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Xiphodynia Surgical Management

A. H. Olivencia-Yurvati

Department of Surgery, University of North Texas Health Science Center, Fort Worth, Texas

Objectives: The objective of this study was to study the results of the largest prospective series to date of xiphodynia patients treated by surgical xiphoidectomy.

Summary of Background Data: Xiphodynia is a condition of recurrent and often debilitating severe upper abdominal or sternal chest pain. A retrospective analysis was conducted of 40 patients undergoing xiphoidectomy from January 2014 to January 2017.

Methods: Preoperative and postoperative pain scales were measured, by using a standardized Wong-Baker visual pain scale, with a reported zero as no pain and 10 as worse pain. Statistical analysis of pre- and post-operative pain scale were recorded and statistical analysis completed by using a nonparametric Mann–Whitney U. The preoperative pain scale for the patient's ranged from the level of 9 to 10 (mean: 9.9).

Results: The postoperative pain scale was rated between zero and 2 (mean: <1). There was a significant improvement in pain rating from preoperative to postoperative with a $P > 0.024$. All of the sports injury patients (n = 9) were back to full activity 4 to 6 weeks after the procedure.

Conclusions: Xiphoidectomy can be an appropriate treatment modality for intractable cases of severe xiphodynia after failure of more conservative treatments. Patients with recurrence of severe, disabling pain and disability appear to benefit the most from a surgical approach based on the results of this study.

Xiphodynia is a condition of recurrent and often debilitating severe upper abdominal or chest pain along with an associated constellation of symptoms including nausea, vomiting, and radiation of pain into the back, neck, shoulders, arms, and chest wall upon mild palpation of the xiphoid process, deep breathing, or usage of the abdominal wall musculature. A database search of the term xiphodynia found a limited number of articles in the English literature specifically addressing this fascinating and often debilitating syndrome. The first paper was written by Lipkin in 1955. He reported a series of 24 patients presenting with xiphodynia. Our paper represents the largest case series of patients treated for severe xiphodynia

Corresponding author: A.H. Olivencia-Yurvati, DO, PhD, Department of Surgery, University of North Texas Health Science Center, 855 Montgomery Street, Fort Worth, Texas 76107.
Tel.: 817-735-5037; Fax: 817-735-5137; E-mail: albert.yurvati@unthsc.edu

with surgical management by complete xiphoid resection.

Material and Methods

The University of North Texas Health Science Center (UNTHSC) institutional review ethics board (IRB) approved this retrospective study. From 2014 to 2017, 40 patients presented to the University of North Texas Health Science Center cardiothoracic section. The majority of patients were seen by numerous physicians prior to their presentation without resolution of their clinical problem. The majority had imaging to include CT scans. All patients had been treated conservatively to include infiltration of the xiphoid region with local anesthetic agents, injectable nonsteroidal or injectable steroids. All patients underwent a complete osteopathic structural examination as described by Sleszynski, Glonek, and Kuchera.[12] Evaluation of the sterno-xiphoid area was completed as follows. First, gentle palpation of the xiphoid was performed to illicit an evaluation of the degree of tissue tenderness. Next, with the index finger on the xiphoid, the patient was transitioned from the supine to sitting position and any mobility of the xiphoid was evaluated, as well as the degree of tenderness. Significant findings included localized pain, with or without mobility of the xiphoid with a reproduction of their pain. A significant portion of the subjects, 70%, had mobility of the xiphoid with concomitant localized pain. This finding is different from the usual osteopathic theory of increased mobility as means of restoring function. In these cases of xiphoidalgia, increased mobility was a nonanatomic finding and is considered abnormal. A standardized Wong-Baker visual pain scale was used, with zero as no pain and 10 as worse pain.

Statistical analysis of pre and post-operative pain scales were recorded and results were analyzed by using a nonparametric Mann–Whitney U test due to the sample size. Assumptions were accepted to include: The sample drawn from the population was random, independence within the samples and mutual independence was assumed, and ordinal measurement scale was assumed. An α of 0.05 was accepted as the threshold for rejecting the null hypothesis of no significant differences. All statistical analyses were performed using the SPSS/PASW (SPSS Version 21.0., IBM Corp., Armonk, NY) statistical package.

All patients underwent general endotracheal anesthesia. The surgical approach was directly over the xiphoid process; the incisions were limited to approximately 6 cm in length. Electrocautery was used to divide the soft tissue and upper abdominal muscle attachments. Larger bridging veins were ligated or clipped for control of bleeding. Once the xiphoid was isolated, a Kocher clamp grasped the xiphoid process, and electrocautery separated the xiphoid from the sternum. The wound was closed in a multilayered fashion with 2–0 nonabsorbable sutures on the muscle–fascial layer and 3–0 absorbable suture on the subcutaneous layer. The skin was approximated via an intercuticular manner with a 4–0 absorbable suture. Sterile dressings were used to cover the incision. Patients were observed for 24 hours and discharged the following morning. All of the patients followed up postoperatively 2weeks after the procedure and a Wong-Baker visual pain scale was recorded.

Results

All 40 patients surgically managed by the technique previously described. The age range was from 14 to 73 (mean age: 27 $\pm$ 6.5 years); all of the younger patients presented with a history of sports injury, whereas the older patients' presentations were secondary to motor vehicle accidents or prior laparoscopic procedures. The entire patient cohort had symptoms for greater than 2 years prior to presentation to our center. A pain scale was used to assess the patients' status preoperatively and at 4 weeks postoperatively. The scale was constructed in a standard distribution of 0 to 10, where 10 was the most intense pain. The preoperative pain scale for the patients ranged from the level of 9 to 10 (mean: 9.9). The postoperative pain scale was rated between 0 and 2 (mean <1). There was a significant improvement in pain rating from preoperative to postoperative with a $P > 0.024$. All of the sports injury patients ($n = 9$) were back to full activity 4 to 6 weeks after the procedure. One particular patient went on to win a state basketball championship.

Discussion

First described in 1712, xiphodynia is thought to be a rare but underappreciated condition that may affect up to 2% of the hospital population.[1] In 1955 Lipkin *et al*[1] reported 24 cases of xiphodynia,

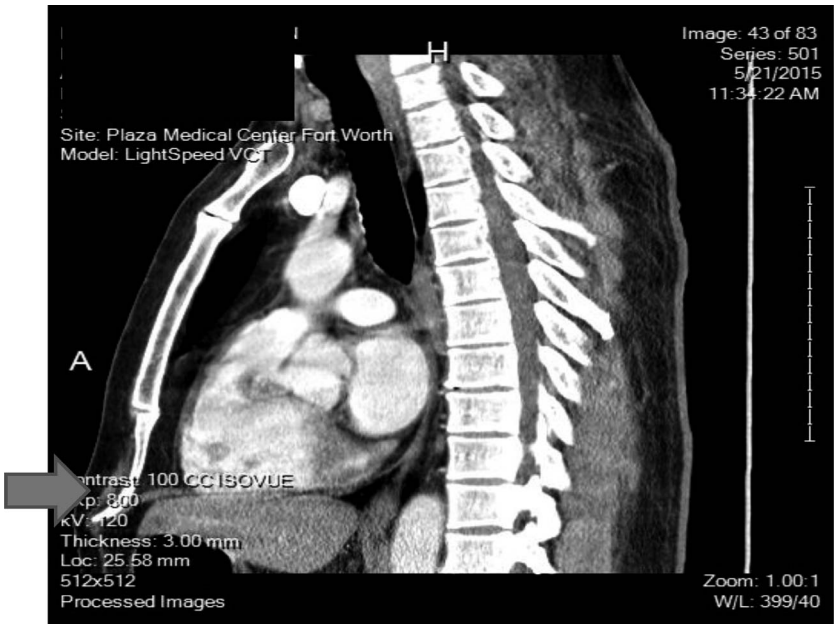

Fig. 1 Xiphoid eversion.

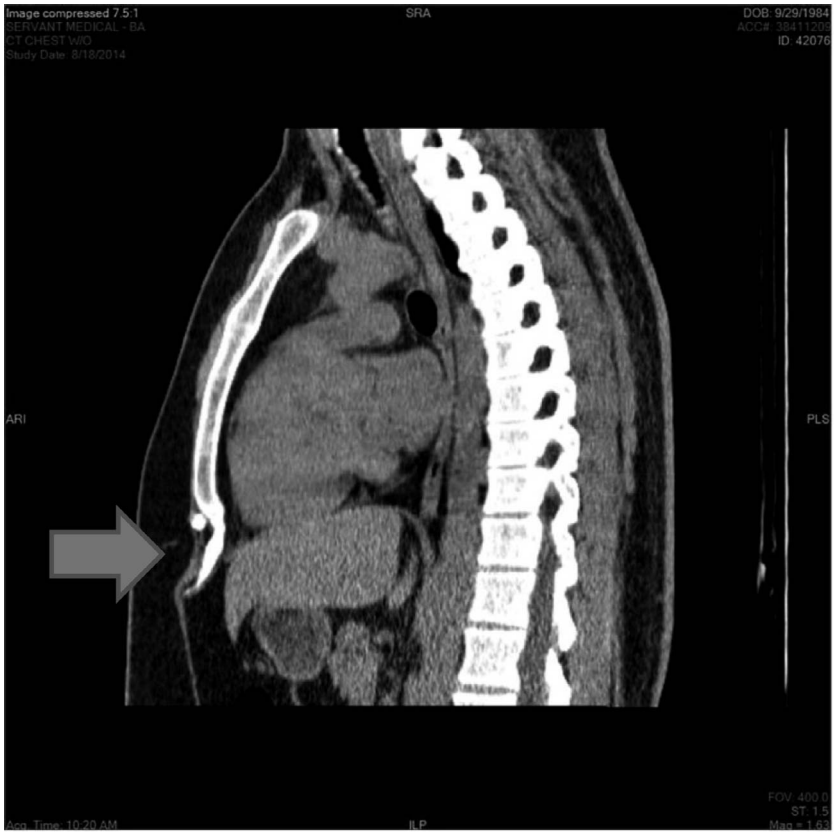

Fig. 2 Xiphoid eversion with abdominal muscle traction.

including cases of primary xiphodynia with no other associated diseases, as well as cases of secondary xiphodynia found in patients with known hiatal hernia, heart, gall bladder, and peptic ulcer diseases. Primary causes have been reported in the literature as being related to blunt trauma,[2–4] following childbirth or pregnancy,[3,4] Tietze syndrome of the xiphisternal joint,[5] repetitive overuse or strain of abdominal muscles in lifting overuse, or sports-related injuries.[3,6–8] Various treatment modalities have been reported with certain degrees of success including rest and oral nonsteroidal anti-inflammatory agents,[1–10] skeletal and soft tissue manipulation,[3] low-level laser therapy,[3] ultrasound therapy,[3] different combinations of analgesic and corticosteroid injections of the xiphosternal joint and surrounding tissues,[1–10] and finally xiphoidectomy.[1–2,4,10]

Xiphoidectomy is sometimes performed in cases of gastrointestinal cancer surgery to enlarge the visual field for a better view of the hemidiaphragms, esophageal hiatus, hepatic veins, liver, and stomach.[11] In the cases where xiphoidectomy was performed as in the case series reported by our center, these procedures were only performed after recurrence of pain following trials of injections of analgesics and corticosteroids.[1–2,4,10]

Also of interest was the preponderance of significant eversion of the xiphoid, as shown on representative computed tomography (CT) scans, with attention to the xiphoid region show (Fig. 1, 2). Of the patients in our series 30% (10 of 30) exhibited this anterior xiphoid protrusion, this is consistent with a study by Seifeldein and Elhamd, who reported via multidetector, CT variants of the diaphragm and the xiphoid. Their series of 142 patients found a concave upward displacement of the diaphragm with a concomitant anterior protrusion of the xiphoid in 32.65% of their patients.[13]

We theorize that the pain and discomfort is a result of noxious nociceptive recruitment of neurons to produce pain radiation and visceral-somatic interactions[14]. Deep breathing or overuse of the abdominal wall musculature may exacerbate pain. Reported complaints include severe upper abdominal or chest pain, nausea, vomiting, and radiation of pain into the back, neck, shoulders, arms, and chest wall upon mild palpation of the xiphoid process. This neural phenomenon may explain the constellation of symptoms exhibited by patients with xiphoidalgia.

Conclusions

Xiphoidectomy can be an appropriate treatment modality for intractable cases of severe xiphodynia after failure of more conservative treatments. Prior to surgery, patients with xiphodynia should have a thorough physical exam, clinical findings, and imaging to support the diagnosis. Recommend that all patients undergo trials of more conservative therapy including oral and injection therapy. Patients with recurrence of severe, disabling pain and disability benefit the most from a surgical approach based on the results of this study.

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