

## Xiphodynia Mimicking Acute Coronary Syndrome

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### Abstract

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A 79-year-old man with diabetes and partial gastrectomy visited our hospital due to gradually worsening epigastric pain on exertion. Unstable angina was suspected and coronary angiography was performed, which revealed severe stenosis of the left ascending artery. Despite successful intervention, the pain persisted. A careful physical examination finally revealed the point of tenderness on the xiphoid process, and the patient was diagnosed with xiphodynia. The severe epigastric pain resolved immediately after xiphoidectomy. This case demonstrates that symptoms of xiphodynia may mimic those of various types of disorders, such as angina, and that careful palpation is warranted during routine physical examinations.

**Key words:** angina, epigastric pain, xiphoid process, xiphodynia, xiphoidectomy

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### Introduction

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The differential diagnosis of epigastric pain includes a variety of mild to severe diseases, and clinicians should pay careful attention to patients with epigastric pain in order to avoid excluding serious diseases, such as angina. Xiphodynia is a rare musculoskeletal disorder associated with a number of symptoms, including chest, abdominal, shoulder and back pain, which mimic symptoms of many serious abdominal and thoracic disorders. Although the incidence of xiphodynia is not well understood, it is likely that many cases are missed due to the difficulty in diagnosing the condition. The diagnosis of xiphodynia is based primarily on the findings of physical examinations, and palpation of the xiphoid is warranted. We herein present the case of a man with anginal pain on exertion who complained of refractory epigastric pain despite successful percutaneous coronary intervention and in whom the source of pain could not be determined, even after a systemic work-up.

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### Case Report

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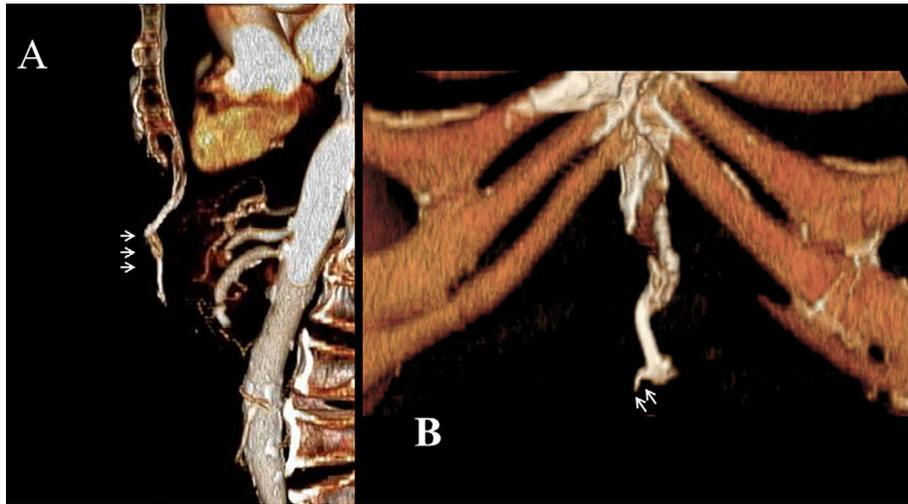
A 79-year-old man with a history of stroke, diabetes and partial gastrectomy for gastric cancer was admitted to our hospital due to epigastric pain on exertion. One week prior to admission, the exercise-related epigastric pain had worsened gradually in both intensity and duration. The pain was not accompanied by sweating or radiating pain. A physical examination demonstrated no heart murmurs, Murphy's sign, McBurney's point of tenderness, muscular defense or abnormal bowel sounds. A surgical scar from the previous gastrectomy was observed around the epigastric region. Blood tests revealed a normal liver function and no neutrophilic leukocytosis or elevation of creatine kinase or lactate dehydrogenase. The C-reactive protein level was 0.1 mg/dL. Electrocardiography showed a normal sinus rhythm, with no ST segment elevation or depression, abnormal Q waves or poor R-wave progression. Moreover, a normal left ventricular function was noted in addition to the absence of ventricular asynergy, remarkable valvular disease, flaps in the ascending aorta and pericardial effusion. Upper gastroscopy was negative for ulcers and malignancy. Due to the patient's

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**Figure 1.** Computed tomography images of the elongated xiphoid process and spine-like projection. A: Sagittal plane image of the elongated xiphoid process (arrows). B: Coronal plane image of the elongated xiphoid process and spine-like projection (arrows).



**Figure 2.** Intraoperative findings of the elongated xiphoid process and resected tissue. The elongated xiphoid process had a spine-like projection on the right side of the tip (large and small arrows).

recurrent epigastric pain on exertion and multiple coronary risk factors, including his advanced age, male sex and history of diabetes, we suspected unstable angina and performed coronary angiography. The coronary angiography examination subsequently revealed 90% stenosis in the proximal left anterior descending artery according to the American Heart Association classification, for which percutaneous coronary intervention (PCI) was performed. Pre-procedural intravascular ultrasound revealed that the severe stenosis was complicated by abundant vulnerable plaques and positive remodeling. Additionally, the minimal luminal area (MLA) in the culprit region was 0.8 mm<sup>2</sup>, and we hence successfully performed PCI without any complications.

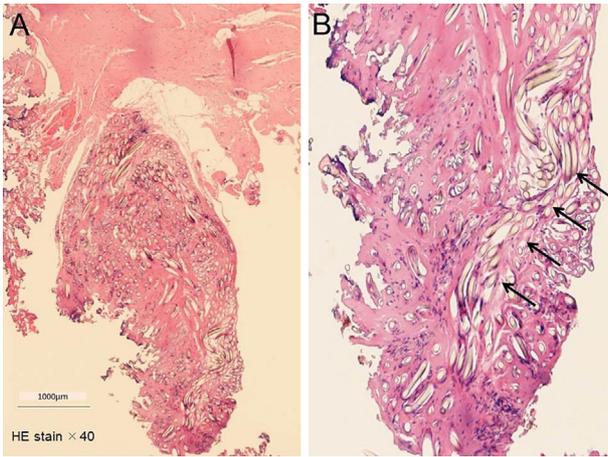
However, the patient continued to complain of the same epigastric pain even after percutaneous coronary intervention. A stress thallium scan was negative for myocardial ischemia, and colonoscopy showed no notable findings. Interestingly, contrast-enhanced computed tomography (CT)

demonstrated marked elongation of the xiphoid process (>5 cm) along the abdominal surgical scar (Fig. 1A, arrows); however, magnetic resonance imaging revealed no inflammation around the xiphoid. Moderate pressure on the xiphoid process induced epigastric pain and indicated a point of tenderness adjacent to the right side of the elongated xiphoid tip. A spine-like projection was observed at the tip of the xiphoid (Fig. 1B, arrows), coinciding with the point of tenderness. We therefore suspected xiphodynia and prescribed acetaminophen and non-steroidal anti-inflammatory drugs. However, neither analgesic was effective. Furthermore, tramadol, morphine and selective serotonin reuptake inhibitors failed to relieve the patient's pain, and he experienced a decreased appetite and weight loss (6 kg within two months) secondary to the pain. The administration of local anesthetic-steroid combination therapy, which has been reported to provide relief in some cases of xiphodynia (1), had a limited effect. Therefore, we decided to perform xiphoidectomy for pain relief (Fig. 2), which has been shown to be effective in a few previous case reports (2, 3).

The elongated xiphoid process had a spine-like projection on the right side of the tip (Fig. 2, large and small arrows), compatible with the CT findings. A histological examination revealed that the resected xiphoid process consisted of thin cartilage and fibrous and fatty tissue (Fig. 3A), whereas the spine-like projection was composed of fibrous tissue and sutures (Fig. 3B, arrows). Moreover, no signs of neoplasm or malignancy were observed. The severe epigastric pain resolved immediately after xiphoidectomy, with no relapse for at least seven months.

## Discussion

Xiphodynia is a rare musculoskeletal disorder causing various symptoms, including chest, abdominal, shoulder and



**Figure 3.** A: Histological findings of the spine-like projection of the xiphoid process. Hematoxylin and Eosin staining,  $\times 40$ . B: Magnified image of the spine-like projection of the xiphoid process. The spine-like projection was composed of sutures (arrows) and fibrous tissue.

back pain, which mimic several common and serious abdominal and thoracic diseases (2). Although Lipkin et al. (4) reported that xiphodynia is found in approximately 2% of the general population, few other data exist regarding its incidence. Although xiphodynia is frequently insidious in onset, trauma, strenuous aerobic exercise and unaccustomed heavy lifting have all been suggested as potential triggers (1). However, in the current case, the patient denied a history of trauma or other remarkable triggering factors.

The mechanism underlying xiphoid process elongation remains unclear. Enomoto et al. (5) reported that elongation may be due to distraction tissue neogenesis and the xiphoid being pulled by the rectus abdominis muscle after surgery. Furthermore, the authors concluded that complete resection of the xiphoid process is warranted to prevent xiphodynia. Accordingly, in the present case, the xiphoid process may have fractured and separated from the sternum during the previous partial gastrectomy. Additionally, heterotopic ossification is a possible cause of xiphoid process elongation after surgery. Kim et al. reported that heterotopic ossification of the incisional site is observed in up to 25.7% of patients with abdominal incisions and that an upper midline incision is significantly positively associated with heterotopic ossification (76.9%) (6).

Moreover, the mechanism of pain associated with xiphodynia is not well understood. Migliore and Signorelli (3) reported the case of a 22-year-old man who developed xiphodynia due to heterotopic ossification or chondrification of the xiphoid, and Maigne et al. (7) highlighted the importance of the xiphosternal angle in the etiology of associated pain by reporting that an abnormal anterior prominence of the xiphoid process can cause mechanical discomfort and perhaps local inflammation. However, the present case demonstrates that xiphodynia may also be caused by mechanical pain as a result of the presence of

spine-like projections. To the best of our knowledge, this is the first report of a spine-like projection composed of surgical sutures causing xiphodynia.

Treatment options for xiphodynia include reassurance, analgesics, topical heat and cold administration, elastic rib belts (1-3) and local anesthetic-steroid combination therapy, which has been reported to provide relief in some cases (1). While the latter is worth trying, there is no solid evidence for its effectiveness in patients with this syndrome. The final option is xiphoidectomy for pain relief, which has been reported to be effective in a few cases (5, 7). In the present case, we found that all treatment options, except xiphoidectomy, had only very limited effectiveness.

Finally, all efforts to rule out any other catastrophic conditions should be made when making the diagnosis of xiphodynia. In the present case, xiphodynia was complicated by severe coronary artery disease. Similarly, Koren and Shahr reported a case of xiphodynia masking acute myocardial infarction, suggesting that xiphodynia should be considered a second-line assumption after thoroughly ruling out more dangerous conditions (8). Moreover, Kang et al. reported that an MLA less than  $2.6 \text{ mm}^2$  in the proximal left ascending artery predicts functional ischemia (9). In the present case, PCI was performed due to the presence of severe stenosis with an MLA of  $0.8 \text{ mm}^2$ , despite a stress test not being performed. Retrospectively, we believe that, under these conditions, it was reasonable to perform PCI in the present case, even though it was unclear whether the coronary stenosis caused the patient's epigastric pain.

The clinical course of the current patient suggests two important clinical issues. First, the diagnosis of xiphodynia is mainly based on the findings of a physical examination and imaging procedures. Hence, careful palpation of the xiphoid process is warranted during routine physical examinations in any patient, particularly those presenting with chest and abdominal pain of unknown etiology. Second, clinicians should be aware that xiphoidectomy may be required to relieve symptoms if conventional medical therapies are not effective.

**The authors state that they have no Conflict of Interest (COI).**

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#### References

- Howell JM. Xiphodynia: a report of three cases. *J Emerg Med* **10**: 435-438, 1992.
- Simpson JK, Hawken E. Xiphodynia: a diagnostic conundrum. *Chiropr Osteopat* **15**: 13, 2007.
- Migliore M, Signorelli M. Episodic abdominal and chest pain in a young adult. *JAMA* **307**: 1746-1747, 2012.
- Lipkin M, Fulton LA, Wolfson EA. The syndrome of the hypersensitive xiphoid. *N Engl J Med* **253**: 591-597, 1955.
- Enomoto N, Tayama K, Kohno M, Otsuka H, Yokose S, Kosuga

- K. Postoperative elongation of the xiphoid process: report of a case. *Ann Thorac Cardiovasc Surg* **17**: 307-309, 2011.
6. Kim J, Kim Y, Jeong WK, Song SY, Cho OK. Heterotopic ossification developing in surgical incisions of the abdomen: analysis of its incidence and possible factors associated with its development. *J Comput Assist Tomogr* **32**: 872-876, 2008.
7. Maigne JY, Vareli M, Rousset P, Cornelis P. Xiphodynia and prominence of the xiphoid process. Value of xiphosternal angle measurement: three case reports. *Joint Bone Spine* **77**: 474-476, 2010.
8. Koren W, Shahar A. Xiphodynia masking acute myocardial infarction: a diagnostic cul-de-sac. *Am J Emerg Med* **16**: 177-178, 1998.
9. Kang SJ, Ahn JM, Song H, et al. Usefulness of minimal luminal coronary area determined by intravascular ultrasound to predict functional significance in stable and unstable angina pectoris. *Am J Cardiol* **109**: 947-953, 2012.

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