

## ATYPICAL PAIN IN ANGINA PECTORIS

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In its typical form the syndrome of angina pectoris seldom offers difficulty in diagnosis. The pain or discomfort is situated in the substernal region, is precipitated by exertion, may or may not radiate from its site of origin, and is relieved promptly by rest and nitroglycerine. Atypical forms of the syndrome, however, are not so well recognized and often are responsible for erroneous diagnoses. It is the purpose of the present report to emphasize the frequency with which the pain of angina pectoris arises in regions other than the substernal area and to point out the more common of the atypical sites of origin.

### MATERIAL AND RESULTS

Five hundred cases of angina pectoris due to coronary artery disease were analyzed. The cases constituted a consecutive series except for the fact that a few records were excluded because of insufficient information in the clinical history or because no electrocardiogram had been made.

In the entire series of 500 cases there were 378 instances in which the pain or discomfort originated in the substernal region and 122 in which it arose in some other area. The pain, therefore, was atypical in its site of origin in 24.4 per cent of the patients. The ages of the patients, distribution according to sex, and the incidence of arterial hypertension are shown in Tables 1 and 2. None of these factors appeared to be of significance in relation to the occurrence of atypical pain. The initial location of the pain in the atypical cases is presented in Table 3. The pain originated in the precordial area in 34 cases, an incidence of but 6.8 per cent of the entire series of 500 cases. Pain originating in the extremities occurred with practically the same frequency as precordial

TABLE 1  
Age Distribution in Typical and Atypical Angina Pectoris

| Age Group   | Typical (378 cases)         | Atypical (122 cases)        |
|-------------|-----------------------------|-----------------------------|
|             | No. of Cases and Percentage | No. of Cases and Percentage |
| 30-39       | 9 (2.4%)                    | 3 (2.5%)                    |
| 40-49       | 80 (21.2%)                  | 30 (24.6%)                  |
| 50-59       | 132 (34.9%)                 | 52 (42.6%)                  |
| 60-69       | 123 (32.5%)                 | 31 (25.4%)                  |
| 70-79       | 31 (8.2%)                   | 5 (4.1%)                    |
| 80 and over | 3 (0.8%)                    | 1 (0.8%)                    |

TABLE 2

Sex and Blood Pressure in Typical and Atypical Angina Pectoris

| Blood Pressure | Typical (378 cases)         |            | Atypical (122 cases)        |            |
|----------------|-----------------------------|------------|-----------------------------|------------|
|                | No. of Cases and Percentage |            | No. of Cases and Percentage |            |
|                | (Male)                      | (Female)   | (Male)                      | (Female)   |
| Normal.....    | 158 (41.8%)                 | 22 (5.8%)  | 54 (44.3%)                  | 10 (8.2%)  |
| Elevated*..... | 123 (32.5%)                 | 75 (19.8%) | 44 (36.1%)                  | 14 (11.5%) |

\*In this study a blood pressure which was over 150/90 mm. of mercury was considered to be elevated.

pain, while discomfort arising in the abdomen was somewhat less common. Less common still were those cases in which the initial location of the distress was the neck, throat, jaws, or upper back.

The data presented in Table 3 also indicate that there are two principal varieties of atypical pain in angina pectoris, namely, a form in which there is no radiation to the substernal area and one in which the discomfort spreads from its site of origin to involve the substernal

TABLE 3

Location and Radiation of Pain in Atypical Angina Pectoris

| Initial Location                | No. of Cases | Percentage of Entire Series (500 cases) | Radiation to the Substernum |
|---------------------------------|--------------|---|-----------------------------|
| Chest.....                      | 38           | 7.6%                                    |                             |
| Precordium.....                 | 34           | 6.8%                                    |                             |
| Other than pre-<br>cordium..... | 4            | 0.8%                                    |                             |
| Upper extremities...            | 35           | 7.0%                                    | 19 (54.3%)                  |
| Left.....                       | 17           | 3.4%                                    | 9 (53.0%)                   |
| Right.....                      | 3            | 0.6%                                    | 2 (66.7%)                   |
| Both.....                       | 15           | 3.0%                                    | 8 (53.3%)                   |
| Epigastrium.....                | 29           | 5.8%                                    | 13 (44.8%)                  |
| Neck, throat, and<br>jaws.....  | 13           | 2.6%                                    | 1 (7.7%)                    |
| Back.....                       | 7            | 1.4%                                    | 3 (42.9%)                   |

## ANGINA PECTORIS

region. The latter form constitutes the so-called *angine renversée* of Potain. In addition to these two types, a third variety of atypical pain was encountered in which the distress was predominantly peripheral in location but was accompanied by slight substernal discomfort. In the present series there were 81 cases in which the pain did not radiate to the substernal region, 36 in which radiation to the substernal area occurred, and 5 in which the peripheral pain was accompanied by slight substernal discomfort. In several of the cases belonging to the first of these groups there had been one or more attacks in which the pain had originated in, or had radiated to, the substernal region, but distress of this kind was not a part of the patient's usual attacks. In a few cases in the first and second groups also there originally had been one or more attacks in which the pain arose in the substernal region and the attacks later had assumed their atypical character. In each of the five cases in the third group, the history of substernal discomfort was obtained only by direct questioning, and the distress never amounted to more than a distinctly minor feature.

Eleven (9 per cent) of the patients who had atypical pain and 61 (16 per cent) of those who had typical pain had experienced myocardial infarction before they were first seen. Electrocardiographic abnormalities were recorded in all but a few of the atypical cases, and the heart was enlarged on roentgenologic examination in 30 of the 122 patients. Nitrite therapy for the attacks had been employed at some time in 34 of the atypical cases and had given relief in all but one patient.

## DISCUSSION

It is generally accepted<sup>1</sup> that cardiac stimuli which result in the pain of angina pectoris are transmitted from the heart entirely by way of sympathetic afferent fibers. A few of these fibers pass directly from the heart to the upper four or five thoracic sympathetic ganglia, but the great majority reach these ganglia by way of the middle and inferior cardiac nerves and the corresponding cervical ganglia. All of the fibers pass through the sympathetic ganglia without interruption and reach their ganglion cells in the upper four or five thoracic posterior nerve root ganglia by way of the white rami communicantes. The central processes of the ganglion cells form synapses with sensory cells in the gray matter of the posterior horns of the spinal cord, and from this point two possible routes exist. The first of these is known as the direct pathway, and over it stimuli are transmitted directly to the thalamus. Apparently it is this type of stimulation that results in the sensation of pain in the substernal region. The second route is known as the indirect

pathway and is the one that is responsible for the radiation or referred pain of angina pectoris. This pathway results from the fact that certain of the sympathetic cardiosensory nerves form synapses with posterior horn cells that also serve somatic afferent nerves. The irritability of these cells is increased by the stimuli arriving over the cardiosensory nerves so that somatic impulses produced by the ordinary contacts with the outside world cause the central neurone to discharge (theory of summation of impulses). The pain is referred to the areas from which the somatic impulses arise. Spillane and White<sup>2</sup> believe that the theory of referred pain explains the ordinary extrathoracic pain of cardiac origin but does not account for the type of pain which begins peripherally and spreads toward the thorax. They are of the opinion that the latter pain is the result of an autonomic reflex which causes painful peripheral spasm of smooth muscle.

Although many observers have directed attention to the occurrence of atypical pain in angina pectoris, few studies have been made to ascertain its frequency and most common varieties. Riseman and Brown<sup>3</sup> reported that in 26 of 100 cases of angina pectoris, the pain originated in an area other than the substernal region. In these cases the most common sites of origin were the cardiac apex or other areas of the anterior chest, thoracic spine, epigastrium, and left arm. Bourne and Scott<sup>4</sup> recorded pain of atypical origin in approximately 30 per cent of 112 cases of angina pectoris, the most common of the atypical sites being the left chest, right chest, and epigastrium. In the present study the incidence of atypical pain was 24 per cent, and the most common sites of origin of the pain in the atypical cases were the precordium or other areas of the anterior chest, the upper extremities, epigastrium, and the neck, throat, or jaws.

Fortunately, a detailed clinical history almost always enables one to make a correct diagnosis of angina pectoris even in those cases in which the pain is not typical in its origin. The attacks are precipitated by exertion or excitement and are particularly liable to occur while walking in cold weather or soon after eating. In both typical and atypical cases, the patient often experiences difficulty in describing the pain and frequently refers to it as a sensation of fulness, pressure, tightness, squeezing, or heaviness. Usually the distress is of such a nature as to enforce cessation of all activity and at times is accompanied by a sense of impending death. The pain may or may not radiate from its site of origin, but when it does do so the fact is of diagnostic importance. In cases in which the pain originates in an atypical area, there is often no radiation or accompanying sensation of distress in the substernal region. At times, however, the patient, on questioning, will acknowledge some

minor substernal discomfort as a part of his usual attacks or will recall having had substernal pain during one or more unusually severe seizures. All symptoms are relieved by rest, usually within a few minutes. It is extremely unusual for the attack to last as long as fifteen minutes. Nitroglycerine and similar preparations almost invariably give prompt relief from the symptoms. Physical examination and electrocardiogram may or may not reveal evidence of organic heart disease. If the electrocardiogram is normal, a record made during an induced attack of pain frequently shows changes in the S-T segment or the T wave of greater degree than occur in the tracings of normal individuals after the same amount of exercise.<sup>5</sup>

It is of course of great importance that all cases of angina pectoris be correctly diagnosed in order that proper therapy may be instituted and the patient advised concerning his future mode of life. Measures of this kind can do much not only to increase the patient's comfort but also to prolong his life, while incorrect management, on the other hand, is very liable to increase the gravity of an already serious prognosis. In cases of atypical pain arising in the epigastrium, accurate recognition may even spare the patient the risk of an unnecessary operation.

#### SUMMARY AND CONCLUSIONS

Five hundred consecutive cases of angina pectoris due to coronary artery disease were analyzed in order to determine the frequency with which the pain originated in regions other than the substernal area. In 378 cases the pain arose in the substernal region, and in 122 (24.4 per cent) it originated in some other area. The most common of the atypical sites of origin were the precordium, upper extremities, epigastrium, and the neck, throat, or jaws. The age and sex of the patients and the presence of arterial hypertension were not of significance in relation to the occurrence of atypical pain.

There are two principal varieties of atypical pain in angina pectoris, namely, a form in which there is no radiation to the substernal area and one in which the discomfort spreads from its site of origin to involve the substernal region (*angine renversée*). A third and less common variety also was encountered in which the distress was predominantly peripheral in location but was accompanied by slight substernal discomfort.

The diagnostic criteria of angina pectoris have been reviewed, and the importance of accurate recognition of all cases of the syndrome has been emphasized.

REFERENCES

1. LEVY, H. L. (Editor): Diseases of the Coronary Arteries and Cardiac Pain, New York: McMillan Co., 1936.
2. SPILLANE, J. F. and WHITE, P. D.: Atypical pain in angina pectoris and myocardial infarction, Brit. Heart J. 2:123, 1940.
3. RISEMAN, J. E. F. and BROWN, M. G.: An analysis of the diagnostic criteria of angina pectoris, Am. Heart J. 14:331, 1937.
4. BOURNE, G. and SCOTT, R. B.: Angina of effort; a clinical study, Brit. Med. J. 1:55, 1938.
5. PROUDFIT, W. L. and ERNSTENE, A. C.: Angina pectoris with pain of atypical distribution; report of case illustrating diagnostic value of electrocardiographic changes during induced attack of pain, Cleve. Clinic Quart. 8:253, 1941.