The Challenge of Diagnosing Patients Presenting With Signs and Symptoms of Subacromial Pain Syndrome

A Descriptive Study of 741 Patients Seen in a Secondary Care Setting

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Background: Subacromial pain syndrome has no universally accepted definition. Patients with shoulder pain are often diagnosed with subacromial pain syndrome without consideration of conflicting or concomitant diagnoses.

Purpose: To investigate the prevalence of conflicting and concomitant diagnoses in patients with signs and symptoms of subacromial pain syndrome.

Study Design: Cross-sectional study; Level of evidence, 3.

Methods: Using standardized diagnostic criteria, a prospective cohort of patients with signs and symptoms of subacromial pain syndrome was divided into 2 mutually exclusive groups: (1) patients with conflicting diagnoses—e.g., frozen shoulder or glenohumeral osteoarthritis (OA); (2) patients with subacromial pain syndrome. Patients with subacromial pain syndrome were further divided into 2 groups: (1) isolated subacromial pain syndrome; (2) subacromial pain syndrome with concomitant diagnoses—e.g., acromioclavicular OA, full-thickness rotator cuff tears, shoulder instability, long head biceps tendon pathology, labral lesions, and calcified tendinopathy. Standardized physical examination tests, radiographs, ultrasound, and magnetic resonance imaging scans were utilized. Tests were performed by experienced orthopaedic specialists in accordance with predefined standardized protocols.

Results: We systematically screened 3321 patients, of whom 576 had signs and symptoms of subacromial pain syndrome (mean age, 56 years; 57% women). Of these, 168 (29%) patients had conflicting diagnoses, with frozen shoulder accounting for the majority of these diagnoses. The remaining 408 patients were diagnosed with subacromial pain syndrome. Of these, 172 (42%) had at least 1 concomitant diagnosis, and 55 (13%) had multiple concomitant diagnoses. In total, 22 different combinations of concomitant diagnoses were observed across the 172 patients. Acromioclavicular OA and full-thickness rotator cuff tears, particularly of the supraspinatus, were the most common concomitant diagnoses. Biceps tendon pathology, calcified tendinopathy, minor shoulder instability, and superior labrum anterior to posterior (SLAP) lesions were less common.

Conclusion: Patients presenting with signs and symptoms of subacromial pain syndrome have a high prevalence of conflicting and concomitant diagnoses. This heterogeneity is a clinical challenge that necessitates a systematic and transparent diagnostic approach in patients presenting with signs and symptoms of subacromial pain syndrome.
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Keywords: general; impingement syndrome; rotator cuff; shoulder, shoulder impingement; subacromial impingement syndrome; subacromial pain syndrome

Subacromial pain syndrome (SAPS) is recognized as the most common cause of shoulder pain.[9,27,31,40] Although there is consensus that patients with SAPS should be

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offered a structured physical therapy regimen, with optional subacromial corticosteroid injections as the first line of treatment, only half of the patients experience symptom relief.[8,22] For patients with persistent symptoms, the surgical procedure, arthroscopic subacromial decompression (ASD), can be considered. However, randomized controlled trials have not found any clinically relevant effect of ASD compared with diagnostic arthroscopy.[3,32] This has brought forth arguments for the discontinuation of ASD.[23,41] With the current state of evidence-based knowledge, approximately half of the patients diagnosed with SAPS are left with unacceptable symptoms and no further treatment options if the current surgical treatment is discontinued without implementing a different approach.

There is no consensus regarding the diagnostic criteria for SAPS, and there is considerable variation across studies.[12] This could result in heterogeneity among patients diagnosed with SAPS owing to the presence of concomitant shoulder diagnoses. It has been theorized that the treatment of SAPS can be improved through a more individualized approach, apprising potential concomitant diagnoses,[1,5,10,14,12] but currently there is little knowledge of this. Biceps tendon pathology, labral tears, supraspinatus tears, calcified tendinopathy, acromioclavicular osteoarthritis (OA), and shoulder instability are diagnoses that have been reported to be present in patients with SAPS.[1,7,26,27,30] It can be debated whether these diagnoses have a direct causal relationship with the symptoms of SAPS, or if they can coexist with SAPS independently as concomitant diagnoses. Regardless, from a surgical perspective, these diagnoses are differentiated from SAPS, as they are approached in a substantially different manner. Increased knowledge of the prevalence of concomitant diagnoses could be an important first step toward a more individualized treatment approach for patients with SAPS. This study aimed to investigate the prevalence of conflicting and concomitant diagnoses in patients with signs and symptoms of SAPS.

METHODS

Ethical Considerations

The study was registered and approved by the Regional Scientific Ethical Committee, Copenhagen Region, Denmark (Reference No: H-19025712). The protocol was uploaded to clinical trials (NCT05549674).

Study Design

This was a cross-sectional study in a secondary care setting. A prospective cohort of patients referred with an insidious onset of shoulder pain was systematically screened for eligibility. Based on standardized physical examination tests, ultrasonography, and radiographs, patients diagnosed with SAPS were systematically screened for the presence of the following concomitant shoulder diagnoses: biceps tendon pathology; superior labrum anterior to posterior tear (SLAP lesion), full-thickness supraspinatus tear; calcified tendinopathy; acromioclavicular OA, minor shoulder instability, and major shoulder instability.

Participants and Inclusion Procedure

Participants were recruited consecutively from the outpatient clinic, Arthroscopic Center, Orthopedic Department, Copenhagen University Hospital, Hvidovre, Denmark, between September 1, 2020, and December 31, 2022. All patients (age$\geq$18 years) referred with insidious onset of shoulder pain to the outpatient clinic were screened for eligibility by orthopaedic shoulder specialists. Eligibility screening comprised a clinical examination with 17 standardized physical examination tests (Table 1). Ultrasonography was used routinely as an adjuvant to the diagnostic process. Patients also underwent standardized radiographs of the glenohumeral and acromioclavicular joints to diagnose or exclude glenohumeral OA, acromioclavicular OA, and calcified tendinopathy. Magnetic resonance imaging (MRI) scan was not used routinely.

Inclusion Criteria

The inclusion criteria for this study were (1) insidious onset of shoulder pain and (2) SAPS, defined as at least 3 out of 5 positive results from the Hawkins, Neer, Jobe, painful arc, and external resistance test.

Setting

Arthroscopic section, Orthopedic Department, Copenhagen University Hospital, Hvidovre, Denmark, employs 7 orthopaedic shoulder specialists, treating patients with shoulder pain regularly (approximately 2 outpatient clinic days per week). The mean orthopaedic experience of the shoulder

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Ethical approval for this study was obtained from De Videnskabsetiske Komiteer for Region Hovedstaden, Regionsgården (H-19025712).

TABLE 1
Physical Examination Tests and Imaging Used to Identify Different Shoulder Diagnoses[a]

Physical Examination Test	Diagnosis
Hawkin	Subacromial pain
Neer	Subacromial pain
Jobe	Subacromial pain
Painful arc	Subacromial pain
External rotation resistance	Subacromial pain
Apprehension	Major shoulder instability
Relocation	Major shoulder instability
Surprise	Major shoulder instability
Jerk	Major shoulder instability
Castagna	Minor shoulder instability
O'Brien	SLAP lesion
Speed	Biceps tendon pathology
Long head biceps tendon palpation pain, bicipital groove	Biceps tendon pathology
Cross-over	Acromioclavicular OA
Acromioclavicular joint palpation pain	Acromioclavicular OA
Passive external shoulder rotation	Frozen shoulder
Passive shoulder flexion	Frozen shoulder
Imaging	**Diagnosis**
Radiography, frontal and sagittal plane shoulder views	Glenohumeral OA
	Calcified tendinopathy
	Acromioclavicular OA
Ultrasonography	Full-thickness rotator cuff tears
	Calcified tendinopathy
	Biceps tendon rupture

[a]Physical examination tests, and imaging were used systematically. A detailed description of the physical examination tests can be found in the Appendix. OA, osteoarthritis; SLAP, superior labrum anterior to posterior.

specialists was 14 years (range, 7-22 years) at the start of the study. The orthopaedic shoulder specialists all used shoulder ultrasonography as part of their normal clinical work. Ultrasonography was performed on Hitachi Arrieta Version 70 Diagnostic Ultrasound Systems.

Every day, the orthopaedic shoulder specialists received a folder containing an individual screening sheet for every eligible shoulder patient on the current patient list. The orthopaedic shoulder specialist registered the results for each patient on the screening sheet according to the standardized testing procedure. If information was missing, the screening pages were returned to the orthopaedic shoulder specialist to be filled out.

Development of a Treatment Algorithm and Agreement on Predefined Diagnoses

Before the study, the concomitant diagnoses and their diagnostic criteria were agreed upon through a structured iterative process. The study group and the orthopaedic shoulder specialists had 3 structured meetings over 6 months where the diagnostic criteria were discussed and adjusted. Based on input from orthopaedic shoulder specialists, the diagnostic criteria were aligned with clinical practice, ensuring that each of the concomitant diagnoses would direct patients toward different treatment paths within the department (Figure 1). Questions regarding the diagnostic procedure— including how each physical examination was performed—were discussed and agreed upon before the inclusion of patients in the study. The physical examination tests were protocolized and standardized. The orthopaedic shoulder specialists all received a copy of a written guide of the diagnostic criteria and the physical examination tests agreed upon.

Based on the clinical examination, patients presenting with signs and symptoms of SAPS were divided into 2 mutually exclusive groups: (1) patients with conflicting diagnoses; (2) patients with SAPS. Patients diagnosed with SAPS were further investigated for the presence of *concomitant* diagnoses. Patients with SAPS were divided into isolated SAPS and SAPS with concomitant diagnoses (Table 2).

Conflicting Diagnoses

Before patients can be classified as having SAPS, other shoulder-related diagnoses that may exhibit signs and symptoms similar to SAPS but require a different treatment should be ruled out.[42] Systemic musculoskeletal disease, inflammatory joint disease (e.g., rheumatoid arthritis), cervical pathology, frozen shoulder, glenohumeral OA, fibromyalgia, previous surgery, fractures, or radiotherapy in the shoulder girdle were considered as such and ruled out before patients were classified as having SAPS. A detailed description of these definitions can be found in the Appendix.

Statistical Analysis

Based on an unpublished pilot study conducted at the study location, the following distribution of patients was assumed: isolated SAPS: 40%; full-thickness supraspinatus tears: 20%; long head biceps tendon pathology: 8%; SLAP lesions: 8%; acromioclavicular OA: 8%; major shoulder instability: 8%; and minor shoulder instability: 8%. In total, 125 patients were needed to include 10 patients in the smallest group. Descriptive statistics were used to summarize the prevalence of conflicting diagnoses and concomitant shoulder diagnoses in patients presenting with SAPS and to calculate percentages. Descriptive statistics were used to summarize patient characteristics, and the standard deviation for age was calculated. No further statistical analyses were performed.

RESULTS

We systematically screened 3321 patients referred to the outpatient clinic during the 28-month inclusion period

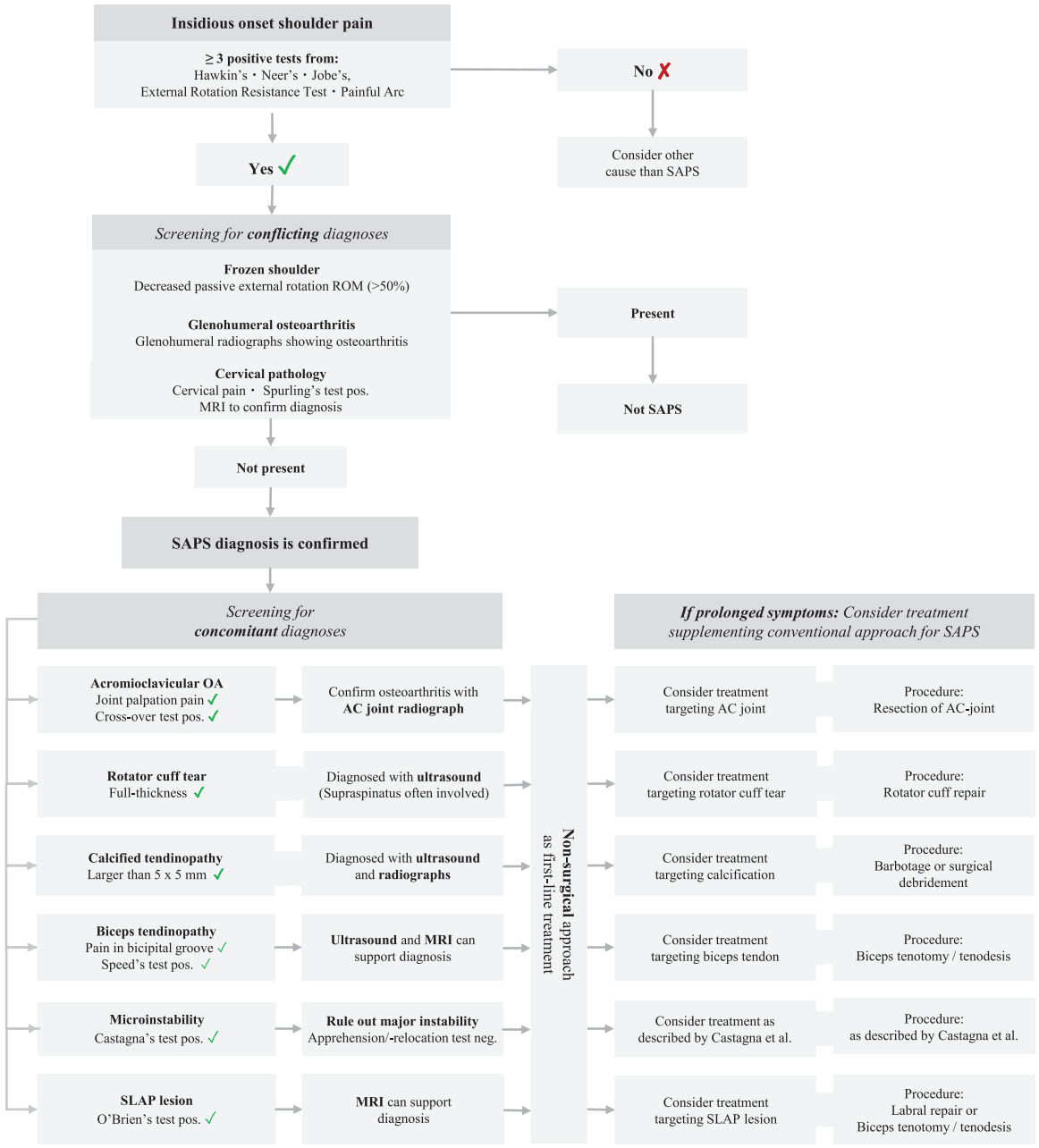

Figure 1. Treatment algorithm for patients with an insidious onset of shoulder pain. AC, acromioclavicular; MRI, magnetic resonance imaging; OA, osteoarthritis; ROM, range of motion; SAPS, subacromial pain syndrome; SLAP, superior labrum anterior to posterior.

(Figure 2). We identified 741 patients referred with insidious onset of shoulder pain, of whom 576 fulfilled the inclusion criteria of at least 3 out of 5 positive tests from the following tests: the Hawkins, Neer, Jobe, painful arc, and external resistance test. From these, 168 patients had conflicting diagnoses: frozen shoulder (n = 64), fibromyalgia (n = 28), glenohumeral OA (n = 22), previous surgery (n = 15), frozen shoulder and glenohumeral OA (n = 1), previous fracture in shoulder girdle (n = 10), cervical symptoms (n = 15), cervical symptoms and glenohumeral OA (n = 2), cervical symptoms and fibromyalgia (n = 4), previous surgery in shoulder region and frozen shoulder (n = 2), previous surgery in shoulder region and glenohumeral OA (n = 3), glenohumeral OA and fibromyalgia (n = 1), and previous fracture and frozen shoulder (n = 1). In total, 408 patients were diagnosed with SAPS. Of these, 172 (42%) had at least 1 concomitant shoulder diagnosis, and 55 patients (13%) had multiple concomitant diagnoses (Table 3 and Figure 3). In total, 22 different combinations of concomitant diagnoses were observed across the 172

TABLE 2
Definition of SAPS and concomitant diagnoses[a]

SAPS	1. Insidious onset of shoulder pain 2. ≥3 out of 5 positive tests from Hawkins, Neer, Jobe, painful arc, and external resistance test 3. No conflicting diagnoses
Isolated SAPS	Patients with SAPS and no concomitant shoulder diagnosis
SAPS with concomitant diagnoses	SAPS and presence of ≥1 concomitant diagnosis from: *Calcified tendinopathy, rotator cuff tear, long head biceps tendon pathology, SLAP lesion, acromioclavicular OA, minor shoulder instability, or major shoulder instability*
Concomitant diagnoses	
Calcified tendinopathy	Calcification in the supraspinatus or infraspinatus tendon >5 × 5–mm in any dimension. Evaluated with ultrasound and radiographs.
Rotator cuff tear	Evaluated with ultrasonography or an MRI scan.[35] Tears were differentiated into partial thickness or full-thickness. A full-thickness tear was defined as a connection between the glenohumeral joint and the subacromial space. Partial thickness tears, inflammation, and fraying were not considered a distinct diagnosis.
Long head biceps tendon pathology	Point tenderness in the bicipital groove and a positive Speed test.[11] Ultrasonographic or clinical evidence of a rupture of the long head biceps tendon was also registered under this category.
SLAP lesion	Defined as a positive O'Brien's test. The definition did not rely on MRI scans, as asymptomatic SLAP lesions identified on imaging are a normal age-related finding.[36] Patients with an acute SLAP lesion (not insidious onset of shoulder pain) were not included.
Acromioclavicular osteoarthritis	Defined as a positive cross-over test (cross-body adduction test),[19] recognizable pain at the acromioclavicular joint at palpation, and radiographical signs of acromioclavicular OA.
Minor shoulder instability	Pain from the apprehension test[15] or Castagna test,[6] *but* no signs of major instability.
Major shoulder instability	Anterior instability was defined as a positive apprehension test,[15] or a surprise test,[24] and a positive relocation test.[15] Posterior instability was defined as a positive jerk test.[21]

[a]OA, osteoarthritis; MRI, magnetic resonance imaging; SAPS, subacromial pain syndrome; SLAP, superior labrum anterior to posterior.

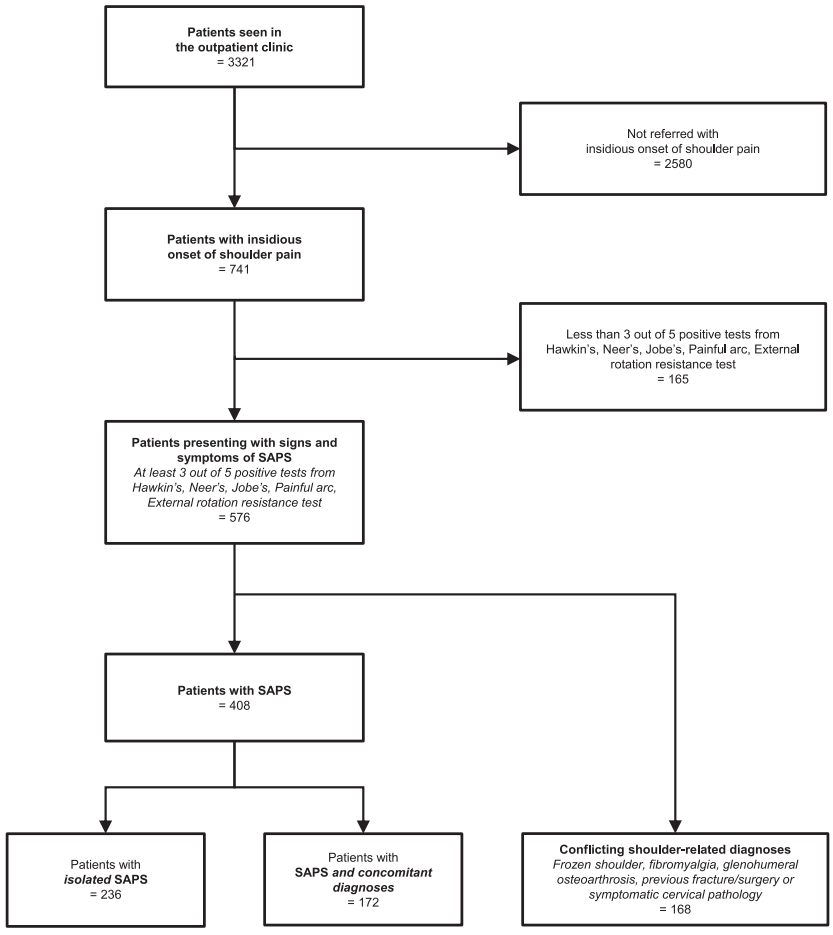

Figure 2. A flow diagram of patients.

TABLE 3
Combinations of Diagnoses in Patients With SAPS[a]

	n	%
Isolated SAPS	236	-
SAPS with concomitant diagnoses	172	100
Acromioclavicular OA	42	24
Acromioclavicular OA + biceps tendon pathology	12	7
Acromioclavicular OA + supraspinatus tear	9	5
Acromioclavicular OA + minor shoulder instability	5	3
Acromioclavicular OA + biceps tendon pathology + SLAP lesion	4	2
Acromioclavicular OA + supraspinatus tear + biceps tendon pathology	3	2
Acromioclavicular OA + biceps tendon pathology + calcified tendinopathy	1	1
Rotator cuff tears (supra = 31; supra + infra = 4; subscap = 1)	36	21
Rotator cuff tear + biceps (supra = 6; supra + infra = 1; supra + infra + subscap = 1)	8	5
Supraspinatus tear + SLAP lesion	2	1
Supraspinatus tear + minor shoulder instability	2	1
Supraspinatus tear + biceps + SLAP lesion	1	1
Biceps tendon pathology (2 complete ruptures)	21	12
Biceps tendon pathology + SLAP lesion	4	2
Biceps tendon pathology + minor shoulder instability	3	2
SLAP lesion	9	5
Minor shoulder instability	4	2
Calcified tendinopathy	6	3
Major shoulder instability	0	0

[a]Of the 408 patients with SAPS, 236 (58%) had isolated SAPS and 172 (42%) had SAPS and at least 1 concomitant diagnosis. From these, 76 (19%) patients had acromioclavicular OA, 60 (15%) had rotator cuff tears, 57 (14%) had biceps tendon pathology, 20 (5%) had SLAP lesions, 14 (3%) had minor shoulder instability, and 7 (2%) had calcified tendinopathy. Infra, infraspinatus; OA, osteoarthritis; SAPS, subacromial pain syndrome; SLAP, superior labrum anterior to posterior; subscap, subscapularis; supra, supraspinatus.

patients. The mean age of the patients was 56 ± 13 years, and 234 patients (57%) were women.

DISCUSSION

The most important finding was that 172 (42%) of the 408 patients diagnosed with SAPS had at least 1 type of concomitant shoulder diagnosis. Of the 172 patients with a concomitant diagnosis, 55 (32%) had multiple concomitant diagnoses. In total, 22 different combinations of concomitant diagnoses were seen. This emphasizes the complexity of patients with SAPS and underpins the potential of establishing a more individualized approach.

SAPS is a clinical diagnosis, and it is typically diagnosed from a combination of physical examination tests.[42] Most often, a combination of the Hawkins, Neer, Jobe, painful arc, and isometric shoulder strength tests are used.[42] This approach is supported by experts, reviews, and guidelines. [13,17,18,27] In the prevailing theory of SAPS, the symptoms are assumed to originate from the subacromial structures (hence the term), but previous studies have shown that the commonly used physical examination tests can elicit pain from anatomic structures other than the subacromial.[7,25,26,29] In this study, we investigated the prevalence of concomitant diagnoses in patients with SAPS. It is beyond the scope of this study to determine whether concomitant diagnoses can be causative of the SAPS symptoms or if they coexist as additional pain-contributing foci. Nevertheless, from a clinical perspective, patients with SAPS who also have concomitant diagnoses represent a heterogeneous group because surgical treatment with ASD alone cannot be expected to relieve all symptoms.

Acromioclavicular OA, full-thickness supraspinatus tears, and long head biceps tendon pathology were the most common concomitant diagnoses observed. Although less common, SLAP lesions, minor shoulder instability, and calcified tendinopathy were also observed. None of the included patients had signs of major shoulder instability, suggesting that this does not commonly provoke signs and symptoms of SAPS.

The most observed concomitant diagnosis was acromioclavicular OA (19% of patients with SAPS). This compares reasonably with the previous studies.[16] The suspicion of acromioclavicular OA arises when pain is found at the acromioclavicular joint. As the subacromial bursa reaches under the acromioclavicular joint, it can be difficult to discern whether the symptoms arise from the joint or the bursa. Suspected acromioclavicular OA should, therefore, be confirmed by radiographs. However, the diagnosis should not rely on imaging alone, as asymptomatic acromioclavicular degenerative findings are a common finding.[33] We found a high prevalence of full-thickness rotator cuff tears in the present study, most often supraspinatus tears. This is an interesting finding, as most studies investigating patients with SAPS aim to exclude patients with full-thickness supraspinatus tears but usually do not screen for this.[42] While a complete rupture of a rotator

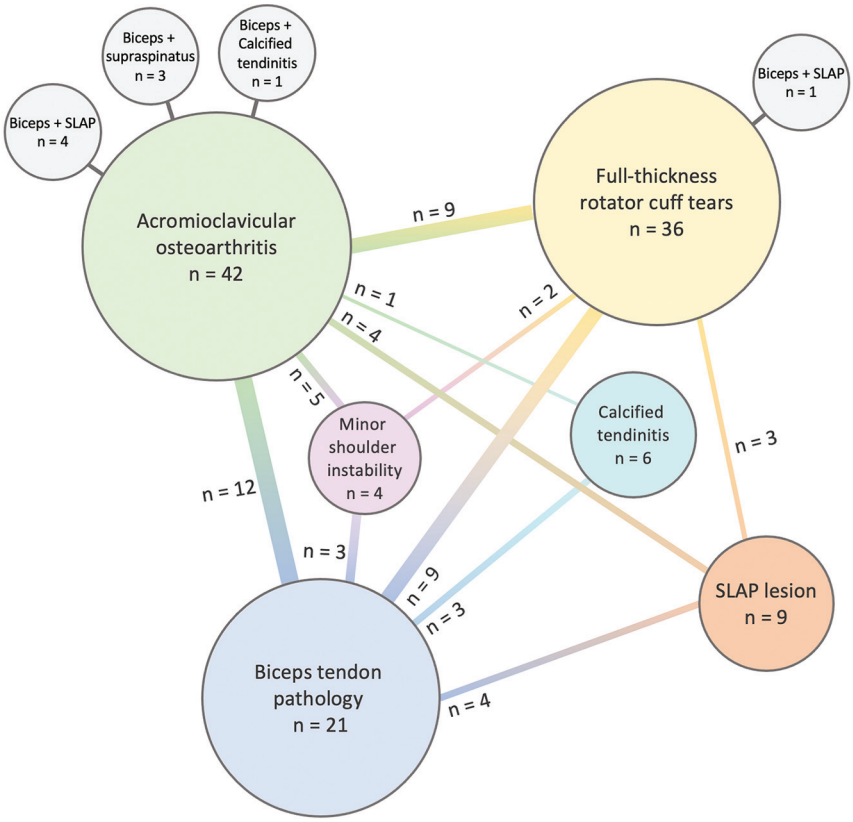

Figure 3. Combinations of concomitant diagnoses in patients with SAPS. Colored circles represent the number of patients with SAPS with 1 concomitant diagnosis. Combinations with 2 types of concomitant diagnoses are represented by connecting lines and adjacent numbers. The smaller circles represent combinations with 3 types of concomitant diagnoses. A total of 172 patients are represented in the figure.

cuff tendon (a full-thickness tear with no humeral attachment) can often be suspected from physical examination tests, full-thickness tears with remaining humeral attachment can be difficult to diagnose with physical examination tests alone. It is generally recommended to use ultrasonography or MRI scans to diagnose rotator cuff tears.[20,39] Biceps tendon pathology was also observed frequently and often in combination with other concomitant diagnoses. This aligns with existing evidence documenting a frequent co-occurrence of biceps tendinopathy with supraspinatus tears.[28] Complete ruptures of the long head biceps tendon can often be identified visually due to obvious muscle deformity. In more subtle cases, ultrasonography or MRI scans can be used to identify a rupture.[2,34] There is no gold standard to identify biceps tendinopathy, but studies have shown a high correlation between point tenderness in the bicipital groove and a positive Speed test to histological tendinopathic changes in the biceps tendon.[11,37,38] Ultrasonography can also be utilized to identify partial ruptures and cases of tendinopathy.[34] The relatively low prevalence of patients presenting with signs of SLAP lesions should be interpreted with the consideration that the diagnosis was determined by a single clinical test (positive O'Brien's test).

Injections of local anaesthetic (diagnostic injections) into the subacromial bursa, the acromioclavicular joint, bicipital sheath, or glenohumeral joint can also be utilized as part of the diagnostic approach for patients with complex pain patterns.

In this study, we observed a high prevalence of concomitant diagnoses in patients with SAPS. There are several possible explanations for the high prevalence of concomitant diagnoses found in the present study. The symptoms of SAPS are theorized to originate from the subacromial structures, namely, the supraspinatus tendon and the subacromial bursa, but the exact pain-generating mechanism remains unclear. Concomitant diagnoses may contribute or, in some cases, fully account for the pain experienced in SAPS. Because of their close anatomic and functional relationship with the subacromial structures, concomitant diagnoses could trigger a nociceptive response in the subacromial structures. Removal of such stimulus, by treatment targeted at the concomitant diagnoses, could then possibly resolve the pain generated from the subacromial structures. This remains an unverified theory. It is also possible that SAPS and concomitant diagnoses simply coexist independently. This theory is supported by the fact that both SAPS and the concomitant diagnoses are seen

frequently, independent of each other. Regardless of the explanation, the treatment outcome for SAPS seems dependent on effective management of concomitant diagnoses.

Conflicting Diagnoses

From the 576 patients with signs and symptoms of SAPS, a considerable proportion (n = 168; 29%) had conflicting diagnoses and were thus not diagnosed with SAPS. The most common conflicting diagnosis was frozen shoulder (n = 72), defined as a loss of passive external rotation of >50% and at least a 25° loss of passive range of motion (ROM) in 2 planes. This highlights frozen shoulder as an important differential diagnosis in patients presenting with signs and symptoms of SAPS. Frozen shoulder progresses through 3 phases: freezing (characterized by pain); frozen (pain accompanied by loss of passive ROM); and thawing (gradual remission of symptoms). Frozen shoulder can be differentiated from SAPS by the loss of passive ROM. However, it can be difficult to differentiate between frozen shoulder and SAPS in the earlier (freezing) phase when there is no loss of passive ROM. Glenohumeral OA was seen in 5% (n = 29) of the patients presenting with signs and symptoms of SAPS. While glenohumeral OA can be asymptomatic, it is difficult to discriminate the pain from that of SAPS. Routine use of radiographs should, therefore, be considered to identify patients with glenohumeral OA. Cervical pathology was observed in 4% (n = 21) of the patients presenting with signs and symptoms of SAPS. The clinical suspicion of cervical pathology arises when shoulder pain is accompanied by cervical pain and the foramen compression test (Spurling test) is positive (Appendix). The diagnosis is confirmed definitively with cervical MRI. Even though both glenohumeral OA and cervical pathology are not frequently observed diagnoses, they require a vastly different treatment approach than SAPS and, therefore, should not be missed.

Prevalence of SAPS

In this study, we found that 55% of all patients referred with insidious onset of shoulder pain to our secondary care institution were diagnosed with SAPS. While previous studies have found SAPS to be the most common cause of shoulder pain in the primary sector,[4,31] the prevalence of SAPS in a secondary care setting has only been investigated sparsely.[9] This study indicates that SAPS is also the most common cause of shoulder pain in a secondary care setting.

Implications of Findings

This study shows that patients presenting with signs and symptoms of SAPS are heterogeneous. The high prevalence of conflicting diagnoses and concomitant diagnoses underpins the need for a systematic and transparent approach in future studies investigating SAPS. Patients with concomitant diagnoses, along with the methods employed for identification, should be accurately accounted for to enable a qualified interpretation of research findings. Furthermore, the high prevalence of frozen shoulder, glenohumeral OA, and cervical pathology warrants a systematic screening for these in patients presenting with signs and symptoms of SAPS, as these regularly require different treatment paths. The clinical importance of concomitant diagnoses in the treatment of SAPS has not been established; nevertheless, it is plausible that treatment focused solely on the subacromial space may lead to inferior outcomes in these patients. The best treatment strategy for patients with concomitant diagnoses may involve addressing anatomic structures beyond the subacromial space through tailored interventions adapted to individual pathoanatomic findings (Figure 1). A lack of attention to this heterogeneity could explain why some patients diagnosed with SAPS do not benefit from a typical rehabilitation program or ASD. However, further studies are needed to elucidate this.

Strengths and Limitations

This study was intended to reflect clinical practice in the closest possible way. Accordingly, the diagnostic criteria for the concomitant diagnoses were closely aligned with the clinical practice of the orthopaedic shoulder specialists. This implies that the identification of a concomitant diagnosis would typically lead to an adjustment or, at the very least, thoughtful consideration of an alternative treatment strategy for the patient. However, with no universally accepted definition for many of the concomitant diagnoses, arguments for alternative definitions can be made. The results should be interpreted bearing this in mind. It must also be considered that MRI scan was not routinely employed.

The systematic screening of patients and predefined and protocolized diagnostic criteria are a strength. The routine use of ultrasound and radiographs increases the validity of findings. It was not registered whether patients had received previous physical therapy, injections, or medication for their shoulder condition.

CONCLUSION

Patients presenting with signs and symptoms of SAPS have a high prevalence of conflicting and concomitant diagnoses. This heterogeneity is a challenge that necessitates a systematic and transparent diagnostic approach, as some diagnoses could require a different treatment approach. Future studies should account for conflicting and concomitant diagnoses to enable a qualified interpretation of findings.

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