Esophageal Disease as a Cause of Anterior Thoracic Pain*

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The occurrence of anterior thoracic pain in an individual past middle age is always a matter of alarm to the patient and of grave concern to the patient's attending physician. This is due to the fact that pain situated about the precordial region is associated in the minds of the laity and the medical profession with serious cardiac or pulmonary disease. That the esophagus may be responsible for the pain is seldom considered, and as a consequence the patient with anterior thoracic pain due to esophageal disease is often forced to undergo a long period of unnecessary invalidism before the true nature of the illness is recognized.

Because of the nature of the nerve supply of the esophagus, pain originating in the esophagus may have a bizarre distribution. The esophagus receives its nerve supply primarily from the vagus nerve and the sympathetic trunks. Visceral afferent impulses are carried to the central nervous system by way of the visceral rami of the sympathetic trunk. Sensation may be referred to the same or other somatic segments (fig. 1). Visceral afferent pain impulses may also be transmitted by way of the vagus nerve. Whether or not the phrenic nerve supplies the lower end of the esophagus has not been definitely established. It does, however, supply the central portion of the diaphragm through which the esophageal hiatus passes. Any disorder of the lower end of the esophagus that involves the esophageal hiatus will irritate afferent visceral pain endings of the phrenic nerve. The phrenic nerve, arising from the third to the fifth cervical roots, allows pain to be referred to the peripheral distribution of these roots. These roots supply the outer aspect of the appropriate shoulder and arm. It is obvious, then, that pain due to esophageal disturbance or disease may be referred to a considerable part of the thorax and neighboring structures.

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What are some of the more common esophageal disorders that may produce anterior thoracic pain?

*Esophageal Hiatal Hernia*

Esophageal hiatal hernia is one of the most frequent causes of such pain. It is a disorder that may be very bizarre in its clinical manifestations, and it has aptly been termed "the great masquerader of the upper gastrointestinal tract." The importance of esophageal hiatal hernia as a diagnostic problem is clearly manifest when it is realized that approximately 8 per cent of the population of the United States are afflicted with this abnormality. This means that there are some 10,000,000 people in this country who have hiatal hernia.

Not all esophageal hiatal hernias cause symptoms. In our experience at the Mayo Clinic, approximately 25 per cent of the patients who have hiatal hernia are completely asymptomatic. In another 25 per cent, the symptoms have a very doubtful relationship to the hernia. In the remaining cases the hernia does produce symptoms.

One of the most common symptoms is pain. Pain occurs in approximately one third of the cases of hiatal hernia in which symptoms are produced. The pain varies greatly in its character, intensity, location

![Nerve supply of esophagus.](http://journal.publications.chestnet.org/pdfaccess.ashx?url=/data/journals/chest/21312/ on 06/21/2017)
and distribution. Most frequently it is located in the epigastric region, and tends to occur soon after eating. It is often aggravated when the patient assumes a recumbent position. The pain has a tendency to radiate out along the costal margins or straight through into the back. In approximately one out of ten patients with esophageal hernia that have pain, the pain is substernal. It may or may not be related to the ingestion of food and on occasion it may be excruciating in character. If the pain is not related to dysphagia or the ingestion of food, it may be readily confused with the pain of angina pectoris. This is especially true if the pain has a tendency to extend into the shoulder and arm.

Theoretically, it should be possible to distinguish between the pain of angina pectoris and that of esophageal hiatal hernia by the distribution of the pain down the arm. In hiatal hernia, the pain is referred down the course of the third to the fifth cervical roots from which the phrenic nerve arises and which supply the outer aspect of the shoulder and arm. In angina pectoris, the pain is more likely to be referred down the inner aspect of the arm; in practice the pain is usually so intense or diffuse that the patient experiences great difficulty in delineating its exact borders. Although the pain of angina pectoris is precipitated generally by exertion and that of esophageal hiatal hernia by ingestion of food, this is not invariably true. The problem of differential diagnosis may be complicated by the fact that both the pain of angina pectoris and the pain of hiatal hernia may be relieved by the use of nitroglycerine. Electrocardiographic changes are not a routine accompaniment of hiatal hernia. It must be remembered, however, that hiatal hernia is a disorder that occurs especially in people past middle age, at a period of life when organic heart disease is more prevalent than in younger people. The two conditions may exist in the same individual, and great difficulty may be experienced in deciding which of the two disorders is the cause of the patient's pain. On occasion, interruption of the phrenic nerve is the only method by means of which the pain of angina pectoris and that of hiatal hernia can be distinguished one from the other.

The symptoms produced by hiatal hernia are in a large measure dependent upon the size of the hernia. The larger the hernia, the more likely it is to cause symptoms, even though small hernias are notorious for disregarding the rule. The symptoms of hiatal hernia are influenced also by the type of hernia. The sliding type and acquired short esophagus with intrathoracic stomach (fig. 2) are more prone to cause pain than are congenital short esophagus with intrathoracic stomach and the para-esophageal variety of hiatal hernia (fig. 3).

The diagnosis of esophageal hiatal hernia can be made with a relatively high degree of accuracy by roentgenographic examination. When there is doubt as to the diagnosis or in the determination of the type of hiatal hernia, esophagoscopy examination is always indicated. Such an examination is of value not only in establishing the presence of a hernia but also in determining its type. It is the only method by which it is possible to determine with accuracy the presence of esophagitis or esophageal
Figure 2: Sliding type of hiatal hernia.

Figure 3: Paraplephagostic type of hiatal hernia.

Figure 4: Diffuse spasm of esophagus.
ulceration. It is also of value in determining the presence of an associated carcinoma, foreign body or benign tumor.

**Achalasia of the Esophagus**

Achalasia of the esophagus, or so-called cardiospasm, may be a cause of anterior thoracic pain. Pain is much more likely to occur in the early stages of a developing achalasia than after the achalasia has become fully developed and dilatation of the esophagus has occurred. Although pain may occur spontaneously in achalasia, it is much more likely to be precipitated by the drinking of cold liquids.

The diagnosis of fully developed achalasia with diffuse dilatation of the esophagus can be made with a high degree of accuracy on roentgenographic examination. Unfortunately, in the early stages of the development of the achalasia, before dilatation of the esophagus has taken place, the roentgen diagnosis is extremely difficult, and it is at this period that pain is most likely to occur. Esophagoscopic examination is of little help in the early diagnosis of achalasia. There are two tests that can be of great help in the identification of early achalasia. The first of these is a study of the motility pattern of the esophagus. In the normal esophagus, with deglutition there is an increase in intraluminal pressure which progresses down the esophagus with the peristaltic wave. In achalasia of the esophagus the intraluminal pressure is not increased with deglutition. The second test that has been found of value in the diagnosis of achalasia is based on the intramuscular injection of methacholine (mecholyl). Kramer and Ingelfinger found that if a patient with achalasia of the esophagus is given an intramuscular injection of 10 mg. of methacholine it will cause the esophagus to be thrown into tetanic contraction. At the same time the patient experiences a very severe retrosternal pain, which closely simulates that seen in angina pectoris. The pain may be so severe as to require the administration of nitroglycerine for relief. These reactions are seldom seen in any type of esophageal disorder other than achalasia.

**Diffuse Spasm of the Lower Part of the Esophagus**

Diffuse spasm of the lower part of the esophagus is often associated with severe anterior thoracic pain. It is a disorder that is frequently confused with achalasia although in no way related to it. It occurs primarily in patients with very active nervous systems. On roentgenologic examination, the lower third of the esophagus will be found in a state of diffuse spasm (fig. 4). On occasion the spasm may involve the entire gullet. The degree of spasm may vary from time to time. It has been described by some roentgenologists under the term "curling." It is never accompanied by evidence of dilatation of the esophagus as is true in achalasia, and in our experience does not progress into such a condition.

Pain is a very prominent feature of diffuse spasm of the esophagus. The pain may occur both with and without the ingestion of liquids or foods. When dysphagia is present the patient complains that food obstructs at a higher level in the esophagus than in achalasia. The degree
of obstruction varies considerably from time to time, from a slight hesitation in the passage of food through the esophagus to complete esophageal obstruction. Pain may be experienced in the retrosternal region if the food is allowed to remain in the gullet or is forced through into the stomach by the drinking of liquids or by forced deglutition. Often, the pain occurs spontaneously and is not related to eating or drinking. A common experience is for a patient to note some hesitation to the passage of food, which can be overcome by drinking water and be unaccompanied by pain. During the night the patient may be awakened suddenly from a sound sleep by a severe substernal pain which may extend into the neck and into one or both shoulders. The occurrence of such an attack for the first time, especially if the history of dysphagia has been overlooked, is invariably diagnosed as being due to coronary heart disease. Added credence to such a diagnosis would seem to be indicated by the fact that the administration of nitroglycerine relieves the pain.

Esophagoscopy is of little value in the diagnosis of diffuse spasm of the esophagus. This is especially true if the examination is performed with the patient under general anesthesia, for then the spasm of the esophagus generally disappears and the esophagoscopy examination will give essentially negative results. More information may be obtained by the passage of a Plummer sound over a previously swallowed silk thread, or by the gentle passage of a stomach tube through the esophagus. Invariably, an obstruction will be detected in the lower part of the esophagus, usually located several inches above the cardia. The obstruction can be overcome by gentle pressure, and as the stomach tube or sound is passed along the course of the esophagus it is repeatedly grasped by contractions of the lower part of the esophagus until the cardia is passed.

Motility studies are of great value in the diagnosis of diffuse spasm of the esophagus. Creamer² has pointed out that in diffuse spasm there is with deglutition a simultaneous contraction of the entire lower third of the esophagus, in contrast to an orderly progression of the peristaltic waves with a progressive increase and decrease of intraluminal pressure, as seen in the normal esophagus. In diffuse spasm the increase in intraluminal pressure due to spasm not only is greater but also is more prolonged than occurs in the normal esophagus. In contrast to achalasia, methacholine has no effect upon the esophagus in most cases of diffuse spasm.

It should be pointed out that achalasia that has been treated by forceful dilatation with various types of dilating instruments may be characterized by a roentgenographic picture resembling that of diffuse spasm of the esophagus. Such cases do not, however, demonstrate the typical motility changes found in diffuse spasm.

**Esophagitis**

A common esophageal disease which may give rise to anterior thoracic pain is esophagitis. The surprising thing is that it is not a more common
cause of such pain. Esophagitis is the most common disorder to afflict the esophagus. Butt and Vinson\(^3\) found it to be present in 7 per cent of their postmortem material. It is a condition that waxes and wanes rapidly. In the great majority of cases it may remain entirely asymptomatic. Again, especially if the esophagitis is severe and associated with ulceration, it may cause severe anterior thoracic pain. The pain is usually described by the patient as being situated deep under the sternum, and often seems to be aggravated by the patient's assuming a recumbent position. It is generally aggravated by the drinking of extremely hot or cold liquids and by the eating of coarse foods. In cases of severe esophagitis the patient may vomit blood or have complete esophageal obstruction due to spasm or secondary cicatization.

Esophagitis may be caused by a great variety of conditions. It may be produced by the regurgitation of gastric secretions into the esophagus, or it may be the result of ingestion of chemical irritants into the esophagus. It may occur as a manifestation of a generalized infectious process, allergic phenomenon, or part of an obstructive process.

The diagnosis of esophagitis must in most cases depend upon the esophagoscopy findings. Roentgenologic examination of the esophagus is of little value unless ulceration or stricture formation has occurred.

**Carcinoma of the Esophagus**

Carcinoma of the esophagus may cause anterior thoracic pain. In most cases such pain is a late manifestation of the disease and is associated with dysphagia so that the diagnosis is a relatively simple matter. That pain may be the first symptom of carcinoma of the esophagus and unassociated with dysphagia is less generally appreciated. When pain occurs as the initial symptom of carcinoma of the esophagus, the carcinoma is more likely to be of a type that infiltrates through the wall of the esophagus than of the polypoid type, which projects into the esophageal lumen and causes obstruction.

The pain in carcinoma of the esophagus may be of a boring type which usually extends through to the back. It is usually aggravated by deglutition and often is affected by position. In cases in which the lesion is situated about the cardia, the pain may be referred into the neck or shoulder.

In the early stages of the disease the diagnosis may be difficult, for the absence of dysphagia may seem to exonerate the esophagus. The results of roentgen examination of the esophagus at this period may well prove to be negative. Esophagoscopy examination with removal of secretions and tissue for cytologic and microscopic examination is usually required to establish the diagnosis.

**Benign Tumors of the Esophagus**

Benign tumors of the esophagus are comparatively rare and seldom produce pain. On occasion, if the tumor is located at the esophageal introitus or at the level of the hiatus in the diaphragm, the patient may
experience discomfort as food passes a constricted site. Very rarely indeed, a patient with a large pedunculated benign tumor may have severe pain if the tumor is regurgitated into the back of the mouth and the patient has difficulty reswallowing it. If the benign tumor undergoes malignant change it may cause pain.

**Foreign Bodies of the Esophagus**

The possibility of a foreign body must always be considered in any patient who presents a history of sudden dysphagia with associated substernal pain. In most instances in which the patient has swallowed a foreign body that has become lodged in the esophagus, it is possible to obtain a clear-cut story of the accident. On occasion, owing most often to excessive libation or during an accident, the ingestion of the foreign body may be overlooked or forgotten. Generally, when a patient has substernal pain due to the ingestion of a foreign body, the pain is aggravated by deglutition. It often tends to subside in intensity unless perforation of the esophagus is imminent. If the foreign body is opaque it may be detected on roentgen examination of the thorax. Nonopaque foreign bodies can be detected only by esophagoscopy or by roentgenoscopic examination of the esophagus with the aid of a swallow of barium.

**Miscellaneous Causes**

A number of other esophageal disorders may cause anterior thoracic pain. Among these may be mentioned diverticulum of the esophagus, fungous infections and collagen disturbances. Recently we have had two patients who had suppuration of the mediastinal nodes with rupture into the esophagus that was associated with thoracic pain. In both cases the pain subsided with evacuation of the necrotic material into the esophagus. In one of the two cases tubercle bacilli were cultured from the evacuated material.

**SUMMARY AND CONCLUSIONS**

Esophageal disorders and disease may give rise to pain that is referred to the anterior part of the thorax. The pain may be situated some distance from the site of the esophageal involvement, and may vary considerably in intensity and character. Although pain due to esophageal disease is usually associated with dysphagia, this is not always true. The possibility of an esophageal origin must always be considered in any patient with unexplained anterior thoracic pain.

**RESUMEN Y CONCLUSIONES**

Los trastornos y afecciones del esófago pueden dar lugar a dolor que puede proyectarse a la pared anterior del tórax. El dolor puede localizarse a cierta distancia del lugar afectado del esófago y puede variar considerablemente en intensidad y caracteres. Aunque el dolor asociado a afección del esófago generalmente se acompaña de disfagia, esto no siempre es cierto. La posibilidad del origen esofágico en un enfermo con dolor torácico anterior no explicado de otra manera, debe conservarse en la mente.
Unpässlichkeit und Krankheit der Speiseröhre können Anlass zu Schmerzen geben, die auf dem anterioren Thoraxabschnitt bezogen werden. Der Schmerz kann sich in einigem Abstand von der Stelle der Speiseröhrenaffektion befinden und kann beträchtlich an Intensität und Charakter wechseln. Wenngleich ein durch eine Speiseröhrenkrankung entstandener Schmerz gewöhnlich mit Schluckbeschwerden verknüpft ist, trifft dies nicht immer zu. Die Möglichkeit eines oesophagealen Ursprungs muss immer in Erwägung gezogen werden bei einem Patienten mit nicht geklärtm Schmerz an der vorderen Brustwand.

REFERENCES
2. Creamer, B.: Personal communication to the authors.