International Journal of Research in Orthopaedics
Kushwah K et al. Int J Res Orthop. 2023 Sep;9(5):994-999
http://www.ijoro.org

Original Research Article

DOI: https://dx.doi.org/10.18203/issn.2455-4510.IntJResOrthop20232613

Determination of various etiological factors for diagnosis of non traumatic scapulo costal syndrome

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Received: 16 May 2023
Revised: 09 June 2023
Accepted: 11 August 2023

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ABSTRACT

Background: Scapulocostal syndrome, also known as "snapping scapula," is an under-recognized problem involving overhead or throwing motion of the upper extremities. It is often described as a snapping or grinding sensation accompanied with pain as the scapula touches the chest wall and an audible or palpable click near the anteromedial scapula.
Method: A prospective observational study was performed at one of the biggest tertiary care centres of central India from September 2021 to March 2023. A total of 50 patients were included in this study. Patient were evaluated clinically in OPD for pain in Scapulothoracic region. All the suspected patients underwent various investigations like X-ray, ultrasonography, electromyography, nerve conduction velocity study, magnetic resonance imaging (MRI) depending on the condition to reach a diagnosis. The data was recorded and evaluated.
Results: A total of 50 patients were included in the study, 30 were females and 20 males, 50 % of our patients were diagnosed with supraspinatus tendinosis, 8 patients were found to have bicipital tendinitis, 3 patients had acromioclavicular joint arthritis, 2 patients developed pain because of glenohumeral joint arthropathy, subscapularis tendinitis. There were some other conditions as well diagnosed in few patients with the help of various investigations.
Conclusions: It was found that there were various reasons for pain in patients diagnosed clinically with scapulocostal syndrome. Dominant hand affection was more common. The clinical investigations play a major role in diagnosing these conditions and planning the treatment.

Keywords: Scapulocostal syndrome, Supraspinatus tendinitis, Bicipital tendinitis, Snapping shoulder

INTRODUCTION

Scapulocostal syndrome, commonly referred to as "snapping scapula," is an often-overlooked condition that occurs during overhead or throwing movements of the upper limbs. Individuals experiencing this syndrome typically describe a snapping or grinding sensation accompanied by pain when the scapula makes contact with the chest wall. Additionally, an audible or palpable click near the anteromedial scapula may be present.[1,2] Shoulder abduction movements can elicit pain. This syndrome is more prevalent among active young adults.

Bursitis is a common cause of scapulocostal syndrome; however, it can also arise due to bony or soft tissue abnormalities. Non-operative approaches, such as physical therapy and, in some cases, massages, are usually the preferred treatment options. However, surgery is often recommended when an anatomical abnormality is detected.[3,4]

Scapulocostal syndrome (SCS) is associated with chronic myofascial pain syndrome affecting the thoracic and scapular regions. SCS pain persists for more than three months.[5,6] Data collected over one year revealed a prevalence of thoracic spine pain ranging from 3.0% to

55.0%.[7] The prevalence of upper back pain throughout an individual's lifetime was found to be 59.5%. Middle-aged individuals between 18 and 60 years old, particularly those in the adult working population, demonstrated the highest incidence of SCS.[8]

This syndrome is more commonly observed in females than in males. Risk factors for SCS include poor sitting posture while working or using digital media. The condition arises as a result of the repetitive and inadequate use of the muscles surrounding the scapulae, constituting an overuse disorder. Myofascial trigger points (MTrPs) can be found in the muscles surrounding the scapulae, including the levator scapulae, upper trapezius, rhomboid major and minor, teres major and minor, infraspinatus, serratus anterior, and serratus posterior superior muscles. Consequently, this syndrome affects the biomechanics of the scapulae.[9,10] Non-traumatic causes of scapulocostal syndrome include skeletal abnormalities, bicipital tendinitis, bursitis, subscapularis atrophy, intramedullary nailing in multiple rib fractures, scapular dyskinesia (articulatory causes, neurological causes, musculoskeletal causes), bone tumors (osteochondroma, elastofibromas), and Luschke's tubercle, among others.

The objective of our study was to diagnose the various conditions causing scapulothoracic pain and to extablish a specific diagnostic protocol for diagnosing the condition and providing the specific treatment accordingly.

METHODS

A prospective observational study was performed at department of orthopaedics, Mahatma Gandhi memorial medical college and Maharaja Yeshwantrao hospital, Indore, Madhya Pradesh which is one of the biggest tertiary care hospitals of central India. The study duration was from October 2020 to September 2022. A total of 50 patients were included in this study. Patient were evaluated clinically in out-patient department for pain in Scapulothoracic region. A detailed history of all the patients was taken to understand the possible cause for their pain. All the patients underwent certain investigations like some common biochemical investigations and some other primary investigations including X rays, ultrasonography of the local region, electromyography, nerve conduction velocity study, MRI was done depending on the condition to reach a diagnosis. Patients with severe pain were admitted and detailed investigations done to diagnose the condition and started with medicines for relieving the pain along with physiotherapy as and when needed.

We included patients in the age group 18 to 70 years, spontaneous origin of non-traumatic scapulocostal pain on either side > 2 week duration.

All the patients with H/O traumatic injury around scapular region of 1 year duration., spinal deformity, monoparesis and hemiplegia were excluded from the study.

All the patients were started with treatment according to the condition diagnosed. A majority of the patients were given analgesics for relieving pain and started with physiotherapy as and when needed.

Patients were assessed for pain using shoulder pain and disability index (0-100).

The data was maintained in Microsoft excel sheet. The final data was evaluated using SPSS 21.0 software. The study was done after getting approval from the institutional ethical committee.

RESULTS

Our study included 50 patients who had a history of scapulocostal pain with no history of trauma with a total duration of more than two weeks. The mean age of our patients was 43.04±15.99 years.

Out of the total 50 patients, fifteen patients were in the age group 18-30 years. Ten patients were in the age group31-45 years. Twenty patients were in the age group 46-60 years. Five patients were in the age group 61-75 years.

Majority of the patients were females i.e., 60% and remaining 40% were males.

Forty-one patients out of the total 50 were Right hand dominant. Remaining nine patients were left hand dominant.

It was found that 37 out of 50 patients had more frequent involvement of right-side shoulder. The detailed demographics are given in Table 1.

Table 1: Demographics.

Factor	Mean
Age (18-75) (In years)	43.04±15.99
Sex (Male: female) ratio	20:30
Dominant side	Right-41, left-9
Side involved	Right-37, left-13

The mean SPADI score was 68.8±20.26. Majority of patients i.e., twenty six out of fifty (52%) had shoulder pain and disability index (SPADI) score of 36-70. Twenty-one patients had had SPADI score of 71-100. Three patients had SPADI score of 0-35 (Table 2).

Table 2: SPADI (Shoulder pain and the disability index).

SPADI score	No. of patient	Percentage (%)	P value
00-35	03	06	0.031868
36-70	26	52	
71-100	21	48	

All the patients underwent clinical examination followed by some investigations to reach to a diagnosis. Forty patients (80%) underwent X-ray, USG as well as MRI of shoulder.

It was found that out of the total patients, 25 patients were diagnosed with supraspinatus tendinopathy, 8 patients were diagnosed with bicipital tendinitis, three patients were diagnosed with acromioclavicular joint arthropathy, two patients were found to have glenohumeral arthropathy and two patients had joint effusion, two patients were found to have subscapular bursitis, one patient each had cortical irregularity of joint surface, humeral head irregularity, fatty degeneration.

Some rare causes are also included in studies like subscapularis bursitis, synovial effusion etc.

Rotator cuff injury found to be the most common cause followed by other cause (Table 3).

All the patients were started with conservative management in the form of analgesics and the physiotherapy.

Table 3: Diagnosis.

Diagnosis	N	Percentage (%)	P value
Acromioclavicular joint arthropathy	03	06	
Bicipital tendinitis	08	16	
Cortical irregularities of shoulder joint	01	02	
Fatty degeneration of supraspinatus	01	02	
Glenohumeral joint arthropathy	02	04	
Humeral head cortical irregularity	01	02	
Joint effusion	02	04	0.000019
Ligament laxity	02	04	
Minimal synovial effusion	01	02	
Moderate synovial effusion	01	02	
Scapulo costal syndrome	01	02	
Subscapularis bursitis	02	04	
Supraspinatus tendinosis	25	50	

Table 4: Frequency of rotator cuff disordersobserved in ultrasound and MRI in study done by Behzad et al.

Type of disorder		Ultrasound(n/%)	MRI, n (%)	Kappa coefficient	P value
Rotator cuff disorders	Total disorder	43 (89.6)	43 (89.6)		
	Full thickness tear	15 (31.3)	16 (33.3)	0.51	<0.001
	Partial thickness tear	10 (20.8)	17 (35.4)	0.55	<0.001
	Tendinopathy	18 (37.5)	10 (20.8)	0.95	<0.001

DISCUSSION

Scapulocostal syndrome is one of the most commonly found conditions in out patient department in majority hospitals all over the world. These patients are usually in a morbid condition for a long time and are left untreated and undiagnosed due to lack of education about the condition amongst the patients. There have been several studies which help us to understand the problem in a much better way and plan the treatment for such patients. There are various investigations which are needed to clearly diagnose the condition and varied treatment options based on their diagnosis.

One of the studies done by Baldawi et al in 2022 give a detailed structure for diagnosing and treating these patients.[14]

Scapular biomechanical and kinetic chain dysfunction can give rise to various related conditions of different severity levels. Scapular dyskinesis (SD) is characterized by an altered position and motion of the scapula in relation to the thorax. This abnormal scapular position can lead to an atypical scapulothoracic articulation, resulting in bursitis, which can further progress to SSS when crepitus is present.[15] These interconnected conditions can also manifest as SICK scapula syndrome (scapular malposition, inferomedial border prominence, anterior coracoid pain, and SD), which represents an extreme form of SD and is commonly associated with shoulder problems in throwing athletes.[16]

Diagnosing SSS can be challenging and typically involves a physical examination along with advanced imaging techniques such as MRI and/or computed tomography (CT) scans to identify potential bony or soft tissue causes of SSS. Diagnostic injections of local anesthetic or steroids administered at the most tender point are utilized to confirm the presence of bursitis, as experiencing symptomatic relief can confirm the diagnosis and identify

the specific affected bursa. In the absence of significant space-occupying lesions, nonoperative treatment is initiated through rehabilitative exercises, activity modification, and pain management. If nonoperative management proves ineffective, the option of open or arthroscopic scapular superomedial resection and bursectomy may be considered.[14,17]

As per the study done by Conduah et al they included 25 patients in their study in comparison to 50 patients in our study.[18] The average age in their study group was 40 years in comparison to our study in which average age was 43.09 years. Based on this review, the most frequently observed clinical signs amongst patients diagnosed with SSS include tenderness along the medial scapular border, palpable crepitus during shoulder movement and audible snapping.[19] Activity related pain can range from mild discomfort to severe disability. However, it is important to note that scapulothoracic crepitus alone is often reported in individuals without symptoms and typically does not require treatment.[20]

During the physical examination, it is important to assess for spinal deformities, palpable crepitus, point tenderness, and scapular winging. Kyphoscoliosis, for example, can disrupt scapulothoracic congruity and lead to snapping scapula. Evaluating symmetry is crucial to rule out periscapular muscle atrophy. Neurological assessment is essential to exclude referred pain. Scapular winging is a common presentation in patients with scapulothoracic bursitis or snapping scapula, often resulting from injury to the long thoracic nerve and dysfunction of the serratus anterior muscles.[20] To achieve deep palpation beneath the medial scapular border, the arm can be placed in a "chicken wing" position (internally rotating the shoulder with the dorsum of the hand over the lumbosacral junction). This position helps laterally tilt the scapula.[21] Assessing both passive and active range of motion (ROM) of the shoulder is important to identify movement restrictions and symptoms related to overhead movements. Direct visualization of scapular movement during shoulder abduction is crucial for detecting dyskinesis. Applying posterior-anterior pressure during ROM can further accentuate scapular crepitations.[22]

Scapular symmetry is a prominent feature emphasized in the literature. Key comparisons involve measuring the height difference of the superomedial scapular angle between the two scapulae, the variation in distance of the superomedial angle from the midline, and the discrepancy in angular degrees of the medial scapular border from the plumb line. A threshold of 1.5 cm or 5° asymmetry is considered abnormal for each of these measurements.[16] Such asymmetry can be attributed to medial scapular muscle tears or dysfunction, which contribute to the development of scapular dyskinesis (SD) and subsequently, SSS. This highlights the significance of evaluating the muscle strength of periscapular muscles posteriorly and the pectoralis minor anteriorly.

According to one study included in this review, the physical examination is most effective in accurately diagnosing type I SD. Type I SD is characterized by the prominence of the inferomedial scapular angle, while type II involves prominence of the medial scapular border, and type III exhibits superior scapular border elevation with anterior displacement. The study suggests that physical examination may be more reliable in diagnosing type I SD, possibly because this type demonstrates the greatest difference in anterior tilt of the scapula compared to types II and III.[23] Nevertheless, the physical examination remains a critical component in the diagnostic process and plays a crucial role in guiding subsequent steps.

While the diagnosis of SSS can be established through appropriate clinical assessment, identifying the underlying cause may require additional imaging and further investigation. Although plain film radiographs have traditionally been the initial choice due to their accessibility and low risk, a study by Mozes et al found them to be unreliable for definitively diagnosing SSS, detecting scapular bony incongruity in only 26.9% of cases. In contrast, CT scans demonstrated a 70% detection rate, while 3D-CT achieved a 100% detection rate.[24] Therefore, the authors recommended the use of 3D-CT to precisely determine the type of SD, as the presence of a thick layer of soft tissue overlaying the scapula can make it challenging to determine the type of SD through observational methods alone. Since SD is a significant predisposing factor for SSS, accurately diagnosing the type of SD helps identify the specific structural abnormalities involved and guides appropriate management strategies.[25]

Despite the high interrater reliability (IRR) of CT scans in diagnosing bony scapulothoracic incongruity, they have shown limited correlation with clinical findings in cases of non-skeletal causes of SSS, such as scapulothoracic bursitis or other soft tissue factors.[15] CT scans have certain limitations, including radiation exposure, cost, and reduced capability to detect soft tissue causes, making them unsuitable for routine diagnosis of SSS. However, CT scans, with or without 3D optimization, can still be beneficial in further characterizing space-occupying skeletal lesions in the scapulothoracic area and assessing skeletal incongruity after detection on plain film radiographs.[15,25]

MRI remains the most valuable diagnostic modality for identifying soft tissue causes of SSS. It offers excellent visualization and characterization of soft tissue lesions, allowing for a detailed assessment of their nature and heterogeneity. The information obtained from MRI can guide treatment decisions tailored to the specific pathology identified. Therefore, the use of MRI is highly recommended when investigating scapulothoracic soft tissue and space-occupying lesions as potential underlying causes of SSS, particularly when nonoperative treatment has been ineffective following clinical diagnosis.[26]

In a study conducted by Behzad Aminzadeh et al MRI of the shoulder was performed to diagnose the condition. Based on the MRI findings, the following diagnoses were made: subacromial/subdeltoid bursitis in 39 patients (81.3%) and subcoracoid bursitis in 19 patients (39.6%).[27] Additionally, 41 patients (85.4%) had shoulder joint effusion, 13 patients (27.1%) showed degenerative changes in the glenohumeral joint, and 28 patients (58.3%) had degenerative changes in the acromioclavicular joint. Calcific tendonitis was observed in three patients (6.3%). One patient (2.1%) exhibited a greater tuberosity fracture of the humerus. Among the MRI findings, 19 patients showed abnormalities in the long head of the biceps tendon, with the most common being tendinopathy (n=39, 27.1%), followed by tendon dislocation in three cases (6.3%). Two patients (4.2%) had a full-thickness tear, and three patients (6.3%) had a partial-thickness tear (Table 4). These results are comparable to our study where variable diagnosis were found as mentioned in Table 3.

From a diagnostic standpoint, individuals experiencing scapular pain and/or crepitus during overhead movement should undergo an assessment for SSS. If SSS is diagnosed based on clinical evaluation, a nonoperative treatment plan should be initiated. Initial radiography can be used to identify any skeletal abnormalities, and if such abnormalities are detected, further characterization can be done using CT imaging. On the other hand, if a soft tissue cause is suspected, MRI is recommended. Cross-sectional imaging, such as CT or MRI, should be reserved for patients with osseous findings on radiography or those who have not responded to nonoperative treatment and require further investigation.

Physiotherapy plays a major role in treating these conditions primarily addressing altered posture, scapular winging or scapulothoracic dyskinesia. Extracorporeal Shockwave Therapy and local steroid injections can be used as adjuncts if conservative treatment doesn't help.

In patients who fail to respond to conservative modalities of management for 3 to 6 months, surgical procedures may be planned depending on the condition. The most commonly performed surgical procedures are scapulothoracic bursectomy and superomedial scapular resection.

This study has several limitations that should be acknowledged. Firstly, it focuses solely on the diagnostic aspect and does not provide insights into the management of patients with SSS. Therefore, it does not offer guidance on the most effective treatment approaches. Secondly, the patient sample size in this study is small, which limits its generalizability to a larger population. The findings may not be representative of the overall population with SSS. Additionally, this study does not include a comparison of different treatment modalities for managing the condition. Therefore, a more comprehensive and detailed study specifically examining the management strategies for these conditions would be beneficial for researchers and healthcare professionals involved in treating patients with SSS.

CONCLUSION

In patients experiencing medial scapular pain, it is important to consider Scapulothoracic syndrome as one of the possible causes. Supraspinatus tendinosis has been identified as the most common cause of Scapulocostal Syndrome, particularly in adult females affecting their dominant hand. Scapulocostal syndrome is a commonly encountered condition that is often underdiagnosed as a cause of back or shoulder pain. A comprehensive evaluation, including a detailed medical history and appropriate diagnostic investigations such as X-rays, ultrasound, CT scans, or MRI, can aid in the diagnosis of this condition. The majority of patients with Scapulocostal syndrome can be managed conservatively, while only a small percentage may require surgical intervention for treatment.

ACKNOWLEDGEMENTS

Author would like to thanks to all the patients who participated in this study, also like to extend our appreciation to the dedicated support staff in the department of orthopaedics and department of radiology.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Kushwah K, Mahajan P, Rajoria V. Determination of various etiological factors for diagnosis of non traumatic scapulo costal syndrome. Int J Res Orthop 2023;9:994-9.