



# STEMI With Musculoskeletal Chest Pain: A Case Report

**Urgent Message:** Reproducible chest wall pain is often considered a symptom that indicates a musculoskeletal diagnosis. However, it should not be used as the sole criterion for ruling out acute coronary syndrome, especially in high-risk populations.

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**Key Words:** STEMI; Reproducible Chest Pain; Atypical ACS; Urgent Care Evaluation

## Abstract

**Introduction:** Chest pain remains a leading cause of emergency department (ED) visits, and its differential encompasses both life-threatening and benign conditions. In the United States, the lifetime prevalence of chest pain is 20-40%.

**Case Presentation:** A 43-year-old woman presented with chest pain radiating to her jaw and back. Associated symptoms included dyspnea and nausea without emesis. She denied diaphoresis and lower extremity edema or pain. Examination of the chest wall revealed reproducible tenderness upon palpation.

**Discussion:** The reproducibility of chest pain upon palpation has long been associated with musculoskeletal conditions, however, reproducible chest pain does not definitively exclude cardiac causes. Approximately 10-15% of patients presenting with acute coronary syndrome (ACS) may have reproducible pain. In atypical presentations, ACS may manifest differently.

**Conclusion:** Reproducible chest wall pain is often considered a symptom that indicates a musculoskeletal dia-



gnosis. However, it should not be used as the sole criterion for ruling out ACS. This limitation highlights the need for healthcare providers to maintain a high degree of awareness and scrutiny when evaluating atypical symptoms, particularly among specific populations that are at greater risk for a missed ACS diagnosis, including women, the elderly, and those living with diabetes.

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## Introduction

Chest pain remains a leading cause of emergency department (ED) visits, and its differential encompasses both life-threatening and benign conditions. In the United States, the lifetime prevalence of chest pain is 20-40%.<sup>1</sup> A patient's description of symptoms can help providers rule in or rule out acute coronary syndrome (ACS).

Symptoms such as tightness, squeezing, or heaviness in the chest, abdomen, or back are consistent with ACS, but a description of sharp or fleeting pain is less likely to represent myocardial ischemia.<sup>2</sup> Of patients presenting to the ED with chest pain, only 5.1% will have an ACS, and more than half will have a noncardiac cause.<sup>3</sup>

Reproducible chest pain is defined as discomfort that can be elicited by certain movements or palpation. Reproducibility of chest pain on palpation is typically attributed to noncardiac etiologies, potentially delaying recognition of ACS.<sup>1,4,5</sup> While traditional teaching suggests that cardiac pain is not reproducible, emerging evidence highlights exceptions to this rule.<sup>2</sup>

This case explores a presentation of ST-segment elevation myocardial infarction (STEMI) with reproducible chest wall pain, while also examining how presentations in women, elderly patients, and those with diabetes can differ from conventional, "typical" descriptions.

## Case Presentation

A 43-year-old woman presented to urgent care with chest pain radiating to her jaw and back. She initially had chest pain 2 days before, which had resolved. The patient described the pain as squeezing, radiating to her back, and pleuritic. Associated symptoms included dyspnea, nausea without emesis, but no diaphoresis or lower extremity edema or pain. The patient had a history of panic attacks but described this as a different pain than she had previously experienced.

Past medical history included systemic lupus erythematosus (SLE), chronic pain, and morbid obesity. She was a current smoker with a 2-pack-per-day history. She had no family history of cardiac events to her knowledge.

## Physical Exam

On physical examination, the patient's vital signs were significant for elevated blood pressure (161/105); tachypnea (31 breaths per minute); and morbid obesity (body mass index of 56.8). She was alert and oriented. Cardiac auscultation revealed normal heart sounds without murmurs, and her lungs were clear bilaterally. Her

abdomen was soft and nontender, and her extremities were without swelling or pain with equal pulses bilaterally. Examination of the chest wall revealed reproducible tenderness upon palpation of her left anterior chest wall.

*"In a patient with chest pain, obtaining a thorough history is essential for guiding the diagnostic process and narrowing the differential."*

## Differential Diagnosis

The differential diagnosis for chest pain includes a wide array of etiologies, many of which are life threatening and should be considered even when the physical exam reveals reproducible chest pain on palpation. In a patient with chest pain, obtaining a thorough history is essential for guiding the diagnostic process and narrowing the differential. Alongside troponin levels, electrocardiogram (ECG) findings, imaging, and other diagnostic tests, the patient's own description of their symptoms provides critical insight into the diagnosis. The PQRSTU mnemonic (**Table 1**) offers a structured approach to capturing these key historical details.<sup>6</sup> **Table 2** provides a mnemonic to help remember key life-threatening etiologies of chest pain.<sup>7</sup>

For patients with reproducible, radiating chest pain, important life threatening and non-life-threatening etiologies include the following:

- Acute coronary syndrome encompasses a range of cardiac conditions including unstable angina and myocardial infarction, typically presenting with chest pain described as pressure or squeezing. It is often accompanied by diaphoresis, nausea, and dyspnea. Diagnosis relies on ECG changes and elevated cardiac biomarkers, as recommended by the American College of Cardiology and American Heart Association.<sup>1</sup>
- Musculoskeletal pain is a common cause of chest discomfort and usually results from muscle strain, costochondritis, or trauma. The pain tends to be reproducible on palpation or movement and is often localized, without associated systemic symptoms.<sup>1,4,8</sup>

Table 1. PQRSTU Mnemonic For Thorough History Taking For Pain <sup>6</sup>	
Category	Description
P – Provocation/Palliation	What triggers the pain or makes it better or worse?
Q – Quality	What does the pain feel like? (eg, sharp, dull, burning)
R – Region/Radiation	Where is the pain, and does it spread?
S – Severity	How intense is the pain? (typically rated on a scale of 0 to 10)
T – Timing	When did the pain start, and is it constant or intermittent?
U – Understanding	What does the patient think is causing the pain?

- Pulmonary embolism can present with sudden onset pleuritic chest pain, dyspnea, and hypoxia. It may be accompanied by tachycardia, hemoptysis, and signs of deep vein thrombosis. Diagnostic evaluation includes D-dimer testing and imaging such as computed tomography pulmonary angiography, as outlined by the American College of Cardiology.<sup>1,4</sup>
- Thoracic aortic dissection typically manifests with sudden, severe, tearing chest and/or back pain (often between the shoulder blades). Occasionally, it may even radiate to the abdomen if the dissection extends into the abdominal aorta. It may cause differential blood pressures in the limbs, pulse deficits, or neurological symptoms if branches of the aorta are involved. Imaging with computed tomography angiography is essential for diagnosis.<sup>1,4</sup>
- Chronic obstructive pulmonary disease acute exacerbation presents with worsening dyspnea, cough, and sputum production. Chest discomfort may be present secondary to increased work of breathing or associated infections. Physical examination and arterial blood gases assist in assessment and diagnosis.<sup>1</sup>
- Pericarditis is characterized by sharp, pleuritic chest pain that improves when sitting forward. A pericardial friction rub may be heard on cardiac auscultation. Electrocardiogram typically shows diffuse ST elevation and PR depression, and echocardiography can reveal pericardial effusion.<sup>1,9</sup>
- Herpes zoster can cause localized chest pain prior to the characteristic vesicular rash in a dermatomal distribution. The pain is often burning or shooting in nature and may be accompanied by sensory disturbances. Early recognition is essential for prompt antiviral treatment.<sup>1</sup>

### Final Diagnosis

In urgent care, the patient's initial ECG showed ST elevations in the anterior-lateral leads, consistent with

Table 2. PETMAC Mnemonic For Life-Threatening Causes of Chest Pain<sup>7</sup>

Letter	Condition(s)
P	Pulmonary embolism, pericarditis, pneumonia
E	Esophageal rupture (Boerhaave syndrome)
T	Tension pneumothorax
M	Myocardial infarction
A	Aortic dissection/aneurysm
C	Cardiac tamponade, cardiac valve pathology, congestive heart failure

STEMI. Upon ED evaluation, her initial troponin levels were <0.03 ng/mL (negative). Troponin levels were repeated and were slightly elevated at 10 ng/mL 2 hours after the initial troponin level. The patient's chest x-ray was unremarkable. A computed tomography angiography (CTA) ruled out pulmonary embolism, cardiac tamponade, esophageal rupture, and aortic dissection.

In regard to management of a patient with suspected ACS, if the ECG is normal, troponin levels need to be repeated every 3-6 hours.<sup>10</sup> The repeat troponins can help identify a non-ST-elevation myocardial infarction (NSTEMI).

### Disposition

The patient received emergency treatment for STEMI with dual antiplatelet therapy using ticagrelor and low-dose heparin. Cardiac catheterization showed an occlusion in the mid-left anterior descending artery, consistent with the ECG changes, which was successfully treated with stent placement.

After percutaneous coronary intervention (PCI), the patient had transient runs of nonsustained ventricular tachycardia, which were managed with beta-blockers.

An echocardiogram confirmed a new diagnosis of heart failure with a mildly reduced ejection fraction of 40-45%. The patient was discharged home on optimized medical therapy.

## Discussion

The reproducibility of chest pain upon palpation has long been associated with musculoskeletal conditions, leading healthcare providers to maintain a lower level of suspicion for ACS. However, reproducible chest pain does not definitively exclude cardiac causes, as approximately 10-15% of patients presenting with ACS may have reproducible pain.<sup>8,11</sup> Grani et al. found that although reproducible chest wall tenderness was associated with a lower likelihood of ACS (negative predictive value of 98.1%), a small proportion of ACS patients still exhibited reproducible pain.<sup>12</sup> Additionally, non-reproducible chest pain had high sensitivity for ACS (92.9%), yet specificity remained low, emphasizing that history and physical exam alone are insufficient for ruling out cardiac etiologies.<sup>13</sup>

*“The presentation of ACS can vary significantly among demographic groups, particularly women, elderly individuals, and patients with diabetes.”*

Though this patient had reproducible chest pain, possibly indicating a decreased risk of a cardiac etiology, the patient did have multiple cardiac risk factors, including smoking, lupus, and obesity. Her history included associated dyspnea and she did not have a defined mechanism of muscular strain. The clinician astutely performed an ECG, which then revealed the STEMI diagnosis and led to the ED evaluation and management. A consideration for the pleuritic aspect of her pain included pulmonary embolism (PE); a consideration for the pain radiating to the back included thoracic aortic dissection. These were both excluded with a chest CTA.

### Variation in Acute Coronary Syndrome Presentations

The presentation of ACS can vary significantly among demographic groups, particularly women, elderly individuals, and patients with diabetes. These variations in symptomatology often diverge from the “typical” presentations that are commonly taught in medical education. Such differences can lead to delays in diagnosis and treatment for these populations, resulting

in increased morbidity and mortality rates.

For instance, women experiencing ACS are generally more likely to report symptoms such as extreme fatigue, shortness of breath, nausea, and discomfort radiating to the back or jaw in addition to chest pain.<sup>4</sup> Women are also more likely to present with 3 or more symptoms compared to men.<sup>1</sup> Factors such as hormonal and physiological differences, as well as a higher prevalence of microvascular disease, may contribute to these additional symptoms.<sup>11</sup>

In older adults, the manifestations of ACS can be notably different, often presenting as shortness of breath, dizziness, or generalized weakness rather than the classic symptom of chest pain.<sup>9</sup> Adults  $\geq 75$  years of age constitute 30%-40% of all hospitalized patients with ACS.<sup>7</sup> While older adults may present with noncardiac symptoms, they are the majority of hospitalized ACS patients and require a more extensive cardiac workup compared to younger adults.

Patients with diabetes often face the challenge of silent ischemia or may exhibit fewer or less severe symptoms.<sup>6</sup> Consequently, symptoms such as fatigue, indigestion, or epigastric discomfort can dominate their clinical presentation, frequently delaying the diagnosis and timely intervention that are crucial for the effective management of their condition.<sup>8</sup> Approximately 25-30% of patients admitted for ACS have diabetes.<sup>1</sup> Combining these considerations with the 1-dimensional presentation often taught in medical education helps highlight the importance of thoroughly considering various presentations and keeping ACS on the differential diagnosis.

### Diagnostic Considerations

Notably, the term “noncardiac” is preferred over “atypical” to describe presentations where heart disease is not suspected.<sup>4</sup> The terms cardiac vs noncardiac are more specific and help lead to the underlying diagnosis.<sup>1</sup>

Body et al. and Swap et al. have indicated that chest pain radiating to the arms, jaw, neck, or shoulder is more strongly associated with myocardial infarction than chest pain without radiation.<sup>2,13</sup>

### Ethics Statement

The patient was unable to be contacted because she was lost to follow-up, and therefore, demographics and some details of the case were changed to protect patient anonymity and confidentiality.

### Takeaway Points

- Reproducible chest wall pain is often considered a

symptom that indicates a musculoskeletal diagnosis. However, it should not be used as the sole criterion for ruling out ACS.

- Healthcare professionals need to maintain a high degree of awareness and scrutiny when evaluating atypical ACS symptoms, particularly among specific populations including women, the elderly, and those living with diabetes.
- Women with ACS may experience more subtle or noncardiac signs, such as fatigue or shortness of breath, which could easily be overlooked or attributed to other causes.
- Elderly patients and those with diabetes may have a varied presentation of ACS or other comorbidities that mask the signs of a cardiac event. ■

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