Chest Wall Syndrome in primary care: a cohort study
Summary

Aims To describe the clinical aspects the chest wall syndrome (CWS), a frequent rheumatic cause of chest pain.

Methods Upon 672 ambulatory patients prospectively included for chest pain, 300 patients with CWS were followed over one year by 58 primary care physicians.

Results Present in 1.2% of 24 620 encounters, CWS was the main cause of chest pain. It affected all ages with a sex ratio of one. History and sensibility to palpation were the keys for diagnosis. Pain was generally moderate, well localised -mainly in the left chest-, continous or intermittent over a number of hours or days, and amplified by position or movement. Pain however may be acute. Eighty-eight patients were affected at several painful sites and 210 patients at a single, most frequently median or left-sided site: pectoralis (14% of 300) witch frequently irradiate in the arm, mid- and upper-chondrocostal (12% and 6%), sternalis (8%), and laterothoracic (4%). Pain was a cause of anxiety and cardiac concern specially when acute. Xyphoidal and lower-rib pain may suggest digestive disorders. Association with cough or dyspnoea, thoracotomy, anxiety, fibromyalgia or other causes gave particular characteristics.

Limits with pain irradiating from the spine, manubriosternal arthritis, anxiety and with severe causes of thoracic pain, neoplastic and mostly coronary artery disease was a constant concern. Therefore CWS coexisted with coronary disease in 19 and neoplasm in 6.

Outcome at one year was favourable even though CWS recurred frequently.

Conclusion CWS is common and benign but leads to anxiety. Coexistence with coronary and neoplastic diseases needs careful consideration.
Chest pain is a frequent complaint in ambulatory care, and well studied in emergency settings, but not in general practice. The causes are diverse, including a broad spectrum from life threatening diseases to benign causes such as chest wall syndrome (CWS). However, the benignity of this syndrome should be questioned when considering that it can produce for patients, greater impairment in daily activities, emotional distress and a higher level of anxiety than ischemic heart disease (1). Furthermore, despite reassurances, a substantial part of patients think that they have cardiac disease (2). CWS is caused by musculoskeletal or myofascial disorders. However, despite the high prevalence of this syndrome seen by GPs (3), prospective studies in general practice are lacking. Incidence, clinical manifestation and evolution are poorly defined. CWS consists of several parietal syndromes which are defined separately in the literature (for example slipping rib syndrome or costochondritis) (4 5 6 7 8 9 10 11 12 13 14). The aim of this prospective work was to study in epidemiological data of private practices, the clinical characteristics and classification of CWS with long term follow-up by 300 consecutive cases diagnosed by GP as CWS.

**Methods**

58 GP’s in private practices included all consecutive patients presenting thoracic pain (main or ancillary symptom) during a 3 to 9 (median 5 )-week period from March to May 2001.

Physicians recorded their observation and their diagnostic hypotheses on questionnaires. All questionnaires were filled immediately after identifying a complaint of chest pain and after each step of consultation: the initial appraisal, completed history, physical examination and at the end of the index encounter. Questionnaires at 3 months and 12 months evaluated new complaints, investigations, new treatments, hospitalisations, and the death and diagnosis processes. For the follow-up, ambulatory check-up examinations were
performed and if it was not possible to see patients, a telephone interview was made (5% patients).

The specific diagnosis retained by GPs at the end of the initial encounter was compared with the 3 and 12-month diagnosis. The final diagnoses were reviewed independently by a group of clinicians and discussed in the case of incoherence. The GPs sent all filled questionnaires to the study coordination centre. All questionnaires were doubled entered to avoid transcription errors. In the case of a new diagnosis, the GPs were contacted to confirm or reject the alternative diagnosis. For analysis, we presented the 300 cases with chest wall syndrome. We preferred to retain the 3-month diagnosis as the follow-up was perfect (100%). The group of clinicians has attributed a more precise classification of CWS when possible to create subgroups of diagnosis based on the chart data, literature available and their own experience.

In the data analysis, the \( t \) test was used for dimensional variables, while the chi-square test was employed for data expressed as proportions. All statistical analyses were performed with Statview 5.0 or Stata 7.0 and CIA 2.1.3 for confidence intervals calculation. Clinical factors significantly associated with having a CWS were identified in univariate logistic regression. To precisely determine independant indicators of a CWS, factors indentified in univariate analysis were introduced in a multiple stepwise logistic regression. The best discriminant pattern of six factors were finally empirically indentified for the CWS versus other causes of chest pain. An individual CWS score was defined, giving one point for each present factor. The differences in score between CWS and the other subgroups were assessed using a one way ANOVA.

**Results**

**Patients**  Among 24,620 primary care encounters, 672 consecutive patients presenting
thoracic pain (2.7%) were included. At 3-month follow-up diagnostic groups were: thoracic wall 51%; (CWS 44.6%, traumatic 4%, divers 2.4%), cardiovascular diseases 16% (coronary artery diseases CAD 12.5%, non CAD 3.4%), psychogenic 11%, respiratory diseases 10%, digestion 8%, no diagnosis 4%. CWS (300 cases), represented 1.2% of all consultations, far more than coronary artery diseases (CAD) (84 cases or 0.34%). Follow-up amounted to 100% and 97% at 3 and 12 months, respectively.

We found 155 women and 145 men. The overall mean age was 50.3 ± 18.2. The CWS was found for all range of ages including teenagers and patients more than 75. CWS was new in the 62% of cases and old or recurrent in 35%. In half of the patients, the complaint was the principal one. 90% of the patients were already known by the GPs. Comorbidity was noted for 250 patients (83%) for psychiatry (149 patients; 50%), cardiovascular diseases (100 patients, 33.3% among whom 19 coronary diseases, 6%) or rheumatology (62 patients, 20.7% including 2 cases of spondyloarthritis but no rheumatoid diseases). Six patients had a neoplastic diseases, including two lung cancers.

**Clinical characteristics** Compared to non-rheumatic thoracic pain, CWS has few distinctive characteristics. For instance, a sensation of oppression or even burning is mentioned in respectively 25% and 2% of patients. The pain intensity is moderate (75%) rather than high (23%), well-localized, and lasts hours, days or weeks. In a majority of patients (71%), it is amplified by factors such as a specific position or motion, by lying position, and breathing or coughing. They are bouts of pain lasting from a few seconds to a few days (50% of patients), or continuous pain for hours or days (35%). However, acute and intense pain can happen (9%). The reported pain is mostly well-localized. The left side is predominantly affected compared to the right side. Pain can spread to the left arm (18 patients) or the right arm (4), the back (5), the neck or the abdomen (3 patients
respectively). Palpation of the thorax often reveals a tender point within the reported painful area. It is described within 214 of the 300 patients. The GPs reported a positive response to provocative manoeuvres in some patients but these haven’t been systematically identified.

CWS can be associated with original characteristics such as coughing or long lasting dyspnoea, pre-existing anxious state, thoracotomy, or various rheumatism affections (table I). In 8 patients, GPs diagnose a “vertebrocostal disorder” related to an unilateral anterior pain together with a spine disorder. No tender point is recorded as the pain probably irradiates from the spine. Short repeated and localized stabs of pain corresponding to the precordial catch \((15)\) might even be experienced (3 patients). This kind of pain is frequent but rarely the cause of a consultation. “Thoracic catch” may be a preferable appelation because it can be experienced on the right side of the chest too.

The CWS frequently causes anxiety for patients and for doctors. 54% of patients experiencing intermittent or continuous pain expressed anxiety compared with 93% of the patients experiencing acute and intense pain. In the first case, 10% of the doctors expressed concern or think of serious trouble, and 26% in the second case.

**Clinical score**  The pattern of the six most discriminant factors allows the attribution of a clinical score to the patients -one point for each of the six factors present. The CWS score is highly discriminant versus all other subgroups of chest pain (ANOVA \(p< 0.0001\)), with the exception of the chest pain with a traumatic origin, which has similar characteristics but a distinct aetiology. In our study, a score of four points or more predicts a CWS with an accuracy of 71% versus all other causes of chest pain, and an accuracy of 96% versus the CAD (Table II). Thus, even if being exclusively clinical, the diagnosis of CWS is not an
exclusion one but a positive diagnosis. Nevertheless, predictive values were derived retrospectively from GPs’ data and are not validated.

**The specific syndromes of CWS** CWS is a generic term that describes various specific syndromes, the nomenclature of which is ill-defined. Patients familiarly speak of intercostal rheumatism. GPs differ in their use of vocabulary and even use different words in the same encounter to refer to the same patient. Over 30 terms are used generally, such as “musculoskeletal pain, parietal or intercostals pain or rheumatism, intercostals neuralgia, thoracodynia, etc.”, or more specifically, such “as Tietze’s syndrome, costovertebral dysfunction, chondrocostal pain, fifth rib subluxation, etc.”.

In this study, a specific syndrome can be defined in 195 of the 210 patients suffering from localized pain. The most frequent syndromes are the left pectoral syndromes (or left pectoral algia) (40 patients), the mid left chondrocostal syndrome (costochondritis) (37), and the sternal syndrome (28) (tab III and fig 1). The thoracic pain of 88 patients spread wider and included several syndromes, the most frequent association being the upper and mid left chondrocostal syndrome (22). Some patients (26) complain of chest pain on both sides of the thorax.

These different syndromes are often described individually in the literature and more systematically in some textbooks (16 17 18). We have added to the commonly described syndromes the axillary (or laterothoracic) syndrome, which is really frequent as well as the high sternal syndrome. This makes understandable the particularities attached to certain chest wall syndromes. For instance, the pectoral syndrome (and even often the mid costochondral or the axillary syndromes) is the cause of practically all acute presentations of CWS, and patients commonly suspect these syndromes to be coronary disease or, in the case of women, to be breast cancer. The muscular origin can explain the frequent
irradiation of pain in the left arm (19). The upper sternalis syndrome can be the result of pathologies of the sternoclavicular joint such as subluxation, arthritis, SAPHO syndrome or of pathologies of the manubriosternal joint associated with psoriasis and spondylarthropathies, in the case of two of ours patients (20 21). As for xiphoidal and lower rib syndromes, they can last a very long time, sometimes decades, and be mistaken for digestive diseases to such a degree that publications concerning this problem are issued by gastroenterology services (22 23).

**Evolution** During the follow up year, 171 patients (51%) were found to have suffered a CWS more than once. Four patients died and 6 were hospitalized for causes independent of CWS. One patient was hospitalized and diagnosed with CWS. One patient was newly diagnosed with myocardial infarction and 3 with coronary heart disease; the initial diagnosis of CWS was not questioned in any of these cases. On the other hand, the initial diagnosis of CWS was abandoned in 16 patients for whom oesophagitis (7), anxiety or somatizing (4), coronary heart disease (3), lung cancer (1) and parietal metastases (1) were diagnosed. This illustrates the variety of conditions with which CWS can be confused.

**Discussion**

In this prospective study, CWS was present in 1.2% of the consultations. Thus, CWS was responsible for 44.6% of chest pain cases, for which it was by far the most frequent cause. Indeed, it was three times more frequent than pains of cardiac origin. On average, GPs encountered one to two cases a week. This prevalence agrees with other studies in ambulatory settings (3 24 25). Built exclusively on history and physical attributes, the diagnosis is a real challenge (26 27 28). CWS however, is not a trash or exclusion diagnosis
as its pattern mentioned above gives a good predictive positive value. The presence of one or several points sensitive to gentle fingerprint palpation is an important sign, even if GPs sometimes diagnose CWS without it. Nevertheless, tender points are only of diagnostic significance if they match the localization of spontaneous pain, which is mostly unilateral. The presence of a tender point is far from specific for the diagnosis of CWS, as it is frequently recorded in affections of other origins such as coronary heart disease (\(^4\) 29), pulmonary embolism (\(^30\)), pleuritic, neoplastic and psychogenic diseases. However, our community-based study goes against existing information, namely, that half of patients with angor pectoris have tender points (\(^4\)), and that half patients with chest wall tenderness suffer from coronary heart disease (\(^29\)). The same consideration is probably valid in the case of the manoeuvres of provocation, even though their sensitivity and their specificity is also unknown (\(^{17}\)).

The strong prevalence of pain on the left side of the chest is intriguing, although rarely mentioned (\(^{10}\)), and only speculative hypotheses could be proposed.

The aetiology of CWS is usually ill-defined. However, the painful areas are found in zones of muscular or tendinous insertions on the bones, or on cartilage or mobile zones of bone-cartilage transitions, such the costochondral junctions. Actual inflammatory lesions are probably an exception as suggested by the absence in our study of cases of real Tietze’s syndrome and of rheumatoid arthritis, a well-known cause of inflammatory soft tissue disorder. Factors favoring pain may not be the same in all patients as disorders such as traumatic origins following a long lasting cough, thoracotomy, or an overuse of respiratory muscles in the case of asthma can all give rise to CWS. In situations of anxiety and tension, Bass et al suggest a mechanism of amplification of the pain in which anxiety increases the common sensibility of a specific point that the patients believes is a threatening somatic condition, thus increasing anxiety (\(^{31}\) \(^{32}\)).
What about the reliability of our data? It is possible that a benign affection such as CWS has been underreported by GPs. It is not clear that all the CWS characteristics were systematically reported in all the patients, and that even all important questions were asked in the questionnaire. Moreover, standard criteria for the diagnosis were lacking and the diagnosis was generally made without outside supervision. In this survey, some diagnostic mistake are inevitable. However, the follow up after one year may clarify cases in which severe conditions were mistaken for CWS. On the other hand, it is also possible that the follow up year, together with the CWS-motivated investigation, allowed accompanying conditions to be identified. These may include such cases as coronary heart disease in which GPs misdiagnosed as simple CWS. Another confusing factor lies in the fact that some chest wall pain could have their origin outside the anterior chest wall if the precordial catches and “vertebrothoracic” disorders are taken into consideration (33 34). Finally, the diagnosis CWS as something other than an anxious state or a somatizing disorder responsible for the pain, can in some case be attributed to the doctor’s belief rather that to clinical reality. Nevertheless, we think that these ambiguous cases are few, and that our patients’ samples are sufficient to describe CWS accurately. More serious problems lie in the interpretation of neoplastic and metastatic symptoms when the primitive neoplasm is unknown, and the delimitations of CWS from CAD for acute manifestations of CWS are also unknown. Furthermore, CAD and CWS may coexist as it is evident after a thoracotomy for a CAD. The clinical score for CWS permits a good discrimination of CWS from CAD, but the data was collected in retrospective and non-prospectively validated analysis, and not in emergency settings. A study made in a academic emergency room during the same period and covering the same region as our study shows three major differences: the CAD is the major cause of chest pain in the emergency room, acute coronary syndrome is quite common, and CWS cases are mostly
described as acute. This suggests that this rare presentations of CWS drives patients to seek the care of emergency centres (35). Thus, CWS is a frequent affection with good prognosis, low morbidity and no mortality. Evolution has only been negative in cases of misdiagnoses, mainly in the presence of malignant affection or in cases of coincidental diseases such as heart or neoplastic disease or pneumonitis. Nevertheless, this affection tends to recur. It also causes real anxiety and frequently suggests to the patient the possibility of heart disease. Moreover, in a few cases, it is difficult to distinguish between coronary heart disease and CWS on a clinical basis.
We are indebted to the Swiss Academy of Medical Sciences for a grant

To Françoise Secretan for her precious work as coordinative scientific nurse

And for the following colleagues for counseling and clinical contribution:


and for the Policlinique Médicale Universitaire de Lausanne: Blanc Muriel, Burki Albert, Chiesi Barbara, de Torrenté Gabrielle, Marguerat Isabelle, Selz Roxane
<table>
<thead>
<tr>
<th>Associated ailments</th>
<th>n (%)</th>
<th>Characteristics</th>
</tr>
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<tbody>
<tr>
<td>Long lasting cough or dyspnea</td>
<td>31 (10)</td>
<td>Mostly a recent complaint</td>
</tr>
<tr>
<td></td>
<td></td>
<td>More frequently right-sided pain (26 vs 11% p=0.022)</td>
</tr>
<tr>
<td>Anxiety</td>
<td>20 (7)</td>
<td>Lower mean age (43 vs 51y, p=0.06)</td>
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<tr>
<td></td>
<td></td>
<td>Constrictive pain (55 vs 23% p=0.004)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Initiated by an anxious affect (40 vs 11% p=0.0005)</td>
</tr>
<tr>
<td>Fibromyalgia</td>
<td>10 (3)</td>
<td>9 of 10 being female</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Wide spread pain; frequent irradiation</td>
</tr>
<tr>
<td>After thoracotomy</td>
<td>8 (3)</td>
<td>Long lasting and recurrent CWS</td>
</tr>
<tr>
<td>Rheumatic disorder</td>
<td>8 (3)</td>
<td>Cyphosis, osteoporosis (3), spondylarthritis (2), arthritis (2), radiotherapy (1)</td>
</tr>
<tr>
<td>Spine disorder</td>
<td>8 (3)</td>
<td>Unilateral pain without tender point, spine disorder</td>
</tr>
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Table I
The six most discriminative clinical characteristics of CWS\(^1\)

<table>
<thead>
<tr>
<th>Pain is</th>
<th>Prevalence of a CWS score(^2) ≥ 4 points</th>
<th>Diagnosis performance of a CWS score ≥ 4 points (CI95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>- well localized on the chest wall</td>
<td>CWS 206 / 289 (71%) vs all other causes of chest pain excepted traumatic pain 96 / 357 (27%)</td>
<td>Sensibility 71 (66-76)</td>
</tr>
<tr>
<td>- localised on the left or median-left part of the chest wall</td>
<td></td>
<td>Specificity 73 (68-77)</td>
</tr>
<tr>
<td>- lasting more that one hour</td>
<td></td>
<td>Positive Predictive Value 68 (63-73)</td>
</tr>
<tr>
<td>- depending on mechanical factors(^3)</td>
<td></td>
<td>Negative Predictive Value 76 (71-81)</td>
</tr>
<tr>
<td>- reproducible by palpation</td>
<td></td>
<td>Likelihood Ratio 2.7 (2.2-3.2)</td>
</tr>
<tr>
<td>- no deep transversal pain with an oppressive character</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CWS 206 / 289 (71%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>vs coronary artery disease 9 / 84 (11%)</td>
<td></td>
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</tr>
</tbody>
</table>

1 Clinical factors significantly associated with having a CWS were identified in univariate logistic regression then introduced in a multiple stepwise logistic regression. The best discriminant pattern of six factors were finally empirically indentified for the CWS versus other causes of chest pain.

2 CWS score = one point for the presence of each of the six characteristics. A positive score was considered in presence of ≥ 4 points

3 A movement, a body position, the respiratory activity

Table II
### The different Chest Wall Syndromes

<table>
<thead>
<tr>
<th></th>
<th>RIGHT</th>
<th>MEDIAN</th>
<th>LEFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pectoralis</td>
<td>1</td>
<td></td>
<td>40</td>
</tr>
<tr>
<td>Upper chondrocostal</td>
<td>2 (rib 2-3)</td>
<td>2</td>
<td>Pectoralis 1</td>
</tr>
<tr>
<td>Axillary</td>
<td>3</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>Mid chondrocostal</td>
<td>2 (rib 4-6)</td>
<td>4</td>
<td>Axillary 3</td>
</tr>
<tr>
<td>Lower chondrocostal</td>
<td>2 (rib 7-9)</td>
<td>6</td>
<td>Lower chondrocostal 2 (rib 7-9)</td>
</tr>
<tr>
<td>Lower rib</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Xiphoidal</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
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</table>

Synonyms:
- Algia pectoralis
- Costochondritis, s costosternal, s costochondral, Tietze’s if swelling
- Lateral thoracic s
- Lower rib pain, rib-tip s, slipping rib s, slipping cartilage s, clicking rib, Cyriax’s
- Xiphoidalgia, xiphodynia

Table III
Figure 1
Legends

Tab I  Influence of associated ailments on the clinical manifestation of the CWS

Tab II  Clinical characteristics of Chest Wall Syndrome (CWS) and their predictive ability of a clinical CWS diagnosis

Tab. III  Different syndromes of the chest wall syndromes with synonyms appellations.
Numbers indicate the number of patients with an isolated syndrome

Fig 1  Localisation of the different chest wall syndromes. Numbers are the number of patients with an isolated syndrome
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