

# Costochondritis: Diagnosis and Treatment

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Costochondritis, an inflammation of costochondral junctions of ribs or chondrosternal joints of the anterior chest wall, is a common condition seen in patients presenting to the physician's office and emergency department. Palpation of the affected chondrosternal joints of the chest wall elicits tenderness. Although costochondritis is usually self-limited and benign, it should be distinguished from other, more serious causes of chest pain. Coronary artery disease is present in 3 to 6 percent of adult patients with chest pain and chest wall tenderness to palpation. History and physical examination of the chest that document reproducible pain by palpation over the costal cartilages are usually all that is needed to make the diagnosis in children, adolescents, and young adults. Patients older than 35 years, those with a history or risk of coronary artery disease, and any patient with cardiopulmonary symptoms should have an electrocardiograph and possibly a chest radiograph. Consider further testing to rule out cardiac causes if clinically indicated by age or cardiac risk status. Clinical trials of treatment are lacking. Traditional practice is to treat with acetaminophen or anti-inflammatory medications where safe and appropriate, advise patients to avoid activities that produce chest muscle overuse, and provide reassurance. (*Am Fam Physician*. 2009;80(6):617-620. Copyright © 2009 American Academy of Family Physicians.)

► **Patient information:**  
A handout on costochondritis, written by the authors of this article, is available at <http://www.aafp.org/afp/20090915/617-s1.html>.

**C**ostochondritis is a common condition seen in patients presenting to the physician's office and emergency department.<sup>1-4</sup> It is also known as costosternal syndrome, parasternal chondrodynia, or anterior chest wall syndrome. Costochondritis is often confused with Tietze syndrome, a similar but rarer disorder involving swelling of a single costal cartilage, usually of the second rib (*Table 1*).<sup>2</sup>

## Definition

Costochondritis is a self-limited condition defined as inflammation of costochondral

junctions of ribs or chondrosternal joints, usually at multiple levels and lacking swelling or induration. Pain is reproduced by palpation of the affected cartilage segments and may radiate on the chest wall.<sup>5</sup>

Tietze syndrome is an inflammatory process causing visible enlargement of the costochondral junction. It occurs in a single rib 70 percent of the time, usually within costal cartilages of ribs two through three, predominantly in rib two.<sup>1,2,6</sup> Infectious, rheumatologic, and neoplastic processes may cause it. Infection is particularly associated with chest wall trauma, such as in patients with stab wounds, postsurgical patients, and those who use intravenous drugs.<sup>7-9</sup> Less common causes include primary neoplasms of the rib, lung, pleura, and muscle, and metastatic disease to the costal cartilage.<sup>10</sup>

## Anatomy

The diagnosis of costochondritis relies on patient history and physical examination findings; therefore, understanding of the chest anatomy is important. Ribs consist of bone and cartilage, with cartilage serving as an elastic bridge between the bony portion of the rib and the sternum.<sup>8</sup> Anteriorly, the costal cartilage of the first rib connects with the manubrium via a rigid fusion of bone and cartilage. The next seven pairs of ribs articulate

**Table 1. Tietze Syndrome and Costochondritis**

Feature	Tietze syndrome	Costochondritis
Prevalence	Rare	More common
Age	Younger than 40 years	Older than 40 years
Number of sites affected	One (in 70 percent of patients)	More than one (in 90 percent of patients)
Costochondral junctions most commonly affected	Second and third	Second to fifth
Local swelling	Present	Absent

Adapted with permission from Fam AG. Approach to musculoskeletal chest wall pain. *Prim Care*. 1988;15(4):773.

**SORT: KEY RECOMMENDATIONS FOR PRACTICE**

Clinical recommendation	Evidence rating	References
Electrocardiography and chest radiography are recommended for patients suspected of having costochondritis who are older than 35 years or for any patient with signs and symptoms of coronary artery disease, infection, or other serious conditions.	C	21, 22
Treatment of costochondritis consists of analgesia, rest, and reassurance. Rarely is physical therapy or combined lidocaine (Xylocaine)/corticosteroid injections of the costochondral joints needed.	C	16, 17

A = consistent, good-quality patient-oriented evidence; B = inconsistent or limited-quality patient-oriented evidence; C = consensus, disease-oriented evidence, usual practice, expert opinion, or case series. For information about the SORT evidence rating system, go to <http://www.aafp.org/afpsort.xml>.

with the sternum via cartilage at synovial-lined joints. Ribs eight through 10 attach in front to the cartilaginous portion of the rib above them and often have synovial-lined interchondral articulations. The lowest two ribs do not articulate with any structure anteriorly.<sup>2,11</sup> The ribs move with respiration and with truncal motion or movement of the upper extremities. The innervation of the thoracic wall is supplied mostly by the intercostal nerves. Impingement of these nerves by movement of the overlying rib or cartilage can cause pain.<sup>12</sup> The shoulder girdle muscles develop in the lower cervical region and carry this innervation with them as they move to attach to the chest wall. Thus, cervical or shoulder problems may refer pain to the chest wall.<sup>2</sup>

## Epidemiology

Costochondritis can affect children as well as adults. A study of chest pain in an outpatient adolescent clinic found that 31 percent of adolescents had musculoskeletal causes, with costochondritis accounting for 14 percent of adolescent patients with chest pain.<sup>4</sup> In this series, no definite cause of chest pain was found in 39 percent of cases.<sup>4</sup> In a prospective series of children three to 15 years of age presenting to an emergency department or cardiac clinic with chest pain, chest wall pain was the most common diagnosis, with respiratory and psychogenic conditions the next most common diagnoses.<sup>13</sup>

Costochondritis is a common diagnosis in adults with acute chest pain. It is present in 13 to 36 percent of these patients, depending on the study and the patient setting.<sup>1-3,6</sup> In a prospective study of adult patients presenting to an emergency department with chest pain, 30 percent had costochondritis.<sup>1</sup> A prospective study of episodes of care for chest pain in a primary care office network found musculoskeletal causes in 20 percent of episodes of care, with costochondritis responsible for 13 percent.<sup>14</sup> These data are similar to a study of patients with noncardiac chest pain that found reproducible chest wall tenderness (although not specifically defined as costochondritis) in 16 percent of patients.<sup>3</sup> A European study found a higher prevalence of musculoskeletal diagnoses in patients with chest pain

presenting in primary care settings compared with hospital settings (20 versus 6 percent, respectively).<sup>15</sup>

## Diagnosis

### HISTORY AND PHYSICAL EXAMINATION

The primary symptom of costochondritis is chest wall pain of varying intensity, typically described as sharp, aching, or pressure-like. The pain is often exacerbated by upper body movement, deep breathing, and exertional activities.<sup>3</sup> History of an antecedent illness with coughing, recent strenuous exercise, or physical activities that stress the upper extremity is common. Although the second to fifth costochondral joints are most often affected, especially ribs three and four, any of the seven costochondral junctions can be involved. Pain can be noted at more than one location, but most often is unilateral.

Pain that is reproduced by palpation of the typically affected areas suggests costochondritis, but depends on the exclusion of underlying causes (Table 2)<sup>1,2,7,8,12,16-20</sup>. Although pain reproduced by chest wall palpation is considered atypical for a cardiac cause, it does not exclude it. In a study of costochondritis in an emergency department, 6 percent of patients with pain reproduced by chest wall palpation were also diagnosed with myocardial infarction, compared with 27 percent of the control group who had chest pain without pain to palpation.<sup>1</sup> In another study of noncardiac chest pain in an emergency department, almost 3 percent of patients had adverse coronary events at 30 days follow-up.<sup>21</sup>

Chest wall examination should include palpation with gentle pressure of the anterior, posterior, and lateral thoracic area, noting areas of tenderness. Discrete areas of tenderness can be better localized by palpation with a single digit. Palpation of the cervical spine, clavicle, shoulders, and thoracic and lumbar spine must be included. Movement of the rib cage can be assessed with deep breathing exercises. The effect of upper extremity movement on pain should also be noted, because moving the arm on the affected side will usually cause pain.<sup>2,11</sup> Examination should also include auscultation of the heart and lungs, and examination of the skin for herpes zoster rash.

**Table 2. Differential Diagnosis and Treatment of Chest Wall Conditions**

Condition	Diagnostic considerations	Treatment principles
Arthritis of sternoclavicular, sternomanubrial, or shoulder joints	Tenderness to palpation of specific joints of the sternum; evidence of joint sclerosis can be seen on radiography	Analgesics, intra-articular corticosteroid injections, physiotherapy <sup>16,17</sup>
Costochondritis	Tenderness to palpation of costochondral junctions; reproduces patient's pain; usually multiple sites on same side of chest <sup>2</sup>	Simple analgesics; heat or ice; rarely, local anesthetic injections or steroid injections <sup>16,17</sup>
Destruction of costal cartilage by infections or neoplasm	Bacterial or fungal infections or metastatic neoplasms to costal cartilages; infections seen postsurgery or in intravenous drug users; chest computed tomography imaging useful to show alteration or destruction of cartilage and extension of masses to chest wall; gallium scanning may be helpful in patients with infection	Antibiotics or antifungal drugs; surgical resection of affected costal cartilage; treatment of neoplasm based on tissue type <sup>7,8</sup>
Fibromyalgia	Symmetric tender points at second costochondral junctions, along with characteristic tender points in the neck, back hip, and extremities, and widespread pain <sup>2,16</sup>	Graded exercise is beneficial; cyclobenzaprine (Flexeril), antidepressants, and pregabalin (Lyrica) may be beneficial <sup>18</sup>
Herpes zoster of thorax	Clusters of vesicles on red bases that follow one or two dermatomes and do not cross the midline; usually preceded by a prodrome of pain; postherpetic neuralgia is common <sup>19</sup>	Oral antiviral agents (e.g., acyclovir [Zovirax], famciclovir [Famvir], valacyclovir [Valtrex]); analgesics as needed for pain; may require narcotics or topical lidocaine patches (Lidoderm) to control pain <sup>19</sup>
Painful xiphoid syndrome	Tenderness at sternoxiphoid joint or over xiphoid process with palpation <sup>20</sup>	Usually self-limited unless associated with congenital deformity of xiphoid; analgesics; rarely, corticosteroid injections <sup>20</sup>
Slipping rib syndrome	Tenderness and hypermobility of anterior ends of lower costal cartilages causing pain at lower anterior chest wall or upper abdomen; diagnosis by "hooking maneuver": curving fingers under costal margin and gently pulling anteriorly—a "click" and movement is felt that reproduces patient's pain <sup>2,12</sup>	Rest, physiotherapy, intercostal nerve blocks; or, if chronic and severe: surgical removal of hypermobile cartilage segment <sup>12</sup>
Tietze syndrome	A single tender and swollen, but nonsupportive costochondral junction; usually in costochondral junction of ribs two or three <sup>1,2</sup>	Simple analgesics; usually self-limiting; rarely, corticosteroid injections <sup>2,16</sup>
Traumatic muscle pain and overuse myalgia	History of trauma to chest or recent new onset of strenuous exercise to upper body (e.g., rowing); may be bilateral and affecting multiple costochondral areas; muscle groups may also be tender to palpation <sup>2</sup>	Simple analgesics; refrain from doing or reduce intensity of strenuous activities that provoke pain <sup>2,16</sup>

Information from references 1, 2, 7, 8, 12, and 16 through 20.

## DIAGNOSTIC TESTING

Patients older than 35 years, those with a history or risk of coronary artery disease, and patients with cardio-pulmonary symptoms should have electrocardiography and, possibly, chest radiography. Further testing should be considered to rule out a cardiac cause if clinically indicated by age or cardiac risk status.<sup>1,21,22</sup>

Patients with fever, cough, chest wall swelling, or other respiratory findings on history or examination should have chest radiography. Imaging of the chest with computed tomography (CT) can delineate pathology in

costal cartilages and rule out underlying pathology, such as tumors.<sup>23</sup> CT imaging should be reserved for cases in which there is high suspicion of infectious or neoplastic processes. Nuclear scanning with technetium 99 scintigraphy has been studied to determine its usefulness in identifying patients with costochondritis, but was not found to be specific for the diagnosis.<sup>24</sup> Signs of inflammation have been seen on gallium or bone scanning in scattered case reports of chest wall infections,<sup>8,25,26</sup> but in only one case report of costochondritis.<sup>16</sup>

Routine laboratory testing is not necessary in patients

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with suspected costochondritis unless the diagnosis is uncertain or if fever or signs of inflammation are present. Screening patients with costochondritis for rheumatologic conditions will result in a low yield unless there are other systemic symptoms (e.g., morning stiffness, widespread pain, signs of an arthritic or rheumatologic cause).<sup>2</sup>

### Treatment

There have been no clinical trials of treatment for costochondritis. Treatment is usually directed at pain relief with acetaminophen, nonsteroidal anti-inflammatory drugs when safe and appropriate, or other analgesics. Applying heat with compresses or heating pads can help, particularly in the case of muscle overuse. Minimizing activities that provoke the symptoms (e.g., reducing the frequency or intensity of exercise or work activities) or using cough suppressants may also help relieve symptoms.<sup>16</sup> Physical therapy has also been used for musculoskeletal chest pain.<sup>17</sup> Refractory cases of costochondritis can be treated with local injections of combined lidocaine (Xylocaine)/corticosteroid into costochondral areas if severe; however, this is rarely necessary.<sup>16</sup>

The course of the condition is variable, lasting from weeks to months, but usually abating by one year. One prospective study found that one third of patients had persistent chest wall tenderness at one year.<sup>17</sup> Adolescents may also have a chronic course.<sup>4</sup> Patients with costochondritis should be educated and reassured that this is a benign condition that will eventually resolve itself.

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### REFERENCES

- Disla E, Rhim HR, Reddy A, Karten I, Taranta A. Costochondritis. A prospective analysis in an emergency department setting. *Arch Intern Med.* 1994;154(21):2466-2469.
- Fam AG. Approach to musculoskeletal chest wall pain. *Prim Care.* 1988;15(4):767-782.
- Wise CM, Semble EL, Dalton CB. Musculoskeletal chest wall syndromes in patients with noncardiac chest pain: a study of 100 patients. *Arch Phys Med Rehabil.* 1992;73(2):147-149.
- Pantell RH, Goodman BW Jr. Adolescent chest pain: a prospective study. *Pediatrics.* 1983;71(6):881-887.
- Costochondritis. Stedman's Online Medical Dictionary. <http://www.stedmans.com/section.cfm/45>. Accessed April 15, 2009.
- Kayser HL. Tietze's syndrome: a review of the literature. *Am J Med.* 1956;21(6):982-989.
- Zapatero J, López Longo J, Monteagudo I, Carreño L. Costal chondritis in heroin addicts: a comparative study with postsurgical chondritis. *Br J Dis Chest.* 1988;82(4):341-346.
- Chicarilli ZN, Ariyan S, Stahl RS. Costochondritis: pathogenesis, diagnosis, and management considerations. *Plast Reconstr Surg.* 1986;77(1):50-59.
- Heckenkamp J, Helling HJ, Rehm KE. Post-traumatic costochondritis caused by *Candida albicans*. Aetiology, diagnosis and treatment. *Scand Cardiovasc J.* 1995;31(3):165-167.
- Meyer CA, White CS. Cartilaginous disorders of the chest. *Radiographics.* 1998;18(5):1109-1123.
- Bickley LS, Szilagyi PG. *Bates' Guide to Physical Examination and History Taking*. 8th ed. Philadelphia, Pa.: Lippincott Williams & Wilkins; 2003.
- Saltzman DA, Schmitz ML, Smith SD, Wagner CW, Jackson RJ, Harp S. The slipping rib syndrome in children. *Paediatr Anaesth.* 2001;11(6):740-743.
- Massin MM, Bourguignont A, Coremans C, Comté L, Lepage P, Gérard P. Chest pain in pediatric patients presenting to an emergency department or to a cardiac clinic. *Clin Pediatr (Phila).* 2004;43(3):231-238.
- Klinkman MS, Stevens D, Gorenflo DW. Episodes of care for chest pain: a preliminary report from MIRNET. Michigan Research Network. *J Fam Pract.* 1994;38(4):345-352.
- Buntinx F, Knockaert D, Bruyninckx R, et al. Chest pain in general practice or in the hospital emergency department: is it the same? *Fam Pract.* 2001;18(6):586-589.
- How J, Volz G, Doe S, Heycock C, Hamilton J, Kelly C. The causes of musculoskeletal chest pain in patients admitted to hospital with suspected myocardial infarction. *Eur J Intern Med.* 2005;16(6):432-436.
- Spalding L, Reay E, Kelly C. Cause and outcome of atypical chest pain in patients admitted to hospital. *J R Soc Med.* 2003;96(3):122-125.
- DynaMed. Fibromyalgia. <http://www.ebscohost.com/dynamed> (subscription required). Accessed April 15, 2009.
- DynaMed. Zoster. <http://www.ebscohost.com/dynamed> (subscription required). Accessed April 15, 2009.
- Gregory PL, Biswas AC, Batt ME. Musculoskeletal problems of the chest wall in athletes. *Sports Med.* 2002;32(4):235-250.
- Miller CD, Lindsell CJ, Khandelwal S, et al. Is the initial diagnostic impression of "noncardiac chest pain" adequate to exclude cardiac disease? [published correction appears in Ann Emerg Med. 2005;45(1):87]. *Ann Emerg Med.* 2004;44(6):565-574.
- Cayley WE Jr. Diagnosing the cause of chest pain. *Am Fam Physician.* 2005;72(10):2012-2021.
- Hamburg C, Abdelwahab IF. Reliability of computed tomography in the initial diagnosis and follow-up evaluation of Tietze's syndrome: case report with review of the literature. *J Comput Tomogr.* 1987;11(1):83-87.
- Mendelson G, Mendelson H, Horowitz SF, Goldfarb CR, Zumoff B. Can (99m) technetium methylene diphosphonate bone scans objectively document costochondritis? *Chest.* 1997;111(6):1600-1602.
- Ikehira H, Kinjo M, Nagase Y, Aoki T, Ito H. Acute pan-costochondritis demonstrated by gallium scintigraphy. *Br J Radial.* 1999;72(854):210-211.
- Caruana V, Swayne LC. Gallium detection of *Salmonella* costochondritis. *J Nucl Med.* 1988;29(12):2004-2007.