 15 sessions within 3 months                  |
| Christiansen et al. 201636| • Physiotherapy:  
  ◦ Advice/instruction  
  ◦ Exercise therapy                                                                                                           | 1                                             | Specific, performed by physiotherapist                                                               | Greater than 5 sessions                      |
<table>
<thead>
<tr>
<th>Reference</th>
<th>Type</th>
<th>Duration</th>
<th>Interventions</th>
</tr>
</thead>
<tbody>
<tr>
<td>DeWachter et al. 2005</td>
<td>Non-specific</td>
<td>6 months</td>
<td>Physiotherapy, NSAIDs, Subacromial steroid injections</td>
</tr>
<tr>
<td>Diab et al. 2009</td>
<td>Non-specific</td>
<td>3-6 months</td>
<td>NSAIDs, Physiotherapy, At least one subacromial steroid injection</td>
</tr>
<tr>
<td>Dickens et al. 2005</td>
<td>n/a</td>
<td>4.5 months</td>
<td>Three subacromial steroid injections at six week intervals</td>
</tr>
<tr>
<td>Dorum et al. 2017</td>
<td>Non-specific</td>
<td>3 months</td>
<td>Physical Therapy, Strengthening and stretching exercises, Manual therapy</td>
</tr>
<tr>
<td>Farfaras et al. 2016</td>
<td>Specific</td>
<td>3-6 months</td>
<td>Physical Therapy, Pain-free exercises with gravity forces removed</td>
</tr>
<tr>
<td>Farfaras et al. 2018</td>
<td>Non-specific</td>
<td>3-6 months</td>
<td>Physical Therapy, NSAIDs, Local steroid injection</td>
</tr>
<tr>
<td>Haahr et al. 2005</td>
<td>Specific</td>
<td>3 months</td>
<td>Physical Therapy, Heat/cold pack, Soft tissue treatments, Exercise:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Active training of the periscapular muscles, Strengthening of the stabilizing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>muscles of the shoulder, Daily HEP</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>No prior interventions listed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Corticosteroid injection, Physical Therapy:</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Eccentric strengthening of rotator cuff (3 sets, 15 reps, 2 times per day)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Concentric/Eccentric exercises for scapular stabilizers (3 sets, 15 reps, 2 times per day)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Posterior shoulder stretch (hold 30-60 sec, 3 reps, 2 times per day)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Shoulder abduction, shoulder retraction, shoulder elevation, neck retraction,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>stretch of upper trapezius, stretch of pectoralis major</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Manual intervention of posterior GH capsule and pectoralis minor stretching</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Education on posture (thoracic spine extension and scapular retraction)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Local anesthetic injection, Physiotherapy</td>
</tr>
</tbody>
</table>

International Journal of Sports Physical Therapy
<table>
<thead>
<tr>
<th>Study</th>
<th>Prior Interventions</th>
<th>NSAIDs</th>
<th>Local Steroid Injections</th>
<th>Physical Therapy</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hultenhein Klintberg et al. 2011</td>
<td>0</td>
<td>n/a</td>
<td>Not Listed</td>
<td>No prior interventions listed</td>
<td>6 months</td>
</tr>
<tr>
<td>Husby et al. 200346</td>
<td>3</td>
<td>Non-specific</td>
<td>Physical therapy</td>
<td>Non-specific, performed by physical therapist</td>
<td>3 months</td>
</tr>
<tr>
<td>Jacobsen et al. 201747</td>
<td>2</td>
<td>Specific</td>
<td>Physical therapy</td>
<td>Specific, performed by physiotherapist</td>
<td>3 months</td>
</tr>
<tr>
<td>Jarvela et al. 201048</td>
<td>1</td>
<td>None Listed</td>
<td>Physical Therapy</td>
<td>None Listed</td>
<td>6 months</td>
</tr>
<tr>
<td>Jenkins et al. 202049</td>
<td>0</td>
<td>n/a</td>
<td>Not Listed</td>
<td>No prior interventions listed</td>
<td>Not Listed</td>
</tr>
<tr>
<td>Kappe et al. 201550</td>
<td>2</td>
<td>Non-specific</td>
<td>Physical Therapy</td>
<td>Non-specific, performed by unknown</td>
<td>Not Listed</td>
</tr>
<tr>
<td>Ketola et al. 200951</td>
<td>4</td>
<td>Specific</td>
<td>Physical Therapy</td>
<td>Specific, performed by physiotherapist</td>
<td>Not Listed</td>
</tr>
<tr>
<td>Khare et al. 201552</td>
<td>1</td>
<td>None Listed</td>
<td>Physical Therapy</td>
<td>None Listed</td>
<td>3 months</td>
</tr>
<tr>
<td>Klintberg et al. 201053</td>
<td>0</td>
<td>n/a</td>
<td>Not Listed</td>
<td>No prior interventions listed</td>
<td>Not Listed</td>
</tr>
<tr>
<td>Kohler et al. 202054</td>
<td>2</td>
<td>Specific</td>
<td>Physical Therapy</td>
<td>Specific, performed by physiotherapist or physician</td>
<td>1.5 months</td>
</tr>
<tr>
<td>Konradsen et al. 201530</td>
<td>2</td>
<td>Non-specific</td>
<td>Physical Therapy</td>
<td>Non-specific, performed by unknown</td>
<td>6 months</td>
</tr>
<tr>
<td>Study (year)</td>
<td>Interventions</td>
<td>Duration</td>
<td>Provider</td>
<td></td>
<td></td>
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<td>-------------</td>
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<td></td>
</tr>
<tr>
<td>Lim et al. 2007</td>
<td>• Rest • Physiotherapy • NSAIDs • Steroid injections in subacromial space</td>
<td>4</td>
<td>Non-specific, performed by unknown provider</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunsjo et al. 2011</td>
<td>• Subacromial glucocorticoid steroid injection • Physical Therapy</td>
<td>2</td>
<td>Non-specific, performed by unknown provider</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Magaji et al. 2012</td>
<td>• At least 1 subacromial injection of steroid • Local anesthetic injection • Physiotherapy: ◦ Global strengthening exercises ◦ Lifestyle and ADL changes to change posture and strengthen appropriate ◦ Taping for biofeedback</td>
<td>3</td>
<td>Non-specific, performed by a physiotherapist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odenbring et al. 2008</td>
<td>• Physical Therapy • NSAIDs • Subacromial steroid injection</td>
<td>3</td>
<td>Non-specific, performed by unknown provider</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paavola et al. 2018</td>
<td>• Physical Therapy: ◦ Individually designed progressive HEP</td>
<td>1</td>
<td>Specific, performed by physiotherapist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Paavola et al. 2021</td>
<td>• Physiotherapy • NSAIDs • Corticosteroid injection • Rest</td>
<td>4</td>
<td>Non-specific, performed by physiotherapist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rehman et al. 2009</td>
<td>• Conservative treatment</td>
<td>1</td>
<td>Non-specific, performed by unknown provider</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rombach et al. 2019</td>
<td>• Conservative treatment • At least 1 steroid injection</td>
<td>2</td>
<td>None listed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rudbeck et al. 2013</td>
<td>• Rest • Exercises • NSAIDs</td>
<td>3</td>
<td>Non-specific, performed by unknown provider</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singh et al. 2014</td>
<td>• Physiotherapy • Subacromial steroid injection • Local anesthetic injection</td>
<td>3</td>
<td>Non-specific, performed by physiotherapist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nizam Siron et al. 2021</td>
<td>• Physiotherapy • Analgesics</td>
<td>2</td>
<td>Non-specific, performed by unknown provider</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Taverna et al. 2007</td>
<td>• Physical Therapy: ◦ ROM Strengthening ◦ Ice ◦ Subacromial corticosteroid injection(s) ◦ NSAIDs ◦ Activity modification ◦ Rest</td>
<td>5</td>
<td>Non-specific, performed by unknown provider</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wright et al. 2000</td>
<td>• Physical Therapy: ◦ Moist Heat ◦ Ice ◦ NSAIDs ◦ Steroid injections</td>
<td>3</td>
<td>Non-specific, performed by unknown provider</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Yeoman et al. 2012

- Physiotherapy
- Two steroid injections

<table>
<thead>
<tr>
<th>Dosage, Frequency</th>
<th>Number of Studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Non-specific, performed by unknown provider</td>
<td>6 months</td>
</tr>
</tbody>
</table>

*Identified conservative care interventions noted within each study. Dosage, frequency, and other details were listed when available.

Physical therapy was defined as specific or non-specific. "Specific" included a description of the physical therapy interventions (e.g., manual therapy, home exercise program). "Non-specific" provided no description. The provider for physical therapy services was identified (e.g. physical therapist, physiotherapist, physician, etc.), or labeled as unknown if no provider was stated.

(ADL = activities of daily living. NSAIDs = non-steroidal anti-inflammatory drug. HEP = home exercise program. ROM = range of motion.)

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**Figure 3.** Identified physical therapy provider. Unique providers were used for those studies that stated physical therapy services were provided, but not by either a department or physician.

**Figure 2.** Physical therapy and home exercise use in the included studies.

Twenty-four studies identified non-specific PT and did not provide details for the provided interventions. Twelve studies (25.5%) explicitly described specific-PT interventions. The specific-PT interventions commonly included eccentric or isometric strengthening of the rotator cuff muscles, scapular stabilization activities, modalities, joint mobilizations, pain-free range of motion, or a prescribed HEP. (Figure 2)

Fourteen studies did not identify if a physical therapist provided the interventions (Table 1). Twenty studies specifically mentioned that a physical therapist/physiotherapist provided the PT service. One study (2.1%) provided PT services from either a physical therapist or a physician, and one study (2.1%) rendered services in the Physical Therapy Department. (Figure 3)

Eight studies gave a specific description of the manual therapy method, technique, or targeted body region.

Seven studies (14.9%) included thermotherapy, and one study (2.1%) provided radial extracorporeal shockwave therapy. Several studies included electrotherapy, ultrasound, and tapping. One study noted physical modality application within PT.

**MEDICATION AND INJECTIONS**

Fifteen studies identified NSAIDs, and two studies provided oral analgesic medications. One study noted "analgesics" while another study mentioned "steroidal anti-inflammatory medication" without specifying application methods.

Twenty-six studies included subjects receiving at least one SI or more while 16 studies noted unspecified amount of shoulder-related injections. Three studies mentioned receiving glucocorticosteroid injections, and four studies noted steroid, and four studies (8.5%) described corticosteroid or cortisone injections. Eleven studies mentioned providing an injection directly into the subacromial space while the remaining studies were non-descript. See Table 1 for a summary of results.

**HOME EXERCISE PROGRAM**

Six studies included a HEP prescribed by an unknown healthcare provider or a physical
therapist. Five studies32,42,47,51,60 (10.6%) used a prescribed HEP within PT services while one study29 (2.1%) included a HEP without PT. Basharat et al.29 provided a HEP with specific exercise descriptions and dosages; all other studies2,42,47,51 provided no HEP detail. Four studies29,32,42,47 (8.5%) provided performance frequency associated with the prescribed HEP. Frequency was given as daily,42,47 five times per week,29 or a two to three times per week.32 No study mentioned compliance tracking or adherence to the HEP. See Table 1 and Figure 2 for a summary of results.

DURATION OF CONSERVATIVE TREATMENT

Three studies37,40,41 (6.4%) provided conservative measures for a range of three to six months. One study75 (2.1%) delivered services for 12–16 months and another 15 studies2,29,31,34,36,46,48,55,57,59,66–68,70 (31.9%) provided interventions for six months. Ten studies7,28,33,39,42,44,47,52,64,72 (21.5%) provided three months of conservative care. One study56 (2.1%) ranged from two to sixteen months, one study38 delivered treatment for 4.5 months, and another provided intervention for 1.5 months.54 Two studies35,60 (4.3%) provided interventions for 15 conservative care sessions, one study32 (2.1%) completed 16 sessions, and one study18 (2.1%) provided more than five visits before undergoing a procedure. Holmgren et al.14 provided conservative measures for three months followed by two months of a HEP. See Table 1 for specific details.

CONSERVATIVE INTERVENTION CLUSTERS

Interventions were clustered based on the most common combinations of interventions as reported in the reviewed studies (Figure 4).7,14,18,27–60,62–70,72 Four studies35,45,49,53 (8.5%) listed no conservative interventions, and four studies28,48,52,69 (8.5%) mentioned “conservative treatment” without description; one study mentioned conservative treatment in addition to receiving at least one steroid injection.62 Thirteen studies7,14,30,31,34,44,47,54,55,57,58,64,66,68 (27.7%) reported subjects received at least one or more injections combined with PT. Six studies36,37,41,46,59,67 (12.8%) included PT, NSAIDs, and injections. Four studies51,56,66,72 (8.5%) included PT, NSAIDs, injections, and rest or activity modification. One study38 (2.1%) included only injections, and three studies27,50,65 (6.4%) included combined PT and NSAIDs or oral analgesics. One study70 (2.1%) included PT, NSAIDs, and activity modification. Three studies29,59,65 (6.4%) included conservative care interventions unique to that study. Seven studies18,32,33,35,40,42,60 (14.9%) included PT only. (Figure 4)

DISCUSSION

This scoping review highlights the variability in the conservative interventions provided to individuals with SAPS before undergoing a SAD, further emphasizing the need for a standard of what is deemed “adequate conservative management.” Few studies provided specific intervention descriptions, such as dosage, type, frequency, medication, or duration of care. Additionally, the interventions received by individuals were provided by physical therapists less than half of the time. The findings from this review call attention to the need for specific criteria that should be met in individuals with SAPS, including maximizing the use of conservative management, before advancing to a SAD.

The majority (76.6%) of subjects in this review received some form of PT service. This finding aligns with research indicating PT, including MT and exercise, can positively impact outcomes for individuals suffering from SAPS; however, it questions why individuals continue to undergo surgery. It brings into question whether the PT services rendered are “adequate.” The next most commonly delivered interventions included SI (55.3%) and NSAIDs (31.9%). This further brings into question if the standards of care as suggested by Vandvik et al.6 is sufficient to limit progression to SAD. This finding should be taken lightly as many conservative measures may be underreported; therefore, not allowing for a full comparison to recommended standards of care. Lastly, only one quarter of the studies offered specific details related to PT intervention, and less than half indicated that a physical therapist rendered PT services. This lack of transparency does not allow for the determination of whether or not adequate PT was provided.

It is concerning that non-invasive interventions are not consistent or exhausted despite being safe, beneficial, and cost effective since SAD procedures produce similar outcomes to conservative care.3,6–9 Furthermore, no conservative interventions were reported in 8.2% (n=4) of the included studies.43,45,49,53 This finding supports the inadequate attempts to offer effective conservative intervention prior to undergoing a SAD, and aligns with prior research on rotator cuff related pain conducted by Naunton et al.12 However, caution in making this conclusion is important as operative studies are not typically focused on detailing conservative measures prescribed prior to undergoing a SAD.

Vandvik et al.6 recommended that individuals with SAPS receive a guided PT program, including a supervised exercise program and patient education, before undergoing surgery. A majority of the included studies offered PT services to subjects prior to receiving a SAD, which aligns with conservative treatment recommendations3,6,12; however, over half of the studies lacked an exercise description and purpose for the intervention. Only a quarter of the studies included exercise specifications, such as exercise protocols to the rotator cuff musculature or general information about posture improvements. Additionally, few of the PT interventions included MT while only a third of the studies incorporated modalities. Less than a quarter of the studies included a well-designed HEP despite the potential benefits from prescribing a HEP with adequate dosing and frequency.78 No studies measured exercise compliance or compliance to attending PT appointments.79 These findings highlight the literature is not descriptive enough to define if adequate PT intervention was conducted.
Treatment provided by physical therapists should include specific exercise to the shoulder muscular, thoracic spine, and scapular stabilizers, along with information on psychosocial factors, pain neuroscience education, and behavior change.\textsuperscript{7,14–17,35,80} Future research should provide specific PT intervention details, if rendered PT services prevented SAD, and who provided the PT services since about a third of the studies did not list the provider of PT services. Providing specific intervention details allow for a better understanding of the completed services. Omitting intervention descriptions consequently limits outcome reproducibility in future research or in a clinical environment. Clinicians do not know the specific intervention type or dosage to use to enhance patient outcomes. Therefore, it is recommended to use a set structure to improve the recreation of a study’s result. The Template for Intervention Description and Replication (TIDieR) or Consensus on Exercise Reporting Template (CERT) can guide exercise intervention description\textsuperscript{81,82}; the modified CERT could guide MT intervention and dosage.\textsuperscript{83} Enhanced intervention description, including exercise and MT, will allow for treatment efficacy to be measured and act as a valid comparator to surgery.\textsuperscript{81}

SI served as the second most provided conservative intervention. Despite the high prevalence for this intervention in the reviewed literature, few studies mentioned the site of the injection, medication, or dosage. Approximately one-third of the included studies in this scoping review did not provide the injected medication or specify the number of injections, which aligns with prior research findings.\textsuperscript{84} Sun et al.\textsuperscript{84} observed irregularities in treatment protocols including the maximum number of injections to administer to a patient with SAPS prior to determining if they failed treatment. If SI are considered for an intervention to address pain associated with SAPS, the anatomical structure to receive the injection is to the subacromial bursa.\textsuperscript{85,86} The outcomes following SI do not appear to be significantly impacted if performed with ultrasound guidance or with anatomic landmarks when conducted by a trained clinician.\textsuperscript{86,87} A 21 gauge needle can be used to inject a methylprednisolone 40 milligrams and one milliliter one percent lidocaine mix directly into the subacromial bursa but recognize individual medical providers may alter the mixture based on experience and the treatment goal.\textsuperscript{85,86,88}

Clinical management for SAPS often includes a multimodal approach. Combined PT and SI accounted for the most common (27.7%) conservative intervention grouping prior to undergoing surgery. These interventions were typically provided over a wide range of time (1.5–16 months). Unfortunately, an effective duration of conservative care prior to considering advancement to surgery remains unclear. Additionally, the timing of when conservative care is delivered remains unknown. For example, it is unknown if receiving PT and SI concurrently leads to an optimal outcome, or if sequential intervention prescription may work best (e.g. PT followed by SI, or vice versa). Several unknowns remain to best define adequate conservative management for SAPS to limit advancement to surgery.

LIMITATIONS
Only studies in the English language were included in the review despite attempts to identify translated studies. Also, no quality assessment was performed, which may limit the impact of the findings but can guide future systematic reviews. Lastly, there is a lack of high-quality PT CPGs for the treatment of nontraumatic shoulder pain. This makes

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**Figure 4. Common conservative intervention clusters.**
determining exercise type, dose, duration, timing, and expected outcomes recommendations difficult.\textsuperscript{13,89}

CONCLUSION

Conservative management for SAPS offers an equally advantageous outcome when compared to SAD. Many individuals continue to receive a SAD despite conservative care, bringing into question what is “adequate care” for individuals with shoulder pain. The findings from this scoping review indicate that typical interventions to conservatively manage pain, such as PT, NSAIDs and SI, are underreported or not offered to individuals with SAPS prior to undergoing a SAD. PT intervention shown to positively impact outcomes was underutilized in many studies, further highlighting that adequate care may not be utilized. The inadequate level of conservative care offered does not allow for a valid comparison to surgery. There is a significant need to investigate successful conservative interventions to prevent SAD.

FUNDING

There was no funding associated with this research.

ACKNOWLEDGEMENTS

Thank you to Cindy Reinl, Bellin College librarian, who assisted with the electronic searches.

AUTHORS DISCLOSURES

The authors certify that they have no affiliations with or financial involvement in any organization or entity with a direct financial interest in the subject matter or materials discussed in the study.

Submitted: August 15, 2022 CDT, Accepted: January 27, 2023 CDT
REFERENCES


55. Konradsen LA, Jensen CH. Arthroscopic subacromial decompression results in normal shoulder function after two years in less than 50% of patients. Dan Med J. 2015;62(3).


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*International Journal of Sports Physical Therapy*