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Thoracic outlet syndrome of pectoralis minor etiology mimicking cardiac symptoms on activity: a case report

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Thoracic outlet syndrome is the result of compression or irritation of neurovascular bundles as they pass from the lower cervical spine into the arm, via the axilla. If the pectoralis minor muscle is involved the patient may present with chest pain, along with pain and paraesthesia into the arm. These symptoms are also commonly seen in patients with chest pain of a cardiac origin. In this case, a patient presents with a history of left sided chest pain with pain and paraesthesia into the left upper limb, which only occurs whilst running. The symptoms were reproduced on both digital pressure over the pectoralis minor muscle and on provocative testing for thoracic outlet syndrome. The patient's treatment therefore focused on the pectoralis minor muscle, with a complete resolution of symptoms. This illustrates that not all cases of chest pain with associated arm symptoms that occur on physical activity are of cardiac origin.
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KEY WORDS: Thoracic outlet syndrome, pectoralis muscles, angina pectoris, chiropractic

Le syndrome de la traversée thoracobrachial est le résultat de la compression ou de l'irritation d'un paquet vasculonerveux au cours de son trajet entre la colonne cervicale inférieure et le bras, en passant par l'aisselle. Si le muscle petit pectoral est sollicité, le patient peut subir de la douleur à la poitrine ainsi que de la douleur et de la paresthésie dans le bras. On voit souvent ces symptômes aussi chez des patients souffrant de douleurs thoraciques d'origine cardiaque. Dans de tels cas, le patient présente des antécédents de douleurs thoraciques du côté gauche, accompagnées de douleur et de paresthésie dans le membre supérieur gauche, qui survient uniquement pendant que le patient court. Les symptômes ont été reproduits par une pression tactile exercée sur le muscle petit pectoral, et par un essai de provocation pour le syndrome de la traversée thoracobrachiale. Le traitement du patient était par conséquent axé sur le muscle petit pectoral, et les symptômes ont complètement disparu. Ainsi, les douleurs thoraciques agencées de symptômes au bras lors de l'activité physique ne sont pas toujours d'origine cardiaque.
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MOTS CLÉS : syndrome de la traversée thoracobrachiale, muscles pectoraux, angine de poitrine, chiropratique

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Introduction

Thoracic outlet syndrome (TOS) was first described by Peet et al in 1956 and has been reported in the literature to have an incidence rate of approximately 8%.[1,2] It is the result of compression or irritation of neurovascular bundles as they pass through narrow passageways from the lower cervical spine into the arm via the axilla.[3] There are three main sites at which such compression or irritation can occur. The first site is the interscalene triangle, where compression can occur between the anterior scalene muscle, middle scalene muscle and the medial surface of the first rib inferiorly.[3] The second site is behind the clavicle in the costoclavicular space, while the third site is at the subcoracoid space in the angle between the pectoralis minor tendon and where it attaches to the coracoid process.[4] Despite the fact that thoracic outlet syndrome has been reported as a clinical entity for 65 years it is only in the last decade that the involvement of the pectoralis minor muscle, in some form, has been noted in over 50% of patients with a diagnosis of TOS, even if the primary site of entrapment is not in the subcoracoid space.[5]

The typical symptoms that can present in a case of TOS include: pain, paraesthesia, weakness, claudication and muscle wasting in the upper limb, along with possible neck pain, chest pain, headache, vertigo and dizziness.[5,6,7,8] If the pectoralis minor muscle is involved in the condition the patient is more likely to report chest pain, particularly below the clavicle, while neck pain and headaches are not as commonly reported as in the other causes of thoracic outlet syndrome.[5,9]

There is not one investigation or test that can consistently confirm the diagnosis of thoracic outlet syndrome.[10] TOS is primarily a collection of multifaceted diverse syndromes rather than a single clinical entity.[11] As such, there can be a confusing array of symptoms that may crossover and mimic other conditions. Conditions that deserve particular attention are any disorders that stem from a cardiac origin.

Cardiac patients, like TOS patients (especially of pectoralis minor origin), can present with chest pain, neck pain and diffuse pain and paraesthesia into the upper limb.[12] Chest pain alone is a common complaint in athletes of all ages and it is reported as the second most common reason for visits to the emergency department in the United States each year, with the potential for a cardiac origin being of most concern to the patient.[13,14] However, in roughly 50% of cases the etiology is considered non-cardiac and in 5-20% of the cases the etiology is from a musculoskeletal origin.[14,15]

The purpose of this report is to highlight a case in which a patient presented with symptoms of chest pain and pain and paraesthesia into the left upper limb, that only occurred on excessive activity. The symptoms could have come from either a cardiac or musculoskeletal origin.

Case presentation

Clinical history and physical examination

A 41-year-old, slightly overweight, male office worker presented to a chiropractic clinic with an eight week history of left-sided chest pain coupled with pain, "a sense of heaviness" and numbness into the left upper limb from the axilla to the fingers. These symptoms were only evident while running for more than 5 minutes, which was an activity the patient started eight weeks prior to presentation with the goal of losing weight. The symptoms would escalate while continuing to run, although the patient would not continue running past 10 minutes as he feared a cardiac origin to his symptoms. The symptoms would abate within 3-5 minutes of stopping running.

The patient attended his general practitioner who examined him and found no abnormalities and then referred him to a cardiologist for further investigation. The cardiologist performed a diagnostic work-up consisting of blood work and a cardiac stress test. The patient reported that he was again informed that his results were within normal limits. No further plan of management was offered. As the patient had, 2 years prior to this, attended the chiropractic clinic with low back pain he decided to return for a second opinion.

When queried about a specific distribution of his symptoms, the patient stated that his chest pain was on his left side between his nipple and clavicle and then spread to his anterior shoulder and down into his left forearm, with associated paraestheia and "heaviness" in his left hand. The patient could not isolate a specific distribution. On questioning, he could not recall any other time that he felt his symptoms other than when he ran and did not report any concurrent symptoms of neck pain, headache, vertigo, loss of dexterity or cold intolerance.

In addition to this, the patient stated that this was the first time he had experienced this problem and did not re-

port any previous history of cardiac related symptoms. He was a non-smoker, who did not take any medication and had no reported previous accidents, illnesses or surgeries. The rest of his past medical history was unremarkable.

On physical examination the patient's blood pressure was 128/86 mmHg and his pulse rate was 84 bpm. Forward head carriage and rounded shoulders were evident on observation. There was no obvious wasting or skin changes in the upper limb and a vascular examination was unremarkable. Sensory, motor and reflex testing of the upper limb showed no abnormalities.

On palpation there was slight tenderness in some areas of the cervical and thoracic spine but no major tenderness of the scalene muscles and no indication of fibromuscular bands or other anomalies in the supraclavicular fossa. However, there was marked tenderness over both the left pectoralis minor muscle belly and tendinous attachment at the coracoid process. Sustained digital pressure over these areas also reproduced the paraesthesia in the patient's left hand and the pain into his left arm. With continued pressure the patient could then identify a distribution pattern to his paraesthesia, which started along the ulnar border of his left hand and forearm and then spread to the rest of his hand. Similarly, the pain in the arm was felt to begin along the medial elbow before increasing in distribution.

Provocative tests for thoracic outlet syndrome were also performed. Both Adson's test (in which the seated patient's radial pulse was palpated on the involved side and the anterior and middle scalenes were tested for involvement by extending the arm with slight external rotation and abduction while the patient's head was rotated towards the involved side with slight lateral flexion and extension, looking for a diminished radial pulse or reproduction of symptoms) and Eden's test (a.k.a. costoclavicular maneuver or military brace test, in which the clavicle and first rib were tested for involvement by extending the seated patient's involved arm while also pulling the shoulder girdle down and backwards and looking for a diminished radial pulse or reproduction of the patient's symptoms) were both negative. However, Wright's test (a.k.a. hyperabduction maneuver, in which the patient's pectoralis minor muscle was tested for involvement by bringing the seated patient's involved arm into abduction and extension) resulted in both a decrease in radial pulse and a reproduction of the patient's symptoms in a similar distribution that occurred on digital pressure of the pectoralis minor muscle. Also in this hyperabducted position the patient's left adductor pollicis and opponens digiti minimi muscles tested weak on muscle testing, which had previously shown no weakness in a normal position.

Case management and outcome

As the patient's symptoms were reproduced both on digital pressure of the pectoralis minor muscle and when performing Wright's test it was not considered necessary to initially perform any imaging, electrodiagnostic studies or further vascular examinations. Although it was explained to the patient that this stance would be modified, if the symptoms did not change as expected with treatment.

The patient was treated on the same day as the initial consultation. The treatment was focused on the involved pectoralis minor muscle, which was treated by manually applying a force to the muscle to passively approximate and distract along the fibers of the muscle belly. In addition to this, the left serratus anterior and latissimus dorsi muscles were also similarly treated. Following this, Wright's test was found to be negative and digital pressure over the pectoralis minor muscle no longer reproduced the patient's symptoms. Joint manipulation was also performed at the left sternoclavicular joint and at the cervical and thoracic spine, as they were palpated to be restricted.

The patient returned after 3 days and reported that he had run for 15 minutes with his symptoms starting to occur after about 10 minutes of activity but at only 20% of the previous level. He was again treated in the same manner and was also given a home stretch to release his pectoralis minor muscle, with specific instructions on the manner in which to stretch so as to not hyperabduct and trigger his symptoms. On his next visit, a week later, he reported that he was now running for 20 minutes with no reproduction of his symptoms. The patient was again treated on this occasion. As he was returning to live in his native country, he was given a home rehabilitation program involving stretching of his pectoralis minor and upper trapezius muscles and a progressive strengthening program for his serratus anterior, latissimus dorsi and rhomboid muscles. On follow-up correspondence two months after his initial presentation the patient reported that he was symptom free and was now running 30 minutes without discomfort.

Discussion

When treating any patient precedence must first be given

to ruling out any potentially life-threatening condition, and it is important to consider a vascular cause in your diagnostic thought process in any athlete who presents with pain, paraesthesia and early fatigue on activity.[13,16] Similarly, the patient in this report was correct in first looking for a cardiac origin to his problem as his symptoms mimicked the presentation seen in conditions such as angina pectoris. Angina pectoris can also present as a diffuse, poorly localized pain that is felt in the chest with associated pain and/or paraesthesia into the left arm. Equally it can be triggered by physical activity that increases oxygen demand and will generally last for a few minutes, being relieved when the increased oxygen demand decreases.[12] However as the patient had been assessed by a cardiologist and was informed that no cardiac pathology was detected, other potential causes of his symptoms needed to be explored.

As can be seen from this case, thoracic outlet syndrome is a possible differential diagnosis to have in such a situation. Exercise-induced thoracic outlet syndrome is becoming more common in athletes and when seen in the athletic population it can affect young and otherwise healthy people.[8,17]

As previously stated TOS is a collection of multifaceted symptoms, which can overlap and lead to confusion in arriving at a definitive diagnosis. However there are certain key elements from this case that can allow the practitioner to formulate a diagnosis of thoracic outlet syndrome rather than one of a cardiac origin.

The most important and obvious criteria for the practitioner to make a differentiation between the two mentioned possibilities is that the patient had already been examined by a cardiologist who informed him that no abnormalities were detected on examination. It is important to remember however that this merely means that no abnormalities were detected on the examinations that were carried out and not that there were no cardiac abnormalities.

From the examination that was carried out by the author the two most important indications for a diagnosis of thoracic outlet syndrome were the reproduction of the patient's symptoms on sustained digital pressure on both the muscle belly of the pectoralis minor muscle and at its tendinous attachment at the coracoid process, and the positive Wright's test.

A reproduction of the patient's symptoms on digital pressure coupled with local tenderness is considered a strong indicator for a diagnosis of TOS.[18] For this to be considered as a positive finding, the crucial factor is the reproduction of the distal paraesthesia and not just local tenderness of the muscle to palpation.[19] Likewise in the case of provocative tests such as Wright's test, the important change to look for is a reproduction of the patient's symptoms and not just a reduction in radial pulse. These tests can have a high false positive rate if merely looking for a diminished radial pulse as it has been shown that the same amount of asymptomatic people will also demonstrate a change in palpable pulse when compared to TOS patients.[3,20]

In the patient in the case above not only were the symptoms reproduced in the exact pattern that the patient experienced while running, but both the adductor pollicis and opponens digiti mini displayed weakness when the arm was held in a hyperabducted position. These muscles did not display a weakness when examined in a normal position and this further indicates that a change in the position and length of the pectoralis minor muscle was causing pressure and/or irritation to the neurovascular bundle that lead to the ulnar nerve, which in turn supplies both of these muscles of the hand.

An increase in symptoms with a change of posture during testing is generally considered a strong factor leading to a diagnosis of thoracic outlet syndrome.[21] This also helps to differentiate between a true case of thoracic outlet syndrome and a myofascial trigger point referral pattern stemming from the pectoralis minor muscle, as you would not expect to see the reproduction of the patient's paraesthesia while performing Wright's test in a case that solely involved a myofascial trigger point in the pectoralis minor muscle. This change in symptomatology related to posture should also be remembered when ordering electrodiagnostic studies, as the symptoms of TOS are often intermittent and electrodiagnostic studies may result in a false-negative if there is not an attempt to replicate the position in which the symptoms are most commonly experienced while performing the study.[22,23]

The final aspect of this case that needs evaluation is why the patient only experienced symptoms while running. Musculoskeletal causes of chest pain in an athlete are known to demonstrate increased pain during running, as the ground reaction force that is generated with each step results in axial loads that can affect the structures involved.[13] In addition to this, when there is an increased

oxygen demand the respiratory muscles of the upper rib cage will increase their activity.[24] This is important as running was a new activity for the patient and inexperienced runners have a very poor ability to synchronize gait and respiration, and have a tendency to display marked irregularities in their respiratory cycle.[25] If the inexperienced runner also runs with a rounded shoulder posture (which was the patient's noted posture on examination) the shortened pectoralis minor fibers can alter the distribution of forces between the arms and trunk and cause strain patterns that reduce the shoulder girdle's ability to accommodate to these aberrant forces and in turn place further stress on the area.[26] This is further compounded by the fact that repetitive movement of an unconditioned muscle will lead to muscle fatigue, decreased proprioception and changes in muscle activation patterns, which in turn can lead to functional instabilities and a possible increased risk of injury.[27]

Summary

Not all cases of chest pain with associated arm symptoms that occur on physical activity are of cardiac origin. While vascular causes should always be considered in a patient with such symptoms, thoracic outlet syndrome with involvement of the pectoralis minor muscle is also a clinically relevant differential diagnosis. This is an important consideration as chest pain is both a serious and very common reason for attending a medical consultation.

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