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EVALUATION OF STERNOCLAVICULAR JOINT DISORDERS: A SINGLE CENTER EXPERIENCE

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ABSTRACT

Objective: The sternoclavicular joint (SCJ) is the sole synovial articulation between the upper extremity and the trunk. It is one of the most commonly used joints since it is a joint that plays a role in almost every movement of the arm. Since SCJ pathologies are rarely reported in the medical literature, relatively little attention is paid to the disorders of this joint.

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Sternoclavicular joint disorders were investigated with regard to characteristics, clinical course, and radiological and laboratory findings in order to contribute to the limited literature focusing on disorders of the SCJ.

Methods: This study conducted between March 2013 and September 2019 including 75 patients with SCJ complaints. All patients were evaluated through physical examinations and radiological and laboratory investigations. In cases where diagnosis was difficult, biopsies were performed. Visual analog scale (VAS) scores were used to assess the pain level of patients and functional results were evaluated using the Rockwood scale before and after the treatment.

Results: The study group consisted of 75 patients (59 females and 16 males) with a mean age of 53.12 ± 8.50 years. Patients were divided into 3 groups: (i) SCJ pathologies due to trauma, (ii) SCJ pathologies due to systemic diseases, and (iii) primary pathologies of SCJ. There were 8 (10.7%) patients in the first group, 9 (12%) in the second group (3 rheumatoid arthritis, RA; 1 systemic lupus erythematosus, SLE; 1 diabetes, and 1 septic arthritis) and 58 (77.3%) patients in the third group. There was a significant decrease in VAS scores and a significant increase in Rockwood Rating Scale scores after treatment.

Conclusion: Most of the patients had a clinical presentation of non-infectious swelling and/or pain in the joint that could not be explained by any specific disease. Appropriate resting and NSAIDs are usually sufficient in the treatment of these patients.

Key words: sternoclavicular joint, sternoclavicular swelling, arthralgia, Rockwood Rating Scale

1. INTRODUCTION

The sternoclavicular joint (SCJ) is the sole synovial articulation between the upper extremity and the trunk. It is one of the most commonly used joints since it is a joint that plays a role in almost every movement of the arm. This multifunctional characteristic also leads to problems such as involvement in localized and/or systemic disease processes (1, 2). Disorders that are frequent in other synovial joints, such as injuries, osteoarthritis, infection and rheumatoid diseases, are also seen in the SCJ (2, 3). Primary symptoms include pain and swelling, while radiographs may show joint narrowing, subchondral sclerosis, osteophyte, joint cavity narrowing and surrounding tissue calcification (4, 5). Magnetic resonance imaging (MRI) is useful in detecting soft tissue injury and computed tomography (CT) can detect disease processes that cause bone destruction (6, 7).

As symptoms are generally well tolerated, and considering the adversities associated with surgical treatments, patients can and are often be treated without surgical intervention. However, disorders such as traumatic injuries and infective, inflammatory and degenerative arthritis are relatively common and can be a source of chronic disability when undiagnosed or poorly treated (8).

Since SCJ pathologies are rarely reported in the medical literature, relatively little attention is paid to the disorders of this joint (9). As such, studies focused on disorders affecting this joint are few and limited, especially in terms of diagnosis and treatment methods related to the primary disorders of this joint. In the present study, the characteristics, clinical course, radiological and laboratory findings of patients with SCJ were investigated in order to contribute to the literature on SCJ disorders.

2. MATERIALS AND METHODS

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This is a retrospective study conducted between March 2013 and September 2019. 68 patients were admitted to orthopedics outpatient clinic, 7 patients were consulted from the gynecology and obstetrics clinic to the orthopedics clinic. Finally, 75 patients with SCJ complaints were included in the study. In the study period a total of 97 patients with SCJ complaints were admitted to our hospital. Of the patients 12 of them excluded due to inadequate patient record.

The sample of the study will constitute 75 patients who meet the working conditions and are determined by performing G-power analysis with 5% margin of error in the 95% confidence interval.

The study protocol was approved by the Karabük University Clinical Research Ethical Committee. All patients gave written informed consent.

Diagnosis of SCJ joint disorders

Anamnesis

A detailed anamnesis was obtained from all patients. Accompanying conditions or diseases, including inherited diseases in the family, presence of genetic diseases, metabolic diseases and presence of persistent chronic diseases were recorded. The demographic and occupational characteristics of the patients were also questioned.

Physical examination and measurements

All patients were examined physically, shoulder joint movements were determined and findings of the affected joint compared to the contralateral joint (sensitivity, swelling and skin discolorations) were identified. The presence or absence of pathologies and complaints in other musculoskeletal systems were also questioned. Visual analog score (VAS) was used to assess the pain level of patients and functional results were evaluated using the Rockwood scale before and after treatment (10). The follow-up protocol we applied for patients was as follows. In the first 6 months, we followed up the outpatient clinic once a month, in the second six months, once every 3 months and every 6 months in the following period. A value of '0' was defined as no pain and '10' meant the most severe pain possible on the VAS scale. The Rockwood scale assesses pain, range of motion, strength, limitation, and subjective results. Each field can be scored from 0 to 3 points. A score of 13 to 15 points indicates an 'excellent' result, 10 to 12 points is a 'good' result, 7 to 9 points is a 'fair' result, and any score less than 7 points is considered as a 'poor' result (10).

Laboratory investigations

In order to evaluate systemic or rheumatologic diseases, complete blood count, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), RF, antinuclear antibody, tissue antigen test for HLA-B27, uric acid, ALT, AST, creatinine, blood urea nitrogen (BUN), blood glucose value and hemoglobin A1c (HbA1c) levels were measured. Calcitonin and vitamin D were measured to investigate pathologies originating from the bones. In addition, hormone profiles (estrogen, prolactin, FSH, TSH), and free T3 and T4 levels that could affect these hormones were investigated.

Radiography

Lung and SCJ X-rays were performed in all patients. Specific imaging studies were performed in patients with additional areas of complaint, those in which diagnosis was difficult, and patients in which symptoms persisted despite NSAID treatment. For this purpose, computed tomography (CT) was performed to determine the presence of structural disorders related to bone pathology in the joint and magnetic resonance imaging (MRI) was applied to determine the increase in joint fluid in cartilage, articular disc, synovia, adjacent anatomic structures, and to understand the structural changes in these anatomic formations. Three-phase bone scintigraphy was performed in patients with suspected inflammatory and / or neoplastic bone involvement in the joint region.

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Biopsy

In patients who could not be diagnosed despite all these tests, SCJ Tru-Cut biopsy was performed.

Treatment

Firstly, patients with systemic disease affecting the SCJ were referred to the relevant branch for the treatment of primary disease and anti-inflammatory treatment protocol was initiated. After these starting treatments, a standard treatment protocol was applied to all patients.

The treatment protocol was as follows: firstly, rest and behavioral change followed by appropriately dosed NSAIDs, and lastly, intraarticular injection of 15 mg corticosteroids. All injections were performed under USG guidance. One month later, a second dose was administered to those in which symptoms did not demonstrate significant regression. Another treatment (third corticosteroid dose) was applied in the same fashion at 2 months if required. None of the patients required surgical treatment.

Statistical Analysis

All analyses were performed on SPSS v21 (SPSS Inc., Chicago, IL, USA). For the normality check the Kolmogorov-Smirnov test was used. Data are given as mean $\pm$ standard deviation or median (minimum - maximum) for continuous variables according to normality of distribution, and as frequency (percentage) for categorical variables. The pre- and post-treatment Rockwood and VAS score comparisons were performed via the Wilcoxon Signed Ranks test. $p < 0.05$ values were defined as significant.

3. RESULTS

The study group consisted of 75 patients (59 females and 16 males) with a mean age of 53.12 ± 8.50 years. 36 (48%) patients had right SCJ disorder and 39 (52%) patients had left SCJ disorder.

We divided the diagnoses into 3 groups according to complaints, tests and examination: 1) SCJ pathologies due to trauma 2) SCJ pathologies due to systemic diseases 3) Primary pathologies of SCJ. There were 8 (10.67%) patients in the first group (trauma), 9 (12%) patients in the second group (3 rheumatoid arthritis, RA; 1 systemic lupus erythematosus (SLE), 1 condensing osteitis of clavicle, 1 friedrich disease, 1 Tietze Syndrome, 1 diabetes mellitus and 1 septic arthritis) and 58 (77.33%) patients in the third group. In the third group, 42 (72.41%) patients had non-infectious swelling and/or joint pain at presentation, which could not be explained by any specific disease. The baseline characteristics of the patients are shown in **Table 1**. Physical examination revealed swelling in 74 (98.6%) patients and pain with palpation in 68 (90.6%) patients. Thirty-nine (57.35%) of the 68 patients who received NSAID treatment, and 22 (84.6%) of the 26 patients who received steroid injections had significant benefit from their respective treatments. There was a significant decrease in VAS scores after treatment and a significant increase in Rockwood Rating Scale scores ($p < 0.001$ for both) (**Table 2**).

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When the radiological findings were evaluated in the study, CT findings were normal in 33 (44%) patients; whereas, 11 (14.7%) patients had degeneration, 9 (12%) patients had deformation, 6 (8%) patients had osteophyte(s), 6 (8%) patients had anterior dislocation. According to MRI findings, 32 (47.05%) patients had normal imaging findings, 10 (13.3%) patients had degeneration and 7 (9.3%) patients had osteophyte(s) (Table 3).

When the laboratory findings were evaluated, 3 (4%) patients had RF positivity, 1 (1.3%) patient had ANA positivity and 1 (1.3%) patient had HLA-B27 positivity. A majority of patients ($n=47$, 77.05%) were found to have low vitamin D levels, and 61 (100%) patients had high FSH levels and low E2 levels (Table 4).

4. DISCUSSION

We divided the diagnoses into 3 groups according to complaints, tests and examination: 1) SCJ pathologies due to trauma, 2) SCJ pathologies due to systemic diseases, and 3) primary pathologies of SCJ. The baseline characteristics of the patients are physical examination revealed swelling in 74 (98.6%) patients and pain with palpation in 68 (90.6%) patients. Thirty-nine (57.35%) of the 68 patients who received NSAID treatment, and 22 (84.6%) of the 26 patients who received steroid injections had significant benefit from their respective treatments. There was a significant decrease in VAS scores after treatment and a significant increase in Rockwood Rating Scale scores.

Because the pathologies involving SCJ are uncommon, they have not attracted attention among clinicians and are not well known; thus, possibly leading to unnecessary examinations and delay in diagnoses. As a matter of fact, many clinicians may consider non-traumatic changes as neoplasms or signs of rheumatologic disease. The results of this study show the frequent findings in such patients, and demonstrates the success of treatment options. In addition, trauma, systemic and primary diseases of SCJ were examined with regard to radiological and laboratory findings, VAS scores and the Rockwood Rating Scale scores.

In the present study, primary disorders of SCJ (85.8%) were detected in the majority of patients presenting with SCJ complaints. Although most of the primary disorders (75.3%) are characterized by pain and swelling, no specific disease or infection had been identified. Non-traumatic swelling of the SCJ is generally seen as a sign of osteoarthritis (3). According to our CT findings, it was interesting that many patients' imaging results were found to be compatible with osteoarthritis. Similarly, in some studies, it has been reported that osteoarthritis is common in SCJ (11, 12).

The most common SCJ disorder with evident etiology was anterior dislocation (due to trauma). It is important to note that SCJ dislocations are relatively rare and few cases have been reported (13). One study reported that SCJ dislocations constitute only 3% of dislocations in the shoulder region (14). Although SCJ dislocations are mostly traumatic, they can sometimes be non-traumatic. Anterior dislocations (90%) constitute the majority of all SCJ dislocations (14). In our study, all dislocations were due to trauma and posterior dislocation was seen in only one case and the remaining cases were all identified as anterior dislocation.

In addition, a number of rare conditions such as hyperostosis and osteitis, condensing osteitis, Friedrich's disease, Tietze syndrome are of importance for this joint and seem to be increasingly diagnosed (5, 8, 15). In the current study, only three patients had primary SCJ disorder associated with a rare pathology (Condensing Osteitis of Clavicle, Friedrich Disease, Tietze Syndrome).

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Studies have reported that SCJ-related clinical presentations are mostly in the form of pain and swelling complaints (3, 16, 17). In our study, swelling was observed in almost all cases and pain with palpation was present in most cases.

In this study, behavior change and rest were recommended to all patients. Most patients (n=68) were treated with NSAIDs; benefitting 57% of them. Whereas, 84.6% of steroid recipients benefited from treatment. However, as a result of these treatments, none of the patients required surgical intervention. We believe that, when a patient over 50 years old presents with swelling and/or pain in the sternoclavicular joint, degenerative joint disease is the primary pathology that should be considered. There is often no need to perform additional investigations unless there is a suspicion for other causes or diseases. Most patients with SCJ problems seem to benefit with NSAIDs and/or intra-articular steroid injections. It was concluded that further investigations and treatments were not needed in these patients in the first place. Therefore, further investigations and treatments should be utilized only when complaints do not diminish with NSAIDs and resting in such patients. Similarly, studies have also reported that SCJ arthritis is usually self-limiting and treatment with NSAIDs is sufficient in most cases (5, 6). In SCJ dislocations, closed reduction is recommended in addition to these treatments (13, 18, 19). In the present study, closed reduction was performed in all SCJ dislocations.

The fact that this is a retrospective study is the major limitation of this study; however, studies on this specific topic are rare and due to the rarity of such problems, obtaining a sufficient number of patients within a reasonable study duration would not have been feasible. Although SCJ cases that had been detected by other clinics were also included and evaluated, some SCJ pathologies may have been missed in different clinics, limiting the characteristics of patients included in the study and possibly causing bias in patient inclusion. On the other hand, we did not assess a single pathology of SCJ, but rather included all diagnoses, thus minimizing bias and positively affecting patient distribution.

Secondly, biopsy was performed in patients who could not be diagnosed conclusively; enabling the diagnosis and exclusion of patients with diseases such as septic arthritis.

5. CONCLUSION

Most patients with SCJ pathologies had a non-infectious clinical presentation accompanied by swelling and/or pain in the joint that could not be explained by any specific disease. The most common identified etiology for SCJ disorder was dislocation-related trauma. Resting, NSAIDs and finally, steroids are usually sufficient in the treatment of these patients. If these approaches do not provide sufficient relief, further examinations and treatments will be required.

Unlike the literature, our study includes the diagnosis, treatment, follow-up and mid-term results of all pathologies without focusing on a single pathology of the sternoclavicular joint. In addition, most of the studies on SCJ in the literature are in the form of review and research articles with the number of patients in our study are rarely encountered.

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TABLES

Table 1. Summary of patient characteristics

Age (n=75) (year)	53 (16 - 75)
Gender (n=75)	
Female	59 (78.66%)
Male	16 (21.33%)
Affected Extremity (n=75)	
Right	36 (48%)
Left	39 (52%)
Etiology (n=75)	
Trauma (Anterior Dislocation)	5 (6.66%)
Trauma (Posterior Dislocation)	1 (1.33%)

Trauma (Intraarticular Fraction)	2 (2.66%)
Rheumatoid Arthritis	3 (4%)
SLE	1 (1.33%)
Diabetes Mellitus	1 (1.33%)
Septic Arthritis	1 (1.33%)
Condensing Osteitis of Clavicle	1 (1.33%)
Friedrich Disease	1 (1.33%)
Tietze Syndrome	1 (1.33%)
Unknown	58 (77.33%)
Occupation of persons with work-related etiology	
Agricultural Laborer	4 (5.33%)
Plumber	4 (5.33%)
Household Cleaning Worker	1 (1.33%)
Road Building Worker	2 (2.66%)
Symptoms (n=75)	
Pain	68 (90.66%)
Deformity	8 (10.6%)
Swelling	68 (90.66%)
Biopsy Findings (n=15)	
	15
Inflammation	(100.00%)
Physical Examination (n=75)	
Pain with Palpation	68 (90.66%)
Swelling	74 (98.66%)
Palpable Clavicle	6 (8%)
Dermal Retraction	1 (1.33%)
Crepitation	1 (1.33%)
Tenderness	1 (1.33%)
Erythema	1 (1.33%)
Benefit from NSAIDs (n=68)	
Complete benefit	39 (57.35%)
With Additional Drugs	3 (4.41%)
Partial benefit	2 (2.94%)
	24
No Benefit	(35.29%)
Benefit from Steroid Injection (n=26)	
Complete benefit	22 (84.62%)
No Benefit	4 (15.38%)

Data are given as median (minimum - maximum) for continuous variables and frequency (percentage) for categorical variables

Table 2. Comparison of scores before and after treatment

Median (Minimum-Maximum)	p
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Rockwood Rating Scale		
Before (n=69)	10 (5 - 15)	<0.001
After (n=75)	14 (9 - 15)	
Visual Analogue Scale		
Before (n=75)	5 (0 - 9)	<0.001
After (n=75)	0 (0 - 3)	

Table 3. Summary of patients' imaging results and nuclear medicine investigations

CT Findings (n=75)	
Anterior Dislocation	6 (8%)
Posterior Dislocation	1 (1.33%)
Non-displaced Fracture	1 (1.33%)
Displaced Fracture	1 (1.33%)
Deformation	9 (12%)
Erosion	3 (4%)
Degeneration	11 (14.6%)
Increased Joint Spacing	1 (1.33%)
Osteophyte	6 (8%)
Sclerosis	1 (1.33%)
Destruction	1 (1.33%)
Avascular Necrosis	1 (1.33%)
Normal	33 (44%)
MRI Findings (n=68)	
Swelling	3 (4.41%)
Synovitis	3 (4.41%)
Damaged Cartilage	2 (2.945%)
Destruction	2 (2.945%)
Increased Synovial Fluid	2 (2.95%)
Degeneration	10 (14.70%)
Osteophyte	6 (8.82%)
Deformation	6 (8.82%)
Avascular Necrosis	1 (1.47%)
Increased Joint Spacing	1 (1.47%)
Normal	32 (47.05%)
X-Ray Findings (n=75)	
Dislocation	6 (8%)
Fracture	1 (1.33%)
Degeneration	5 (6.68%)
Sclerosis	1 (1.33%)
Deformation	1 (1.33%)
Normal	61 (81.33%)
Lung X-ray Findings (n=75)	
Dislocation	7 (9.33%)
Degeneration	4 (5.33%)
Increased Joint Spacing	1 (1.34%)

Normal	63 (84%)
Bone Densitometry (n=52)	
Femur Neck	-1.8 (-3.7 - 1)
Lumbar Vertebrae	-0.85 (-2.9 - 1.2)
Skeletal Scintigraphy (n=56)	
Positive	8 (14.28%)
Normal	48 (85.72%)
Data are given as median (minimum - maximum) for continuous variables and frequency (percentage) for categorical variables	

Table 4. Summary of Laboratory investigations

Hemoglobin (n=75)	12.55 (0.3 - 16)
Sedimentation (n=75)	20.5 (11 - 70)
CRP (n=75)	4 (1 - 102)
Low	0 (0.00%)
Normal	58 (77.33%)
High	17 (22.67%)
Rheumatoid Arthritis (n=75)	3 (4%)
ANA (+) (n=75)	1 (1.33%)
HLA-B27 (+) (n=75)	1 (1.33%)
Uric Acid (mg/dL) (n=75)	3.6 (1.9 - 7.1)
Low	1 (1.33%)
Normal	60 (80%)
High	14 (18.67%)
HbA1c (n=67)	5 (2.8 - 8.9)
Low	3 (4.48%)
Normal	54 (80.60%)
High	10 (14.92%)
Creatinine (mg/dL) (n=75)	0.8 (0.5 - 4.2)
Low	1 (1.33%)
Normal	69 (92.54%)
High	5 (6.13%)
BUN (mg/dL) (n=75)	21 (8 - 87)
Low	0 (0.00%)
Normal	36 (48%)
High	39 (52%)
ALT (n=75)	29 (12 - 76)
Low	0 (0.00%)
Normal	51 (68%)
High	24 (32%)
AST (n=75)	23 (7 - 92)
Low	1 (1.33%)
Normal	54 (72%)
High	20 (26.67%)
Free T3 (pg/ml) (n=75)	3.4 (1.1 - 5.6)

Low	6 (8.0%)
Normal	64 (85.34%)
High	5 (6.66%)
Free T4 (ng/dl) (n=75)	0.8 (0.1 - 1.4)
Low	11 (14.67%)
Normal	56 (74.67%)
High	8 (10.66%)
Calcitonin (pg/ml) (n=61)	4.3 (1.2 - 16.1)
Low	0 (0.00%)
Normal	46 (75.41%)
High	15 (24.59%)
D vit (nmol/l) (n=61)	48.1 (12.8 - 103.4)
Low	47 (77.05%)
Normal	14 (36.07%)
High	0 (0.00%)
FSH (pg/ml) (n=61)	66.57 ± 14.71
Low	0 (0.00%)
Normal	0 (0.00%)
High	61 (100%)
E2 (pg/ml) (n=61)	15.88 ± 5.92
Low	61 (100%)
Normal	0 (0.00%)
High	0 (0.00%)

Data are given as mean ± standard deviation or median (minimum - maximum) for continuous variables according to normality and frequency (percentage) for categorical variables