Atypical Chest Pain of Cardiac and Esophageal Origin

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Cardiac and esophageal causes of atypical pain in the chest are often a difficult diagnostic problem. The pain is considered atypical because of its unusual distribution or unusual precipitating and relieving factors. One hundred and five patients with such pain were evaluated by complete esophageal and cardiac investigation. Based on the results of the investigations, 43 patients were found to have esophageal disease, 12 had cardiac disease, 21 had both cardiac and esophageal disease, and 29 had neither disorder. When the 43 patients with atypical esophageal disease were compared with 100 consecutive patients who had gastroesophageal reflux, it was found that in the patients with atypical esophageal disease, pain in the arm was more frequent, pain precipitated by exercise occurred frequently, and relief from pain with administration of antacids was less reliable. These factors accounted for the labeling of the disorder as atypical. Further difficulty in diagnosis was noted with the use of the technique of perfusion with acid. Although typical esophageal pain may be reproduced by such perfusion, all components of pain and, particularly, the distribution of pain to the arm cannot be reliably reproduced. Based on this study, we believed that in the patient with atypical pain in the chest, both cardiac and esophageal disease must be carefully evaluated if diagnostic errors are to be avoided.

A typical esophageal and cardiac pain can be a major diagnostic problem.2,3 Both diseases are common.4,5 They may occur simultaneously, and certain components of their symptoms are similar. Inaccuracy in diagnosis can result in inappropriate therapy.

The factors that determine whether cardiac pain and esophageal pain are typical or atypical have not been clearly defined. In most instances the individual clinician believes that the description of symptoms does not fit his concept of the "normal." The variations in symptoms which give rise to diagnostic difficulty are an abnormal distribution of pain, unusual precipitation of pain, or differences in pain-relieving factors.

Because of these difficulties in diagnosis and the potentially serious consequences of misdiagnosis, we undertook the investigation of both the esophagus and the heart in 105 consecutive patients who were considered to have atypical pain in the chest. Many of these patients had previously been hospitalized and treated inappropriately.6

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Perfusion with esophageal acid was used in all patients to determine whether or not their pain was of esophageal origin. Arising out of this study was the recognition that, even though pain was of esophageal origin, all components of pain may not be reproduced by the technique of perfusion with acid.5,6 Because of this difficulty, a second study has been conducted to determine how accurately pain is reproduced by this method.

Materials and Methods

Study 1

One hundred and five consecutive patients with atypical pains in the chest have been studied to determine whether their pain was of esophageal or cardiac origin. In this study, esophageal and cardiac investigations were performed on all patients, and the subsequent diagnosis was based on the results of the tests conducted. History was evaluated using a prepared history sheet, and the questions that were asked indicated distribution of pain and precipitating and relieving factors, as well as other symptoms specific to cardiac and esophageal disease.

All patients had a barium esophagogram, esophageal manometric studies, and studies using the technique of perfusion with acid. In addition, all patients had a standard electrocardiogram, and subsequently, for more complete cardiac evaluation, all had either an exercise ECG, coronary angiogram, or both studies.

The barium esophagogram included careful evaluation of gastroesophageal reflux by the water-siphon test. Manometric studies were performed using three fused catheters (P-E 190), continuously perfused with water at 6.4 ml/min. Strain gauges (Statham P23Db) were used as sensing devices, and
data were recorded on an ultraviolet recorder (Honeywell Visiorder 1508). 9

Studies using the technique of perfusion with acid were done simultaneously 7,8 with manometric studies, and perfusion was performed 5 cm above the gastroesophageal junction. Perfusion with acid was continued for 30 minutes, alternating with saline solution, in order to determine the patient's response. In some patients, because of the severity of pain, perfusion with acid had to be terminated at an earlier stage.

Cardiac investigation included right and left cardiac catheterization, left ventricular angiographic studies, and selective coronary cineangiographic studies performed by the Jukins' technique. 10 Exercise ECGs were performed using a treadmill and constant electrocardiographic monitoring. Failure to obtain a heart rate of 85 percent of the predicted maximum was considered to be an incomplete study unless ischemic changes had already taken place.

For the purpose of comparison of symptoms, 100 consecutive patients with radiologically proved gastroesophageal reflux were evaluated by history.

Study 3

During the first study, it was recognized that total production of pain did not always occur with the technique of perfusion with esophageal acid, despite the fact that the components of pain that were reproduced were often referred to by the patient as being typical. In the patient with atypical pain in the chest, multiple pathologic abnormalities may be present, and the component of pain not reproduced could represent pain from an alternate source.

To evaluate the accuracy of reproduction of pain, we studied 72 consecutive patients who had proven gastroesophageal reflux and who required surgical correction of reflux because of intractable symptoms. All patients had their distribution of pain evaluated by history, and all patients had a study using the technique of perfusion with esophageal acid and had documentation of the reproduction of actual pain by the perfusion. Following surgical correction of gastroesophageal reflux, all patients had total relief of their esophageal pain when they were seen between three and six months later for followup clinical evaluation.

RESULTS

Study 1

In the 105 patients with atypical pain in the chest, the diagnosis of cardiac or esophageal disease was made from the results of the investigations performed, independent of the symptoms.

Group 1 (Esophageal Pain). These patients had a radiologically diagnosed hiatal hernia, manometric evidence of a hernia, or radiologic evidence of gastroesophageal reflux. A major component of their pain was reproduced by perfusion with esophageal acid. One patient had diffuse spasm of the esophagus, and in this patient, pain was reproduced by perfusion with acid. In each patient a coronary angiogram, an exercise ECG, or both of these studies were normal.

Group 2 (Cardiac Pain). The results of a barium swallow, esophageal manometric studies, and studies using the technique of perfusion with acid were normal; and the patients had an abnormal exercise ECG, with either ST-segment depression or coronary angiographic evidence of arterial stenosis (or both).

Group 3. Cardiac and esophageal findings were both abnormal, indicating the presence of both diseases.

Group 4. The results of cardiac and esophageal investigations were all normal.

Forty-three patients were diagnosed as having esophageal disease, 12 were diagnosed as having cardiac disease, 21 had both cardiac and esophageal disease, and in 29 patients, neither disorder was present.

Comparison of Symptoms: Atypical vs Typical Esophageal Pain. Comparison of the distribution of pain and of precipitating and relieving factors can be made between the 43 patients with esophageal disease as the sole cause of atypical pain in the chest and the 100 consecutive patients with proven gastroesophageal reflux. In the 43 patients with atypical pain in the chest (with esophageal disease), the distribution of pain was compared with the distribution described in the 100 consecutive patients with gastroesophageal reflux (Table 1). Similarly, precipitation of pain by food, posture, and exercise was compared between the two groups (Table 2). Relief of pain in the patients with atypical pain in the chest was via administration of antacids in 18 percent

Table 1—Distribution of Pain in 43 Atypical Patients vs 100 Consecutive Patients with Gastroesophageal Reflux

<table>
<thead>
<tr>
<th>Location of Pain</th>
<th>43 Atypical Patients</th>
<th>100 Consecutive Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epigastric</td>
<td>23 (53)</td>
<td>88 (88)</td>
</tr>
<tr>
<td>Retrosternal</td>
<td>40 (93)</td>
<td>91 (91)</td>
</tr>
<tr>
<td>Back</td>
<td>14 (32)</td>
<td>40 (40)</td>
</tr>
<tr>
<td>Neck and ear</td>
<td>10 (23)</td>
<td>5 (5)</td>
</tr>
<tr>
<td>Arm*</td>
<td>24 (55)</td>
<td>6 (6)</td>
</tr>
</tbody>
</table>

*Distribution of pain in arms was much higher in atypical patients and was one of reasons for them being labelled as atypical.

Table 2—Precipitation of Pain in 43 Atypical Patients vs 100 Consecutive Patients with Gastroesophageal Reflux

<table>
<thead>
<tr>
<th>Precipitating Factors</th>
<th>43 Atypical Patients</th>
<th>100 Consecutive Patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td>29 (67)</td>
<td>95 (95)</td>
</tr>
<tr>
<td>Posture</td>
<td>17 (39)</td>
<td>51 (51)</td>
</tr>
<tr>
<td>Exercise*</td>
<td>24 (55)</td>
<td>9 (9)</td>
</tr>
</tbody>
</table>

*Exercise-induced pain is atypical in patients with gastroesophageal reflux. High incidence in 43 atypical patients accounts in part for them being labelled as atypical.
(8/43) and via therapy with nitroglycerin in 20 percent (9/43). In the consecutive group of 100 patients with gastroesophageal reflux, relief of pain was by therapy with antacids in 95 percent and with nitroglycerin in 10 percent.

Surgery. Seventeen patients were treated surgically for gastroesophageal reflux that was unresponsive to conservative management, and one was treated surgically for diffuse spasm. Fourteen of these patients had only esophageal disease (group 1), and four had both esophageal and cardiac disease (group 3). All of these patients had complete relief of their esophageal symptoms. Six patients with coronary arterial disease (group 2) had aortocoronary bypass, which was effective in relief of pain.

Study 2

In this study, reproduction of pain by the technique of perfusion with acid was compared with the distribution of pain obtained by history. Following surgical correction of gastroesophageal reflux, all patients reviewed clinically three to six months after repair had complete relief of pain.

In the 72 patients with gastroesophageal reflux, the pattern of pain by history was epigastric in 91 percent (66/72), retrosternal in 98 percent (71/72), in the back in 52 percent (37/72), in the arms in 18 percent (13/72), and in the ear in 1 percent (1/72). The technique of perfusion with acid reproduced all components of pain in 54 percent (39/72), reproduced certain portions of the complex of pain in 37 percent (27/72), and did not produce any discomfort in 8 percent (6/72).

Failure to reproduce pain with the technique of perfusion with acid occurred for epigastric pain in 15 percent (11/72), for retrosternal pain in 12 percent (9/72), for pain in the back in 52 percent (37/72), and for pain in the arms in 69 percent (50/72). Only one patient had pain in the ears, and this was reproduced.

Discussion

Atypical pain in the chest presents a common diagnostic problem. It is of importance because misdiagnosis leads to mismanagement, with the potential of serious complications. The reasons for labeling cardiac or esophageal pain as atypical are the distributions of pain or its precipitating and relieving factors:

Experience gained in the management of these 105 patients with atypical pain in the chest has shown that many of the patients were incorrectly diagnosed and treated over a period of years. Because of the difficulties in symptomatic evaluation, it was elected to investigate both esophageal and cardiac disease. With this approach, the patients could then be divided into diagnosed categories (or esophageal, cardiac, cardiac and esophageal, and a final group where neither organ was considered to be the source of pain).

Forty-three patients were shown to have gastroesophageal reflux as the source of their symptoms. This group was compared to 100 consecutive patients with symptoms of gastroesophageal reflux in order to determine what components of history had led to their pain being labelled as atypical.

Distribution of pain to the arm can occur with both cardiac and esophageal disease but is much more typical of cardiac pain. In this study, such pain occurred in 55 percent (24) of the 43 patients with atypical esophageal symptoms and in only 6 percent of the 100 consecutive patients with gastroesophageal reflux. Since pain in the arms is rare in gastroesophageal reflux, the presence of such pain necessitates consideration of a cardiac origin.

Typical pain is produced by eating and postural change in patients with gastroesophageal reflux; however, in this atypical group, pain was produced by eating in only 67 percent (29/43), by posture in 39 percent (17/43), and by exercise in 55 percent (24/43). This contrasts with the typical group of 100 patients, where pain was secondary to eating in 56 percent, to postural change in 51 percent, and to exercise in only 9 percent. Exercise-induced pain is common in cardiac disease but can occur with gastroesophageal reflux and is more likely to occur immediately after eating. When present, exercise-induced pain suggests cardiac disease and accounts for the difficulty in diagnosis and the labelling of the patient as having atypical pain.

Relief of pain may occur with administration of antacids and nitroglycerin in esophageal disease. Relief due to administration of nitroglycerin in patients with angina is effective within three minutes, whereas when such relief is reported by the patient with esophageal disease, usually the therapy is variable in its effect, and the onset of relief is delayed by five or more minutes. Although relief due to administration of nitroglycerin was present in 20 percent (9/43) of the patients with atypical esophageal disease, such relief was also reported in 10 percent of the 100 consecutive patients with typical esophageal disease. In none of these patients did the relief of pain occur in less than three minutes.

Failure of therapy with antacids to give relief in the patients with atypical pain in the chest is one reason for doubting an esophageal diagnosis, as the more typical group reported effective relief with administration of antacids in 95 percent.
The differences in the distribution of pain and its precipitation and relief account for the difficulty in the diagnosis of its atypical origin. With the recognition of the features of esophageal disease responsible for the difficulty in diagnosis, it then became necessary to look more closely at the reproduction of pain by the technique of perfusion with acid.

In the typical patient, perfusion with acid can be used as a confirmatory test, and accurate reproduction of pain is of great diagnostic value. The patient may well indicate that the pain reproduced is typical; however, reproduction of all components of pain occurred in only 54 percent (39/72) of patients. In 8 percent (6/72), there was no reproduction of pain; and in 37 percent (27/72), although the reproduced pain was considered by the patient to be typical, it was incomplete. The most easily reproduced pains were epigastric and retrosternal pain, while pain in the back and arms occurs only during major exacerbations of symptoms, so that this level of production of pain may not be reached.

When a patient is considered to have atypical pain in the chest and the differential diagnosis includes cardiac and esophageal disease, the technique of perfusion with acid, although of value, clearly has limitations. In the patient with atypical pain in the chest, a failure to reproduce all components of pain makes it impossible to exclude cardiac disease. Because of these difficulties, although esophageal investigation can establish accurately the presence of esophageal pathologic abnormalities, it cannot exclude the possibility of concomitant cardiac disease.

In such a patient with atypical pain, we have found that complete esophageal and cardiac investigation is the only safe method of evaluation. Having used this approach, we have been able to operate on 14 patients with esophageal disease and four with both esophageal and cardiac disease to achieve effective relief of esophageal symptoms. Six other patients have had aortocoronary bypass with effective relief of angina.

References