

Postprandial Referred Shoulder Pain: A Case Report

Review began 05/09/2022
Review ended 05/23/2022
Published 05/31/2022

© Copyright 2022

Ott et al. This is an open access article distributed under the terms of the Creative Commons Attribution License CC-BY 4.0., which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Keaton Ott¹, Joe Iwanaga², Aaron S. Dumont², Marios Loukas³, R. Shane Tubbs^{2, 4}

1. Department of Structural and Cellular Biology, Tulane University School of Medicine, New Orleans, USA 2. Department of Neurosurgery, Tulane University School of Medicine, New Orleans, USA 3. Anatomical Sciences, St. George's University, St. George, GRD 4. Department of Neurosurgery, Neurosurgery and Ochsner Neuroscience Institute, Ochsner Health System, New Orleans, USA

Corresponding author: Joe Iwanaga, iwanagajoe@gmail.com

Abstract

The precise mechanism of referred pain is not well understood; however, diaphragmatic irritation is a well-known etiology of referred pain. Left side referred pain due to diaphragmatic irritation is most commonly attributed to splenic laceration i.e. Kerr's sign. Here, we report an unusual case of left-sided referred pain that followed eating. An adult male presented vague and chronic left shoulder pain that followed eating. The pain was described as a deep boring type of discomfort that was poorly localized to the region deep to the acromion and extended superomedially along the upper fibers of the trapezius muscle. The pain was present immediately after eating heavy meals and always abated approximately 30 minutes later. There was no history of previous surgery and physical examination was unremarkable. CT examination of the abdomen and thorax did not show any pathology or anatomical variations that would result in such referred pain. Although the exact etiology of this case is unclear, the most likely cause would be left-sided diaphragmatic irritation from the stomach after eating. The current literature does not enclose reports pertaining to similar findings. Although unusual and seemingly rare, postprandial referred shoulder pain should be considered by clinicians alongside other causes of referred shoulder pain when presented with shoulder pain without an obvious musculoskeletal or neural etiology.

Categories: Radiology, Anatomy

Keywords: eating, shoulder, pain, anatomy, diaphragm

Introduction

Referred pain can be defined as pain from a noxious stimulus originating in one area of the body which is perceived in another area of the body [1]. The prototypical example of referred pain is angina pectoris due to coronary artery disease, wherein ischemia of cardiac muscle is perceived as pain commonly in the left side of the chest, medial aspect of the left arm, and left neck or jaw. Another common site of referred pain with important diagnostic value for thoracic and abdominal disease are the shoulders [1]. Referred shoulder pain, attributed to irritation of phrenic nerve afferent fibers innervating the diaphragm and its associated serous membranes, can have numerous etiologies ranging from hemoperitoneum to pericarditis to foreign bodies. We present an unusual case of chronic referred pain to the left shoulder region reported only after eating.

Case Presentation

A 52-year-old healthy male presented for routine medical examination. The chief complaint was referred pain over the left shoulder region only after eating. The pain was described as being vague and chronic (greater than 20 years) in nature, and always being a deep boring type of discomfort that was poorly localized to the region deep to the acromion which extended superomedially along the upper fibers of the trapezius muscle. However, the pain could never be alleviated with shoulder position or palpation/massage of these regions. Moreover, analgesics such as ibuprofen or acetaminophen never altered the severity or duration of the pain. Specifically, the pain was present immediately after eating heavy meals and always abated approximately 30 minutes later. Neither the type of food nor the time of eating had any influence on the referred pain. Additionally, the position of the patient never altered the duration or severity of the referred pain.

The patient's past medical history included hypercholesterolemia and familial hypertension both of which were treated adequately with medications. There was no history of previous surgery. On physical examination, the patient's motor and sensory exams were within normal limits. The neurological examination was non-focal. On thoracic examination, there were no murmurs, wheezing, or signs of airway disease. The head and neck examination was found to be within normal limits. Lastly, the abdominal examination was found to be normal with no bruits, tenderness, or masses identified.

A CT was performed to evaluate the region around the diaphragm including the abdomen. There was no intrathoracic or intra-abdominal pathology (e.g., hiatal hernia) or anatomical variations noted. The stomach was in a normal position and no masses or abnormal fluid collections were found in the abdomen or, more

How to cite this article

Ott K, Iwanaga J, Dumont A S, et al. (May 31, 2022) Postprandial Referred Shoulder Pain: A Case Report. Cureus 14(5): e25535. DOI 10.7759/cureus.25535

specifically, near the diaphragm (Figure 1, 2).

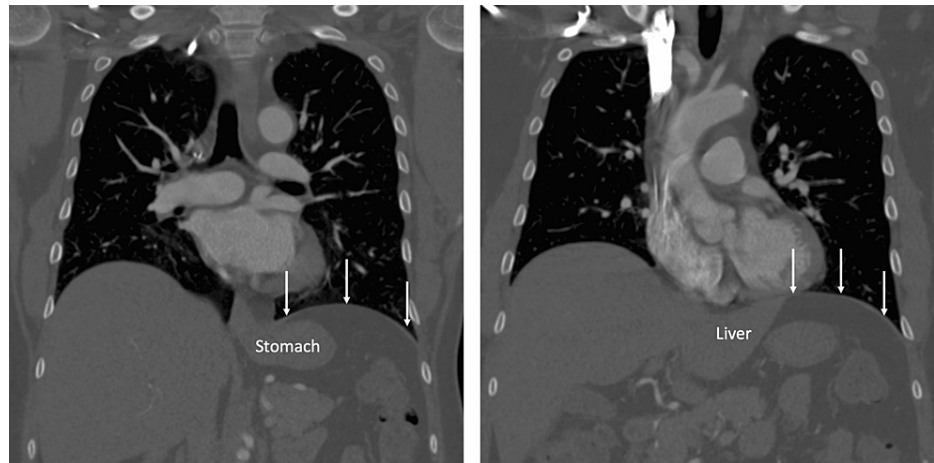


FIGURE 1: CT examples of the diaphragmatic region in the coronal plane noting the absence of pathology in this region. Arrows: diaphragm

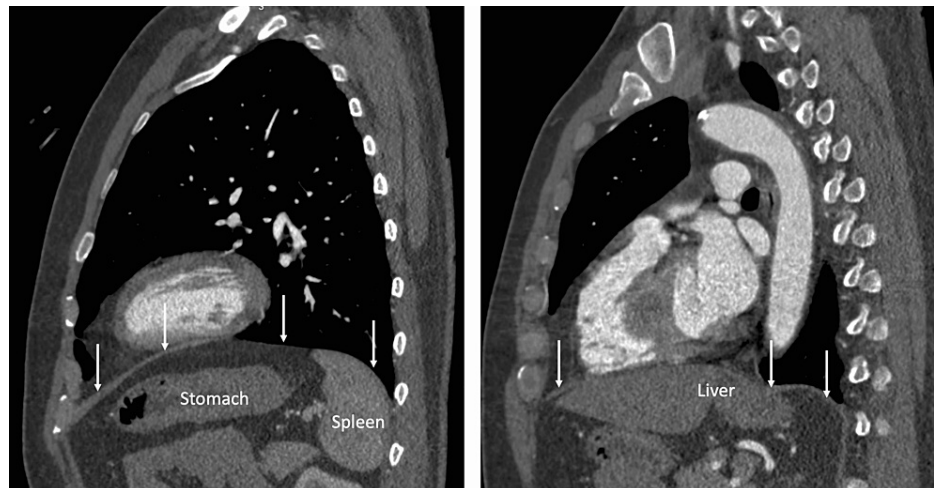


FIGURE 2: CT examples of the diaphragmatic region in the sagittal plane noting the absence of pathology in this region. Arrows: diaphragm

Discussion

We report a case of referred left shoulder pain in a patient without pathology or anatomical variations of the left side of the diaphragm. To our knowledge, this is the first reported case of referred pain to the left shoulder after eating. We propose that such a case represents transient diaphragmatic irritation/displacement by an overdistended stomach.

The precise mechanism of referred pain is not well understood; however, a prevailing theory proposes that afferent fibers from different areas, visceral or somatic, converge onto common neuronal cell bodies in the spinal cord, resulting in central misinterpretation of the location of the noxious stimulus and perception of pain in an unstimulated area [1]. This may explain why referred pain commonly presents in specific segmental dermatomal or myotomal patterns. Using referred shoulder pain as an example, phrenic afferent fibers innervating the diaphragm and associated serous membranes terminate in the dorsal horns of C3-5 spinal cord levels alongside afferent fibers from the supraclavicular nerves (C3-4) and certain C5 ventral ramus branches such as the axillary or suprascapular nerves, which together innervate the skin, muscle, and joints of the shoulder [2]. Irritation in the diaphragmatic region eliciting referred pain in the shoulder thus reflects this common spinal cord level termination of their sensory fibers. In our case, the vague involvement of the upper trapezius might also point to its dual innervation via C3-C4 fibers from the cervical plexus that

have, historically, been thought to convey proprioceptive sensation from this muscle.

Considering the varied structures surrounding the diaphragm and with phrenic nerve afferents innervating the diaphragm as well as portions of the parietal pleura, fibrous and serous pericardium, and parietal peritoneum, it should come as no surprise that a myriad of conditions may be the cause of referred shoulder pain [2]. Above the diaphragm, cases of referred shoulder pain due to pericarditis [3], lower lobe pneumonia [4], and Pancoast tumor [5] among others have been reported. Below the diaphragm, cases of referred shoulder pain due to gastric perforation [6], pancreatitis [7], and liver abscess [8] among others have been reported. The particularly asymmetrical anatomy of the abdomen lends itself to often predictable lateralization of referred shoulder pain, as is the case with left shoulder pain due to irritation of the left hemidiaphragm and related parietal peritoneum and hemidiaphragm from hemoperitoneum secondary to splenic rupture, a well-recognized physical finding referred to as Kehr's sign [9]. Iatrogenic etiologies have also been reported in cases presenting with referred shoulder pain. Dialysate inflow has been found to elicit shoulder pain in some peritoneal dialysis patients, worsened in the supine position or with deep inspiration, presumably due to subdiaphragmatic irritation of the peritoneum [10]. Similarly, shoulder pain resulting from peritoneal tubing lodged in a subdiaphragmatic position has been described as a complication of ventriculoperitoneal shunt placement [11].

Conclusions

The present case report highlights the possibility of referred shoulder pain postprandially due to gastric distension. We are unaware of similar reports of such a phenomenon in the literature. Although unusual and seemingly rare, postprandial referred shoulder pain should be considered by clinicians alongside other causes of referred shoulder pain when presented with shoulder pain without an obvious musculoskeletal or neural etiology.

Additional Information

Disclosures

Human subjects: Consent was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

References

1. Arendt-Nielsen L, Svensson P: Referred muscle pain: basic and clinical findings . *Clin J Pain*. 2001, 17:11-9. [10.1097/00002508-200103000-00003](https://doi.org/10.1097/00002508-200103000-00003)
2. Standring S: *Gray's Anatomy the Anatomical Basis of Clinical Practice*. Standring S (ed): Elsevier, New York; 2020.
3. Wacker W, Merrill JP: Uremic pericarditis in acute and chronic renal failure . *JAMA*. 1954, 156:764-5. [10.1001/jama.1954.02950080012005](https://doi.org/10.1001/jama.1954.02950080012005)
4. Petchkrua W, Harris SA: Shoulder pain as an unusual presentation of pneumonia in a stroke patient: a case report. *Arch Phys Med Rehabil*. 2000, 81:827-29. [10.1016/s0003-9993\(00\)90119-9](https://doi.org/10.1016/s0003-9993(00)90119-9)
5. Ronan L, D'Souza S: Pancoast's tumour presenting as shoulder pain in an orthopaedic clinic . *BMJ Case Rep*. 2015, 2015:[10.1136/bcr-2012-008131](https://doi.org/10.1136/bcr-2012-008131)
6. Pappano DA, Bass ES: Referred shoulder pain preceding abdominal pain in a teenage girl with gastric perforation. *Pediatr Emerg Care*. 2006, 22:807-9. [10.1097/01.pec.0000248691.19305.ec](https://doi.org/10.1097/01.pec.0000248691.19305.ec)
7. Decina PA, Vallee D, Mierau D: Acute pancreatitis presenting as back pain: a case report . *J Can Chiropr Assoc*. 1992, 36:75-83.
8. Lee CC, Chang WK: Liver abscess presenting with persistent hiccups and right shoulder pain . *QJM*. 2020, 113:205-4. [10.1093/qjmed/hcz264](https://doi.org/10.1093/qjmed/hcz264)
9. Sutton CD, Marshall LJ, White SA, Berry DP, Dennison AR: Kehr's sign - a rare cause: spontaneous phrenic artery rupture. *ANZ J Surg*. 2002, 72:913-4. [10.1046/j.1445-2197.2002.02339.x](https://doi.org/10.1046/j.1445-2197.2002.02339.x)
10. Ardalan MR, Tubbs RS, Etemadi J, Shoja MM: Referred shoulder pain in patients undergoing peritoneal dialysis. *Biomed Int*. 2010, 1:34-36.
11. Tubbs RS, Wellons JC 3rd, Blount JP, Grabb PA, Oakes WJ: Referred shoulder pain from ventriculoperitoneal shunts. Report of three cases. *J Neurosurg*. 2005, 102:218-20. [10.3171/jns.2005.102.2.0218](https://doi.org/10.3171/jns.2005.102.2.0218)