Original article

Clinical characteristics of anterior chest wall pain in spondyloarthritis: An analysis of 275 patients

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ABSTRACT

Objectives: Anterior chest wall pain is a common but little studied feature of spondyloarthritis. The objectives of our study were to assess the prevalence of anterior chest wall pain and to describe its clinical characteristics in a cohort of spondyloarthritis patients in a tertiary care center.

Methods: Study design: retrolective single center observational study in 2010 (COSPA). Consecutive patients with definite spondyloarthritis according to Amor's criteria were included. Data collection: each patient underwent direct interview by a physician. Prevalence of anterior chest wall pain, according to spondyloarthritis subtype and its date of appearance, localization and nature were collected.

Results: In all, 275 consecutive spondyloarthritis patients were assessed. Among them, 102 patients (37.1%) suffered from spondyloarthritis-associated anterior chest wall pain. It was the first symptom of spondyloarthritis in 3.6% of cases. The prevalence after 5 and 10 years following the diagnosis of spondyloarthritis was 26.0% and 35.5%, respectively. Pain was usually in the upper chest and acute, increased by respiratory movements and movements of the arm; pain during the night was less frequent (41.0%). A flare lasted on average 5 weeks; recurrences were frequent (75%). Non-steroidal anti-inflammatory drugs and anti-tumor necrosis factor agents were reported as effective in 49.3% and 80.0% of cases, respectively.

Conclusion: Anterior chest wall pain was a frequent manifestation in spondyloarthritis. It occurred early in the disease course, but the risk persisted after disease onset. Better knowledge of the clinical characteristics of this symptom may help physicians for diagnosis and follow-up.

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1. Introduction

The diagnosis of spondyloarthritis (SpA) is often made with difficulty with a mean delay of five to eleven years between onset of symptoms and diagnosis [1,2]. An earlier diagnosis could allow a better management in particular in severe cases [3]. SpA is a heterogeneous disease, characterised by enthesitic involvement, which is assessed by scores including the entheses on the anterior chest wall [4,5]. The prevalence of anterior chest wall pain is unclear and highly variable from study to study: it has been reported in 24 to 88% of SpAs [6–12]. It seems to occur early in the disease course [7,8,10,13–16] and may be the first manifestation in 4 to 18% of cases [7,8,10,16]. Consequently a better knowledge of this pain might be helpful for earlier diagnosis.

There are few published data about clinical characteristics of chest wall pain in SpA [7–9,17]. Furthermore the existing data are issued from studies with small sample sizes.

This pain can simulate visceral disease [6–8,11,18]. Consequently considering the diagnosis of SpA might avoid, in some cases, unnecessary invasive investigations.

Prevalence and clinical characteristics of chest wall pain are not well determined; clinical questions include the localisation, nature, intensity and natural history of this pain as well as clinical features of SpA associated with chest pain.

The efficaciousness of different treatments on chest wall pain is rarely reported [19]. Anti-tumor necrosis factor (TNF) agents seem effective on enthesitic manifestations [20,21]; however specific effect of treatments on chest wall involvement is not clearly assessed.

When having diagnosed chest pain, clinicians may wonder, is such a manifestation a potential marker of severity in SpA? A small-scale comparison between patients with and patients without chest pain suggests association with a more severe disease [8].

Thus physicians are in need of more data to acknowledge and manage chest pain associated with SpA.

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The objectives of this study were: to analyze the prevalence and the clinical characteristics of anterior chest wall pain in a cohort of patients with SpA in a tertiary care center; to determine the natural history and efficaciousness of different treatments received; and to compare SpA patients with versus without chest pain to detect a clinical pattern of SpA associated with this pain.

2. Methods

2.1. Study design

A cross-sectional retrolective observational study, COchin SPondylArthritis (COSPA), was performed between November 2009 and July 2010, in one tertiary referral center. The study was in accordance with ethical standards in France; oral informed consent was obtained from each patient.

2.2. Patients

Patients were selected from the unit database through the keywords "spondylarthrite", "spondylarthropathie" or "rhumatisme psoriasique". All patients living in Paris or in the suburb of Paris and seen in our department in the last 4 years were selected, if they fulfilled Amor's criteria [22]. In all, 1237 patients were selected; a random sample of 590 were contacted (Fig. 1).

2.3. General data collection

General data collected were age, sex, disease duration, SpA subtype (axial, peripheral, enthesitis or extra-articular): predominant manifestation according to the patient file, exact diagnosis (ankylosing spondylitis, reactive arthritis, chronic inflammatory bowel disease with arthropathy, psoriatic arthritis, undifferentiated spondylarthropathy or juvenile spondylarthritis), HLA B27 status, C-reactive protein rate, radiographic sacro-iliitis according to modified New York criteria [23] and treatments.

2.4. Anterior chest wall pain: data collection and interpretation

Data were collected based on face-to-face interview completed with medical files. The interviews were conducted by eight residents.

Anterior chest wall pain was defined as patients reporting orally and having reported in the clinical file, at least one episode of chest wall pain attributed by the rheumatologist to SpA at the time of the pain (i.e. after ruling out other causes of chest pain). To exclude some other potential causes of chest pain, an episode had to last at least one day. No other clinical characteristic was required. For previous similar episodes reported by the patient, the diagnosis was retrospectively retained in the absence of other causes of pain. Prevalence of anterior chest wall pain in the cohort and according to SpA subtypes (e.g., axial, peripheral or extra articular predominant manifestations) was calculated.

Clinical characteristics of chest pain were collected: date of appearance, the localization, nature of the pain (acute and/or chronic), intensity of pain, mean duration of the episodes, imaging investigations performed, specific or general treatments prescribed with their patient-reported efficacy.

Other manifestations at any time point e.g., uveitis, hip involvement, heel pain, psoriasis and inflammatory bowel disease were collected.

2.5. Severity of SpA

Severity of SpA was defined arbitrarily as bamboo spine (defined by a fusion of more than 80% of the vertebral bodies of the spine on the most recent radiographs), SpA-related hip involvement, height loss of more than five centimeters or a Bath Ankylosing Spondylitis Functional Index (BASFI) [24] superior to 40.

2.6. Statistical analyses

Prevalence was defined as the number of patients with at least one episode of anterior chest wall pain during their disease, over the total number of patients. Descriptive statistics were used for characteristics of the pain, imaging and treatments. Continuous variables were given as mean values ($\pm$ Standard Deviation, SD). Time of appearance of the manifestation was analyzed by Kaplan Meier survival technique. Comparisons between patients with and without chest pain were performed by non-parametric tests (Wilcoxon/Fisher), concerning demographic characteristics, SpA subtype, exact diagnosis, disease duration and presence of criteria of severity of SpA. A multivariate analysis was planned to compare patients with versus without chest pain (by stepwise logistic regression) if p value less than 0.20 in the univariate analyses. To take into account that this manifestation is related to disease duration, all patients with chest pain were compared to a subgroup of patients without chest pain but with disease duration at least equal to the median duration before appearance of this pain. P-values less than or equal to 0.05 were considered significant. Analyses were performed using the SAS statistical software version 9.1.

3. Results

3.1. Patients' characteristics

In all, 275 patients were included in COSPA (Fig. 1, Table 1). Mean age of the population was 44.6 ($\pm$ 13.0) years, 169 (61.4%) were men, 199 (79.3% of available data) were HLA B27 positive, 190 (74.5% of available data) had radiographic sacroiliitis. Mean duration of the disease was 16.7 ($\pm$ 11.8) years. Diagnosis was primary ankylosing spondylitis in 69.1% of cases and psoriatic arthritis in 17.8% of cases. In all, 161 (58.9%) and 139 (50.6%) patients received anti-TNF agents over the duration of the disease course and at the time of the interview, respectively.

3.2. Prevalence of anterior chest wall pain

3.2.1. Prevalence in the cohort
One hundred and two patients (37.1%) suffered from SpA-associated chest wall pain.

3.2.2. Prevalence according to time
The prevalence of chest pain after 5 and 10 years following the diagnosis of SpA was 26.0% ($\pm$ 2.8) and 35.5% ($\pm$ 3.4), respectively (Fig. 2). Among patients with anterior chest wall pain, pain appeared before the diagnosis of SpA in 34.1% of cases (30/88 with complete data), it was the first symptom of SpA in 9.8% of cases (10/102) and overall it appeared during the first 10 years of disease duration in 71.6% of cases (63/88). In cases of appearance of chest wall pain before the diagnosis of SpA, the mean delay before the diagnosis was 4.2 ($\pm$ 5.9) years. In patients without anterior chest wall pain at the time of the diagnosis, the mean disease duration before appearance of chest pain was 7.4 ($\pm$ 8.2) years.

3.2.3. Prevalence according to SpA subtype
Anterior chest wall pain was more frequent in axial forms (40.8%, 82/201) than in other forms; it was reported in 23.2% (13/56) of predominant peripheral forms ($p < 0.05$).
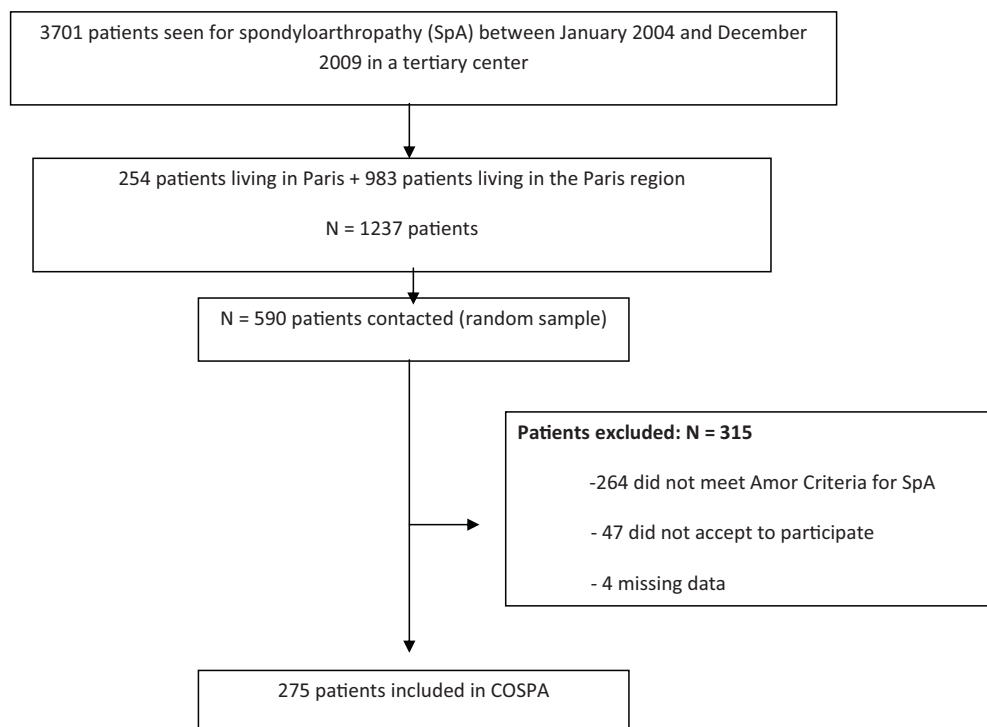
Fig. 1. Flow chart of patient selection in the COSPA study, to collect data on patients with spondyloarthropathy during a direct interview in a tertiary rheumatology center.

3.3. Clinical characteristics of chest wall pain

3.3.1. Localization

In 18 cases, this data was missing because the localization was reported neither in the clinical file nor by the patient. It predominated in the upper chest 85.7% (72/84 of complete data) with ($n = 41$) or without ($n = 31$) lower chest pain associated. The joints involved were the sternocostal joints in the upper and lower chest (69.0% and 61.9%, respectively), the manubriosternal joint (48.1%) and the sternoclavicular joints (33.3%).

Table 1
Patients' characteristics: main characteristics of all the patients, patients with anterior chest wall pain, patients without chest pain and a disease duration at least equal to the median duration before appearance of chest pain, i.e., 5 years.

	All $n = 275$	With chest pain $n = 102$	Without chest pain $n = 144$	p[a]
Gender, male n (%)	169 (61.5)	61 (59.8)	93 (64.6)	0.5
HLA B 27 n (% of available data)	199 (79.3)	80 (83.3)	101 (78.3)	0.39
Family history of SPA n (%)	116 (43.1)	48 (49.0)	57 (40.1)	0.18
Age at inclusion, mean ($\pm$ SD) (years)	44.6 ($\pm$ 13.5)	42.4 ($\pm$ 12.0)	47.9 ($\pm$ 13.7)	0.002[*]
Age at diagnosis, mean ($\pm$ SD) (years)	32.9 ($\pm$ 13.1)	30.2 ($\pm$ 11.6)	34.5 ($\pm$ 13.8)	0.02[**]
Disease duration, mean $\pm$ SD) (years)	16.7 ($\pm$ 11.8)	17.3 ($\pm$ 11.2)	19.1 ($\pm$ 11.3)	0.21
Inflammatory lumbar pain n (%)	220 (80.6)	90 (89.1)	114 (79.7)	0.05
Radiographic sacroiliitis n (% of available data)	190 (74.5)	79 (82.3)	99 (75.0)	0.2
Arthritis n (%)	127 (46.2)	39 (38.2)	71 (49.3)	0.09
Psoriasis n (%)	84 (30.6)	30 (29.4)	47 (32.6)	0.67
Heel pain n (%)	130 (47.3)	58 (56.9)	54 (37.5)	0.003[*]
Dactylitis n (%)	59 (21.5)	22 (21.6)	29 (20.1)	0.87
Uveitis n (%)	77 (28.0)	36 (35.3)	39 (27.1)	0.2
BASDAI score [28], mean ($\pm$ SD)	32.1 ($\pm$ 22.7)	33.6 ($\pm$ 25.1)	30.4 ($\pm$ 19.7)	0.58
BASFI score, mean ($\pm$ SD)	27.4 ($\pm$ 25.4)	29.0 ($\pm$ 25.9)	26.5 ($\pm$ 24.5)	0.57
Use of anti-TNF agents n (%)	161 (58.9)	67 (65.7)	85 (59.0%)	0.29
Syndesmophytes n (%of available data)	95 (38.5)	44 (46.3)	50 (39.1)	0.27
Ankylosing spondylitis n (%)	190 (69.1)	80 (78.4)	95 (66.0)	0.045[**]
Psoriatic arthritis n (%)	49 (17.8)	12 (11.8)	29 (20.1)	0.11
Chronic inflammatory bowel disease n (%)	23 (8.4)	10 (9.8)	12 (8.3)	0.82
Reactive arthritis n (%)	5 (1.8)	1 (1.0)	2 (1.4)	1
Juvenile SPA n (%)	9 (3.3)	5 (4.9)	3 (2.1)	0.28

SpA: spondylarthritis; anti-TNF: anti-tumor necrosis factor; BASDAI: bath ankylosing spondylitis disease activity index; BASFI: bath ankylosing spondylitis functional index; n: number.

[a] Comparison between patients with anterior chest wall pain and patients without anterior chest wall pain but with follow-up > 5 years.

[*] $p < 0.01$.

[**] $p < 0.05$.
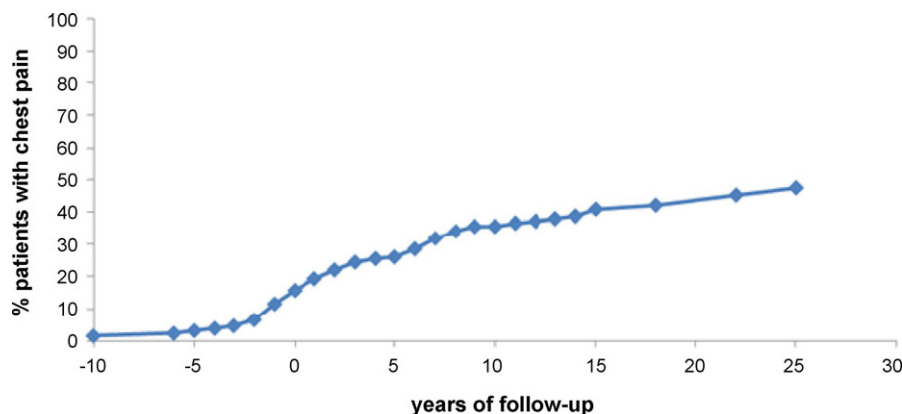
Fig. 2. Prevalence of anterior chest wall pain according to time (Kaplan-Meier survival technique): X-axis years of follow-up from the diagnosis of spondyloarthritis (SpA). Time 0 represents the diagnosis. Years before year 0 represent years before the diagnosis of SpA (e.g. time -10 means 10 years before the diagnosis of SpA). Y-axis: percentage of patients with anterior chest wall pain among all the patients included in the study.

3.3.2. Nature

Pain was usually acute with painful flares (75.5%) with ($n = 37$) or without ($n = 37$) chronic pain. Respiratory movements and movements of the arm increased the pain in respectively 81.0% and 57.1% of cases. Pain during the night was less frequent (41.0%). Pain was not intense in most cases (60.6%). Tenderness to pressure was commonly reported (75.5%). Local swelling was rarely reported (16.7%).

3.3.3. Natural history

A flare lasted on average 5.4 (± 10.8) weeks. Recurrences were frequent (75%). Patients with at least one episode of chest wall pain, suffered from on average 8.9 (± 12.7) flares of chest pain over the disease course, i.e., 1.0 episode per year.

3.3.4. Misdiagnosis

Coronary tests were performed for this pain in seven cases (exercise tolerance test [$n = 5$], coronary arteriography [$n = 2$]). Upper endoscopy was performed in one patient.

3.3.5. Imaging investigations

Imaging was performed in 18.6% ($n = 19$) of cases. It was to confirm the diagnosis of SpA in 10 cases (in five out of 10 cases, chest pain was the first manifestation of the disease). It is worth noting that chest pain was associated with low back pain in all but one patient. In one patient, imaging allowed to rule out an infection (chest pain associated with swelling of the sternoclavicular joint, low back pain and fever). The activity of the disease was assessed by imaging of the anterior chest wall in five cases, but chest pain was not the only manifestation of SpA in these cases. In four patients, imaging was realized for therapeutic purpose: i.e. before local injection of steroids. Anterior chest wall involvement was detected by at least one imaging investigation performed in 52.6% of cases. Scintigraphy showed increased radiotracer uptake in 50.0% (7/14); lesions on computed tomography (CT) and magnetic resonance imaging (MRI) were found in 50.0% (3/8) and 80.0% (4/7) respectively. CT revealed joint space narrowing associated with erosions of the sternoclavicular joints in two cases and both lytic lesions and sclerosis of the two first ribs associated with erosions of the two first sternocostal joints in one case. MRI showed bone marrow oedema of the sternoclavicular joint with intra-articular effusion in two cases and synovial reaction of the manubriosternal joint in two cases.

3.3.6. Treatments

In all, 71 patients (69.6%) were treated by non-steroidal anti-inflammatory drugs (NSAIDs) (for both chest pain and back pain in all but three cases); they reported good effectiveness (defined as good or excellent response) in 49.3% (35/71) of cases whereas anti-TNF agents, prescribed for both chest pain and other manifestations of the disease, were reported as effective on chest pain in 80.0% (40/50) of cases. Local NSAIDs and injections of steroids in the sternoclavicular joints were specifically used to relieve chest pain in 14 and six patients with good effectiveness in seven out of 14 (50.0%) and five out of six (83.3%) cases, respectively.

3.3.7. Comparison of SpA patients with anterior chest wall pain and patients without anterior chest wall pain

Patients with anterior chest wall pain were younger with younger age at diagnosis ($p < 0.05$) (Table 1). Diagnosis of ankylosing spondylitis was more frequent in patients with chest pain (78.4%) ($p < 0.05$). Heel pain was significantly ($p < 0.01$) associated with chest pain. There was no association between chest wall pain and psoriasis, peripheral arthritis, dactylitis, uveitis, and chronic inflammatory bowel disease. Multivariate analysis confirmed that patients with anterior chest wall pain were significantly younger (per 5 years increase, odds ratio = 0.81, 95% confidence interval [CI]: 0.67–0.96, $p < 0.05$) and suffered more frequently from heel pain (odds ratio = 3.71, 95% CI: 1.55–8.90, $p < 0.01$).

Patients with anterior chest wall pain did not have a more severe disease (data not shown).

4. Discussion

In the present study, anterior chest wall pain was a common feature of SpA (37.1%), particularly in axial disease. Anterior chest wall pain was the first manifestation of SpA in 3.6% (10/275) of patients, which may be a challenge for diagnosis. Among patients with anterior chest wall pain, pain occurred early in the disease course (before the diagnosis of SpA in 34.1% of cases and during the first 10 years of disease duration in 71.6% of cases); however the risk seems to persist quite a long time after disease onset (Fig. 2). Pain was usually in the upper chest and acute, increased by respiratory movements and movements of the arm; pain during the night was less frequent. A flare lasted on average 5 weeks; recurrences were frequent (mean: one flare per year). A misdiagnosis of a visceral origin of this pain, in particular heart disease, was made in eight cases (7.8%). NSAIDs were considered as effective by half of the patients.

There are some limitations to this study. First, the study was retrolective, i.e., was based on face-to-face interviews but with retrospective reporting of chest pain. However, interviews were performed very thoroughly, by a physician, and data reported by the patients were confirmed by medical files. Furthermore anterior chest wall pain is a subjective symptom, thus pain might have been related others features than chest wall involvement, such as muscular pain, resulting in an overestimate bias. However, in routine practice, diagnosis is, most of the time, made clinically and imaging investigations are rarely performed to confirm anterior chest wall involvement. Thus our study reflects daily practice. As patients were selected from a tertiary care center, they might have a more severe disease, resulting in an increased prevalence of chest pain; indeed 161 patients (58.9%) received anti-TNF agents over the disease course. Among SpA patients from the unit database, a sample was selected on geographic location and interviews were performed only for patients agreeing to come. Therefore our patients might have not been representative of SpA patients treated in this center. However a random sample was contacted to improve the representativeness and only 47 patients (8.0% of patients contacted) refused to participate. Imaging was relatively rarely performed therefore this study cannot answer questions regarding comparisons of imaging modalities.

This study also has strengths. It is the largest clinical description of anterior chest wall pain in SpA [7–9,17]; clinical description was the main objective, therefore clinical data were carefully collected. Contrary to most previous studies, our study included all SpA subtypes and not only ankylosing spondylitis.

The high prevalence of anterior chest wall pain in the present study (37.1%) was in accordance with previous reports with prevalences between 24% and 88% [6–12]. This large range may be explained by the small size of most studies and the variation of the definition of chest wall pain across studies, e.g., spontaneous pain or tenderness to pressure. Furthermore this manifestation occurs over time therefore prevalences will vary with follow-up duration. Chest pain was more frequent in axial form than in others forms, confirming the classical notion that anterior chest wall pain is part of the axial spectrum. A small prospective study of 50 ankylosing spondylitis and 50 psoriatic arthritis patients [9] indicated however a similar frequency of chest wall pain in the two groups.

The pain was localized in the upper chest, particularly in the sternocostal joints in opposition to previous reports [6,7,9]. Surprisingly, our patients did not always report night pain in the anterior chest wall [7]. Perhaps treatments (NSAIDs in particular) may have influenced this aspect. It is important for clinicians to keep in mind that chest wall pain in SpA may be polymorph.

Pain may simulate visceral disease, in some cases, especially heart and digestive diseases [6,7,11,18]. In the present study, eight investigations (i.e., in 7.8% of painful patients) were performed in view of another diagnosis.

In the cohort, morphologic examinations (e.g., bone scintigraphy, CT or MRI) were rarely performed. Other authors have suggested that bone scintigraphy may be the most sensitive technique to detect anterior chest wall involvement, whereas MRI assesses more accurately inflammatory changes [25–27]. In any case, the present study confirms that imaging investigations to detect anterior chest wall involvement are not performed in daily practice.

The treatment of anterior chest wall pain can rest on NSAIDs [7], local injections [19], physiotherapy and anti-TNF agents. Here, NSAIDs were reported as efficient in half of cases and anti-TNF agents more so (in 80% of cases); which is consistent with their efficacy on pain related to enthesitis [4,20,21]. Local injections of steroids also appeared efficacious in this study (for five out of six patients) and may be an interesting alternative.

The comparison of patients with and without chest pain revealed an association with heel pain. Like heel pain, chest pain is caused by enthesitis; a plethora of sites may be involved (costovertebral, sternocostal, costochondral, sternal joints as well as ligamentous and tendon insertion sites). Enthesitis is also suggested by imaging studies [9,26].

In conclusion, the present study reports clinical information on anterior chest wall pain in SpA. This information may help clinicians in diagnosing this frequent manifestation of SpA. Thus if a young patient suffers from recurrent upper-chest wall pain increased by respiratory movements and movements of the arm, physicians should bear in mind the possibility of SpA. Imaging of the anterior chest wall should be further studied.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

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