

Treatments for costochondritis in athletes: A literature review

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Abstract. Costochondritis (CC) or anterior chest wall syndrome, may be defined as an inflammation of the costochondral junctions of ribs that causes an intense ache.(1,2) Though it is considered a self-limited condition, it's characterized by multiple incidences during the period of one year what may keep the athlete apart from its practice. Though there's a lot in literature that shares about the CC condition, there's too little about other treatment strategies apart from the medicament. Apparently, there's no consensus in the literature what treatments options are indicated for this disease (3), and there's a lack of scientific evidence that appoints how other potential treatments may be used to accelerate the healing processes in CC, decreasing the painful condition and allowing athletes to return to their practice as soon as possible. This study aimed to search in the present literature and analyze the options of non-medicament treatment for costochondritis, in addition to its efficacy. Its secondary objective was to observe the literature itself and to investigate the offer of studies that address this subject. To perform this literature review, it was used search tools from Google Academic, PubMed and Science Direct to select 8 studies from peer-reviewed Journals. There are several non-medicament options that may help in the Costochondritis treatment and pain-relief, as it has been seen in the literature review: Manual Therapy, Dry Needling, Acupuncture, Nerve Blocks, Extracorporeal Shockwaves. The papers in this review presented great results of these therapies in reducing CC symptoms and allowing the patient to resume his/her sports activities, however, the studies displayed are mainly case reports. Thus, it's necessary to perform more high-evidence studies to prove the efficacy of these treatment methods and to fill the gap of the lack of studies that address Costochondritis.

Keywords. Costochondritis; Non-medicament treatment; Chest Pain; Physical Therapy; Athletes.

Introduction

Costochondritis (CC) or anterior chest wall syndrome, may be defined as an inflammation of the costochondral junctions of ribs that causes an intense ache.(1,2) Generally, it has an insidious and persistent onset and generates a non-swollen sharp pain condition that strikes 2-5 ribs unilaterally and is worsened by position changes and deep inspirations. (2,4,5)

Though costochondritis corresponds to 13% to 30% of the musculoskeletal chest pain in the Emergence Rooms (ER)(6,7), its etiology is still unclear, in such a way that the inflammation observed may be spontaneous and idiopathic or be related to injuries caused by trauma or overuse. It's a condition that apparently affects mostly individual of the female gender, Hispanic and Afro-Caribbean origin, from a lower socio-economic class and athletes(8,9). Furthermore, it's recognized an association between costochondritis and rheumatic conditions like seronegative spondyloarthropathies (spA) and fibromyalgia(6,10)

The Costochondritis diagnosis consists in the patient history and a physical exam. It's important to primary discard other non-musculoskeletal cause such as Acute Coronary Syndrome, Pulmonary Embolism, Pericarditis, Pleurisy, among others.

In the physical exam it's usual to identify tenderness to palpation, the absence of swelling, heat, or erythema (these are the indicators of Tietze's syndrome, another chest pain condition that must be discarded). For evaluation, the pain may be provoked by shoulder adduction on the affected side with the head rotation to the same side or by the "Crowing Rooster Maneuver", which involves the extension of cervical spine with traction on posteriorly extended and abducted arms with the head rotated to the same side as the pain. It's indicated to verify posture deviations and measure the muscular strength.(1,4,5,11,12)

It's not usual to rely on image exams for the CC diagnosis as it's hard to observe tissue modification through image. Although its usually normal, mild soft tissue swelling and low attenuation cartilage may be seen in radiography and Computerized Tomography, respectively. During evaluation, it's needed to verify the presence of sensory disturbances and check the peripheral reflexes of upper and lower extremities as a neural examination to rule out nerve compression.(11)

Though costochondritis is considered a self-limited condition, it's characterized by multiple incidences during the period of one year and keep the athlete apart from its practice.(8) The main CC treatment is pointed with the use of Non-Steroidal Anti-Inflammatory Drugs and when it comes to physical therapy strategies, it's only cited stretching and the use of ice and heat therapy. (1,2,4,11,13)

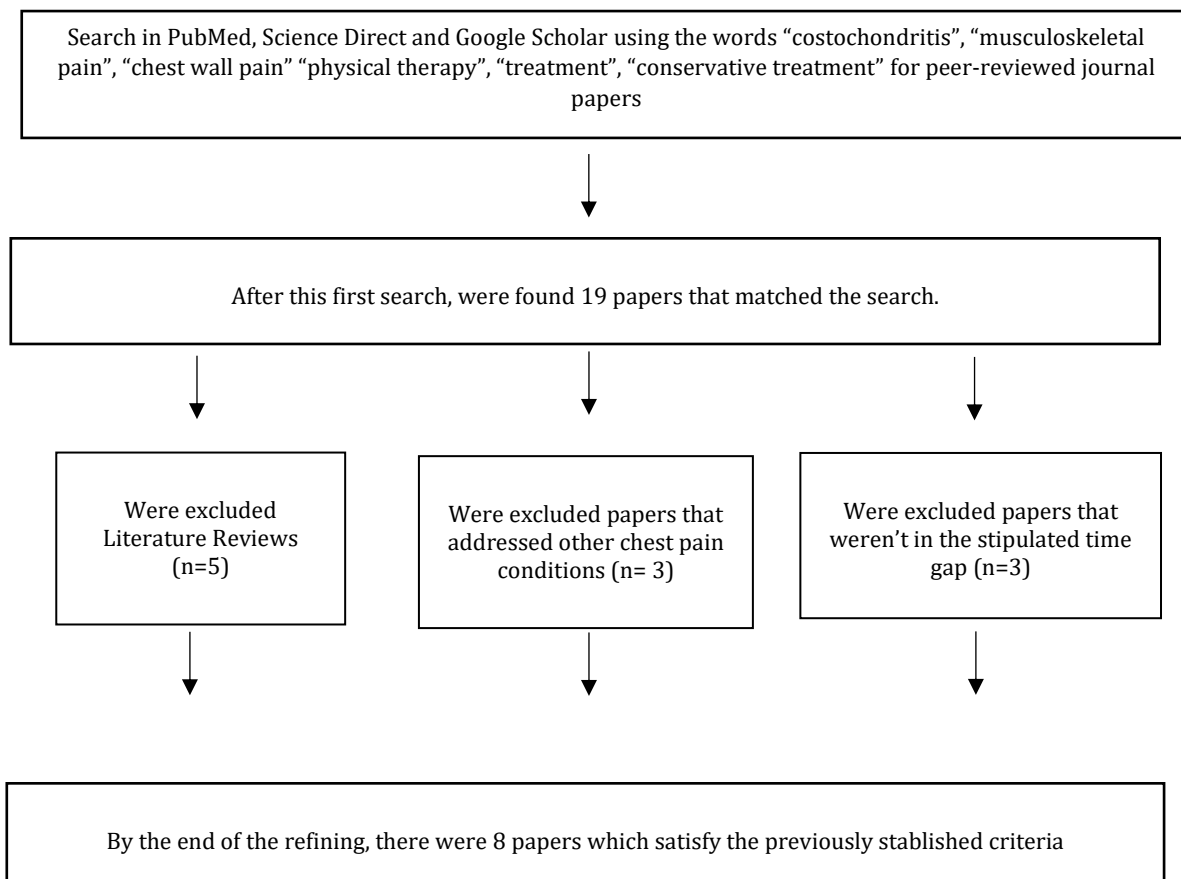
Though there's a lot in literature that shares about the CC condition, there's too little about other treatment strategies apart from the medicament. Apparently, there's no consensus in the literature what treatments options are indicated for this disease (3), and there's a lack of scientific evidence that appoints how other potential treatments may be used to accelerate the healing processes in CC, decreasing the painful condition and allowing athletes to return to their practice as soon as possible.

The main goal of this study was to search in the present literature and analyze the options of non-medicament treatment for costochondritis, in addition to its efficacy. The secondary goal of this study was to observe the literature itself and to investigate the offer of studies that address this subject.

Methods

To perform this literature review, it was used search tools from Google Academic, PubMed and Science Direct to select 8 studies from peer-reviewed Journals (Table 1). Were selected to be included in the review studies which addressed the efficacy of a conservative treatment for costochondritis and were published after 2010. Papers that were published before that year, the ones considered literature reviews and the ones that address other musculoskeletal pain apart from costochondritis were excluded from this project.

The papers choice is illustrated in the flowchart below.



Results

It was difficult to find clinical trials that approach this topic, therefore, the studies brought here by this article are mainly case reports. In the table below, the papers chosen to integrate the review are listed.

Table 1 – Results from the bibliography survey

Title	Author(s)	Journal	Year of publishing	Type of study	Purpose	Conclusion
Treatment of a female collegiate rower with costochondritis: A case report (14)	Grindstaff T, et al.	Journal of manual and manipulative therapy	2010	Case report	It's to bring better understanding about persistent CC examination, evaluation, and treatment in athletes	It suggests that there's a hypomobility in the posterior thoracic facet joints and costovertebral joints. Thereat, a trying to regain motion is observed via hypermobility at the costosternal joint. Potentially, the pain and trauma in the costosternal joint is related to repetitive tissue stress. The study describes Manual Therapy as a plausible intervention to restoring posterior thoracic mobility.
Evaluation and treatment of musculoskeletal chest wall pain in military athlete (15)	Westrick R, et al.	The international Journal of Sports Physical Therapy	2012	Case report	Approach the use of dry needling in Costochondritis evaluation and diagnosis	Dry needling (DN) is seen as a potential strategy for pain relieve and an effective approach to Costochondritis treatment since

						<p>Muscle Trigger Points were attended in Pectoralis Minor. In addition, it was verified that the DN to the costochondral joint and the focal soft tissue tenderness reproduced the patient's familiar pain, which confirms that the current symptoms were mainly musculoskeletal.</p>
<p>Impairment based examination and treatment of costochondritis: a case series(3)</p>	<p>Zaruba R, Wilson E</p>	<p>The international Journal of Sports Physical Therapy</p>	<p>2017</p>	<p>Case report</p>	<p>Identify common impairments and examine the effects of treatment in subjects with costochondritis by analyzing 8 case reports.</p>	<p>The study indicates that the Manual Therapy and therapeutic exercises were competent approach to decrease de CC painful condition. The study also raise an interesting question: Are the CC symptoms due to direct injury at the costochondral region or are they the result of compensation for changes in other areas of the axial skeleton?</p>
<p>Integrating Acupuncture for the Management of Costochondritis in Adolescents (16)</p>	<p>Lin K, Tung C</p>	<p>Medical Acupuncture</p>	<p>2017</p>	<p>Case report</p>	<p>This report describes the integration of acupuncture in the management of costochondritis in pediatric patients</p>	<p>The study approach 3 cases of adolescents with persistent CC and that haven't seen a symptom reduction after the conventional therapy. Therefore, Acupuncture showed itself as an good option as an CC pain-relief.</p>
<p>Ultrasound-guided Intercostal Nerve Block in Chronic Musculoskeletal Chest Pain: A Case Report(17)</p>	<p>Sahu S, Vasudeva A, Handa G</p>	<p>Indian Journal of Physical Medicine & Rehabilitation</p>	<p>2019</p>	<p>Case report</p>	<p>Observe the effect of the Ultrasound-guided intercostal nerve block in costochondritis</p>	<p>The ultrasound-guided intercostal nerve block is appointed as a relatively simple procedure that be effective selected patients.</p>

High-energy Flux Density Extracorporeal Shock-wave Therapy (ESWT) Versus Therapeutic Steroid Injection (IASI) in Costochondritis: A single-blinded, Randomized Controlled Study (18)	Çiftçi H, Gezginaslan Ö	Aktuelle Rheumatology	2021	Clinical trial	The comparison of the effects of ESWT vs. IASI on pain, depression, quality of life, and pressure pain threshold (PPT) in patients with costochondritis	After a single-blinded, randomized, controlled study with 67 patients, it was observed that there wasn't a significantly difference between both groups in what comes to the symptoms decreased, although the ESWT had slightly better results than the IASI group. Both methods may be use in the CC treatment.
Orthopedic manipulative therapeutic approach of costochondral pain after combined strenuous endurance exercise: a case report(19)	Rojas-Valverde D, Ruiz-Yanarella D	Revista Terapeutica	2022	Case report	Present the effectiveness of physiotherapeutic treatment based on manual orthopedic techniques in amateur athletes with costochondritis due to physical strenuous exercise.	Manual therapy is effective to relieve pain increase mobility of cervical rotation, increase mobility of glenohumeral joint (e.g, internal rotation), in an amateur athlete with costochondritis.
Acupuncture appears to be a rapidly effective treatment for costochondritis(20)	Alexander R	Acupuncture in Medicine	2022	Case report	It's to analyze a series of costochondritis cases and its response to acupuncture.	It was shown various cases that report acupuncture as a safe effective treatment for costochondritis. However, further research and more access needed for this therapeutic modality

Discussion

In trying to understand the mechanic pathology of Costochondritis, is important to understand the costochondral joint anatomy. Ribs are structures consisted in bone and cartilage, with the latter serving as an elastic connection between the bony portion of the rib and the sternum. The first rib is connected to the manubrium through a rigid bone structure, the other seven ribs are connected to the sternum via cartilage at synovial-lined joints, and the last two ribs are not connected to the sternum.(2,21)

Respiration, trunk motion and upper extremities movements are related with the costochondral joint movement. Other aspect that is often brought up in papers is the innervation of the thoracic wall, which is supplied mostly by the intercostal nerves and the impingement of these by the overlying rib or cartilage may provoke pain.

It's known that, biomechanically, there's a connection and a strength transmission through the anterior and posterior trunk portions, otherwise, the rib and the thoracic vertebral spine. It's well illustrated by Grindstaff et al. (2010):

The rib and associated thoracic vertebral segment can be described as a fixed ring analogous to a 'hula hoop'. Movement and stress applied at one portion can be transmitted through the entire ring. For example, during thoracic flexion the posterior rib rotates anteriorly (internal torsion) and elevates while the anterior portion of the rib translates inferiorly.

When it comes to postural deviations that may derange the costochondral joint biomechanics, the studies addressed in the Literature Review observed, mainly, the following patterns: hypomobility and restricted range of motion in the upper thoracic spine, with one side more stricken than the other, hypertonia of the pectoralis minor muscle, and, though the strength in the upper body was preserved in most of the cases, a difficult to complete the shoulder adduction movement, referring tenderness and pain in the end of the movement. (14,15,19,22)

The pectoralis minor is a muscle that originates in the costal cartilages of the third to fifth ribs and insert itself at the medial border and coracoid process of scapula. Its main function is, along with other muscles in the region, the scapula stabilization by pulling it downward and anteriorly against the thoracic wall. Also, it's accessory muscle of inspiration, having a part in respiration process.(23)

The hypertonia and contractures in pectoralis minor may be seen as a direct sign related to costochondritis, though, it's not known yet if it's an originator or a consequence of the painful condition.

Apart from acupuncture, which based in working to regulate the energy fluxes in the body, the other treatments shown in the review intended to decrease the pectoralis minor activity, aiming to the muscle returns to its optimal length of contraction, thus, it dialogues with the improvement in the patients CC condition. All of them showed great results in the treatments and allowed patients to return to activity after applied.

However, it's still necessary to expand this niche of research considering that the literature review presented was build up by case reports and this method of study presents limitations. The ideal is to continue the work already begun in these papers, generating other studies that represents a bigger population number.

Conclusion

There are several non-medicament options that may help in the Costochondritis treatment and pain-relief, as it has been seen in the literature review: Manual Therapy, Dry Needling, Acupuncture, Nerve Blocks, Extracorporeal Shockwaves. Also, it was observed a direct relation between the pectoralis minor muscle and the costochondritis. The papers in this review presented great results of these therapies in reducing CC symptoms and allowing the patient to resume his/her sports activities, however, the studies displayed are mainly case reports. Thus, it's necessary to perform more high-evidence studies to prove the efficacy of these treatment methods and to fill the gap of the lack of studies that address Costochondritis.

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