

Chest Pain Simulating Coronary Artery Disease

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Pain in the chest may be as nonspecific as any of the symptoms of circulatory insufficiency and is therefore not necessarily always a representative of anginal or coronary heart failure. In other words, it is a symptom that may have originated in a thoracic structure other than the heart. Angina pectoris, the classical syndrome that was so clearly described by Heberden is a symptom-complex that must be considered a clinical disease entity of serious prognostic significance. The gravity of such a diagnosis is known to most laymen and the pronouncement of such a sentence may be the final straw which leads to dissolution.

Again, such a diagnosis on inadequate grounds in a neurotic individual may cause unnecessary mental anguish and even invalidism. The nervous and mental influences play such a prominent role in the etiology of angina pectoris that most careful and most tactful explanation of the situation must be offered to those who actually suffer from the condition.

It is therefore of the utmost importance to have very clear conceptions of what angina pectoris is and to be able to determine who does not have it as well as who has it.

It is not my intention to give detailed tables of differential diagnostic points; these can be found in most textbooks on general medicine or on diagnosis. Rather, my aim is to mention those clinical entities — and they are quite a number — which might lead to some confusion in diagnosis. The ultimate decision depends on various factors — some beyond our

control as, for instance, the ability or otherwise of the patient to describe his symptoms, the normal electrocardiogram in cases where the symptomatology is highly suggestive of coronary disease, and the neurotic who is either diabetic or hypertensive.

Apart from these contributory factors, even under ideal conditions the diagnosis is sometimes very difficult to make.

In most cases, however, if one keeps in mind the qualities and behaviour of angina pectoris and myocardial infarction — that is, the site, the character, the duration and the provocation — then the chances are that mistakes will be fewer.

At this stage I would like to point out some exceptions to the general rules regarding the qualities and behaviour of cardiac pain which I have learned from my work. For example, anginal pain may be parasternal and not retrosternal; esophageal spasm may cause severe retrosternal pain which is relieved by nitroglycerin, a drug which also relieves gall-bladder spasm, so that nitroglycerin given as a therapeutic test is of little value.

I have seen a man with typical effort angina who never had any chest pain, but only pressure pain in both elbows. Another patient with myocardial infarction experienced severe pain in the left shoulder, with no radiation, either to the anterior chest wall or to the arms. And yet another man got severe epigastric pain with vomiting and diarrhoea, in which the electrocardiogram left no doubt as to the diagnosis.

I shall now try to tackle the points at

issue and discuss those conditions which really create trouble in diagnosis. With regard to cardiac pain, unless specifically stated, no distinction is made between angina pectoris, coronary failure or myocardial infarction.

The approach to the subject is based mainly on private and hospital patients, and we shall now discuss the causes of chest pain which might simulate coronary artery diseases.

1. ANXIETY STATES

When combined with left inframammary pain, anxiety states present no diagnostic difficulty, but when the pain is parasternal, or even central, it may be very confusing. The patients are usually women near the menopause, and they may describe a central pain radiating to the throat, jaws and arms, during or after effort, when reaching up to a high shelf, when washing or using their arms in other ways and, sometimes, when emotionally upset. The attacks are apt to be widely spread, unrestricted effort causing no distress between them. Complete investigations may reveal nothing significant in any system, and the nature of the attacks remains obscure. Angina can only be excluded by obtaining a normal ECG during spontaneous or induced pain.

2. DA COSTA'S SYNDROME (NEURO-CIRCULATORY ASTHENIA, EFFORT SYNDROME)

Neurocirculatory asthenia refers to an ill defined syndrome of psychogenic or neurogenic origin, often mistaken for organic heart disease and characterized by dyspnoea, precordial pain, dizziness, palpitation, headache, exhaustion and a general incapacity or inefficiency in adjusting to physical or emotional strain. Despite the distinctive titles given to this syndrome it is not a nosological entity. It is nothing more than a mixture of the more general picture of psychoneurosis

which, in the cases under discussion, chances to assume entirely cardiac symptoms.

The characteristic symptoms and signs associated with psychiatric disorders usually make the diagnosis easy.

3. ESOPHAGEAL SPASM

Esophageal spasm may cause central chest pain, radiating down both arms and being tight or bursting in character. There is no close relationship to effort but emotional tension aggravates the intensity and frequency of symptoms. The distress arises from abnormal changes in smooth muscle tone. The pain and spasm may be transitory or may persist for hours.

The diagnosis may be proved by demonstrating esophageal spasm by means of fluoroscopy and by obtaining a normal electrocardiogram during attacks.

4. DIAPHRAGMATIC HERNIA

Diaphragmatic hernia may cause, on effort, pain similar to angina pectoris but it is usually more closely related to meals and in most cases is precipitated by lying down or bending forward. It is usually revealed by a barium meal examination.

5. SPLENIC FLEXURE SYNDROME

Another interesting example of visceral pain which mimics angina has recently been described under the title of splenic flexure syndrome. It is due to distension of the splenic flexure with gas, probably the result of a spastic colon. Forty cases have been reported, 75% of which had precordial pain, in 25% it radiated to one or both shoulders, in 20% to the left side of the neck, and in 20% down one or both arms. Relief resulted from the expulsion of faeces or flatus. In all these cases a barium meal revealed the condition.

6. Laterally Displaced Cervical Intervertebral Disc

Discomfort may range from mild annoyance to pain of unbearable intensity. The pain may be generalised throughout

the shoulder girdle and radiate to the lower arm and hand and to the anterior chest wall. The pain is usually worse in the recumbent position, often awakening the patient or preventing sleep.

It is quite easily differentiated from cardiac pain by the fact that motion of the neck, usually, hyperextension, or rotation of the chin to the painful side, aggravates the pain. Also, coughing, sneezing and straining may cause severe jolts of pain.

7. SCALENUS ANTERIOR SYNDROME.

Scalenus anterior syndrome may be defined as a painful symptom complex affecting the shoulder girdle, neck, chest, arm and hand, often associated with numbness and tingling due to irritation of the brachial plexus and subclavian vessels by a spastic or hypertrophied anterior scalenus muscle.

As you know the anterior scalenus muscle arises from the transverse processes of the 3rd, 4th, 5th and 6th Cervical vertebra it comes almost directly downwards to be inserted on the scalene tubercle on the upper inner surface of the 1st rib. At each level from the 4th to the 7th C. segment, a branch is supplied to innervate the muscle. The subclavian artery lies within an acute angle formed by the scalenus anterior muscle and the 1st rib. The subclavian vein lies in front of the muscle and in the space between the 1st rib and clavicle. A trough is formed with the ribs as a base — the scalenus anterior muscle in front and the scalenus medius behind; the subclavian artery and brachial plexus are contained within the triangle and therefore any spasm or shortening of the muscle would cause compression of the contents of this triangle which include the subclavian artery and brachial plexus. Differential diagnostic points are:—

a) forcing the head back and away from

the painful side may cause increased pain.

- b) arterial amplitude and pressure changes take place with deep breathing, and extension and rotation of the cervical spine.
- c) reflexes may be diminished or absent.
- d) there may be fullness of the supraclavicular space.
- e) the grip is poor.
- f) compression of the anterior scalenus muscle just above the clavicle causes intensified pain.

I have spoken at some length on this syndrome because it is not generally appreciated that it is not an infrequent differential diagnostic problem.

8. PECTORALIS MINOR SYNDROME

Persons engaged in strenuous work may suffer from chest pain due to strain of the pectoralis minor muscle which arises from the anterior ends of the 3rd, 4th, 5th ribs and narrows as it passes to be inserted into the medial border and upper surface of the coracoid process of the scapula. This pain must not be confused with angina if the left muscle is involved. The pain is provoked by movements of the arm but never radiates down the arm. It can be reproduced when the backward and laterally outstretched extremity is pushed against resistance, a manoeuvre that requires contraction of the pectoralis minor.

9. INTERCOSTAL NERVE PAIN

Irritation of the intercostal nerves may arise from a "neuritis" of those nerves, resulting from trauma, systemic or upper respiratory infections or other toxic causes, or pressure upon the nerve. The "neuritis" is often aggravated by exposure to cold, like angina pectoris, but the pain is localised in the intercostal spaces and the patient is usually able to identify the exact side of tenderness. The

nature of the pain may be stabbing lancinating or burning. One may locate tender pressure points near the parasternal lines.

10. MYALGIAS

This scapegoat of so many of our problems does, in reality, exist. When we tell our patients that this and that pain is "nothing, it's rheumatism etc." we may be justified in our diagnosis but not perhaps in our concept of its etiology. As you know irritation of muscle is a frequent cause of somatic pain. Apparently muscle is a tissue from which only one sort of pain is produced; the description is aching in nature.

The aching muscle tenderness of the intercostals to motion and palpation after unaccustomed exercise, and muscle stiffness and pain following exposure to cold are clinical myalgias in their commonest forms. They result from mild inflammation of muscle tissue.

Myositis involving the intercostal muscles may give rise to marked discomfort and nodules and induration in the muscles may be present.

11. THE OSTALGIAS

The source of pain from bone is the numerous sensory nerve endings in the periosteum and to a lesser extent in the endosteum. Pathological processes in the ribs or sternum will be diagnosed by inspection, palpation and X-rays. Fractures, subperiosteal haematomas osteomyelitis, or tumors, may be the cause of localised pain and tenderness. Here I would like to mention a syndrome called Tietze's syndrome which I have never encountered but appears not to be rare according to the literature and consists of a non-specific, non-suppurative painful swelling of the costal cartilages and usually accompanying chronic respiratory infections.

12. MISCELLANEOUS PAINS

Other pains which are usually easy to diagnose and which should not cause any diagnostic dilemmas are herpes zoster, pleural pain and mastodynia.

Tumors, especially bronchogenic carcinoma may be attended by severe, continuous pain when the tumour tissue, extending to the pleurae through the lung, constantly irritate the pain nerve endings in the pleura.

The occurrence of spontaneous pneumothorax is often signalled by severe pain, usually in the upper and lateral thoracic wall and is exquisitely influenced by any movement and by the cough and dyspnoea which accompany it.

13. LEFT SHOULDER PAIN

Pain from the left shoulder may be referred to the anterior chest wall and down the inside of the left arm. It has been proved that if an injection of hypertonic saline is made into the left 8th cervical interspinous ligament pain is felt over the left breast and inside the left arm. This disposes at once of the idea that this pain distribution is peculiar to angina, and therefore the left shoulder should always be examined before a diagnosis is reached.

We shall now consider those cases where the pain is severe enough to mimic an attack of myocardial infarction. Since this talk is concerned with chest pain we have intentionally omitted some episodes which are of the utmost importance and which the students should read and re-read again. These episodes present themselves as mainly epigastric in location and have to be differentiated from coronary thrombosis. I am referring to acute pancreatitis, perforated duodenal ulcer and mesenteric vein thrombosis.

14. GALL-STONE COLIC

At this stage I have to make a confession. Every physician, I believe, has his

favourite disease — diagnosis relationship. Without trying to be dogmatic I would like to stress the importance of gall-stone colic as a cause of lower retrosternal pain, closely resembling coronary thrombosis. To make things worse the attack is usually followed by shock, nausea and fever. One diagnostic point I have found to be very useful when present is pain referred to the right shoulder. The electrocardiogram, of course, gives conclusive evidence but then we don't carry an ECG in our bag, and it may require all the acumen of an experienced physician to differentiate gall-stone colic from coronary thrombosis.

The pain of the colic is usually centered high up under the xiphisternum and may extend upwards; it radiates through to the back and may have a segmental distribution similar to that of angina; it is constricting in character and may be so intense as the most severe anginal pain.

Occasionally other points help in the differential diagnosis, for instance the copious vomit of bile in colic and its association with a slow pulse rate.

15. THE DUMPING SYNDROME

In the March 1950 issue of *The Practitioner*, Paul Gibson has pointed out the similarity of the dumping syndrome to coronary thrombosis. Either during a meal, or about 30 minutes later, there may appear quite abruptly a feeling of acute discomfort high up in the epigastrium with palpitation and sweating and a feeling of apprehension and faintness. The symptoms may last for an hour or more and then pass off leaving the patient weak and drowsy. Without the history of gastrectomy we can easily be misled but recovery is rapid and the blood pressure usually rises. A history of previous attacks is important.

16. PULMONARY EMBOLISM.

If the attack of embolism is manifested by chest pain, haemoptysis and physical signs in the lung, pulmonary embolism is easily diagnosed, but haemoptysis and physical signs are more often absent than not. In general, pain excited by pulmonary embolism is apt to be sharp and pleuritic in quality. Cyanosis is often more striking and tachypnoea more frequent than in cases of acute myocardial infarction. But the most important clue, and this is really important, is early engorgement of the cervical vein and immediate hypertension. The ECG is diagnostic.

17. CARDIAC ARRHYTHMIAS

The sudden onset of an arrhythmia, especially when associated with tachycardia, is sometimes attended by oppressive substernal pain which may be prolonged, by cold sweat and occasionally by dyspnoea and other evidences of heart failure. Such a picture is often mistaken for acute myocardial infarction. Discovery of the arrhythmia does not always exclude myocardial infarction since the latter may be associated with certain arrhythmias at its onset. Cessation of the pain and other symptoms when the arrhythmia disappears, and absence of the characteristic ECG changes of cardiac infarction excludes this condition.

18. ACUTE PERICARDITIS

Acute pericarditis may simulate cardiac infarction closely but the pain of pericarditis may be intensified by cough and deep respiration. The ECG distinguishes between the two conditions.

19. DISSECTING (NON-SYPHILITIC) ANEURYSM OF THE AORTA

Occurs predominantly among males between the ages of 40 and 70 with pre-existing hypertension. Weakness of the media due to degenerative disease is the

basic disturbance. The intimal lesion occurs commonly a few centimeters above the aortic valve or near the origin of the left subclavian artery, but it may occur anywhere in the thoracic aorta.

Of great diagnostic significance is the persistence of hypertension even when there is evidence of shock after the onset of the dissection. A difference in pressure in the two arms favours dissecting aneurysm. In both conditions there is severe retrosternal or precordial pain but the pain of dissection aneurysm of the aorta usually occurs more suddenly, is often of an immediate tearing quality and is apt to have more widespread radiating qualities, e.g., to head and neck, to the back, the lumbar region and the lower extremities. Dysphagia due to the pressure of the false sac on the esophagus occurs rarely but when present, however, it is a distinguishing diagnostic feature for it is not encountered in coronary thrombosis.

The last condition to be described is:-

20. SPONTANEOUS INTERSTITIAL EMPHYSEMA OF THE LUNG.

(Mediastinal emphysema)

Since I have never seen a case of mediastinal emphysema I am quoting from Friedberg's "Diseases of the Heart". This syndrome may be characterised by an abrupt onset of severe chest pain in the substernal region, radiating to the neck and left arm. The true cause of the pain may be betrayed by the pathognomonic sign of very loud peculiar crunching, crackling or bubbling sounds over the sternum and precordium synchronous with cardiac symptoms. X-ray of the chest may reveal shadows of air in the mediastinum itself.

Before concluding I would like to recapitulate the notes on the relation of pain to exertion and on the character and location of pain because of their importance in the final diagnosis.

RELATION OF THE PAIN TO EXERTION

Pain in the conditions simulating heart disease is chiefly distinguished from angina pectoris by being unrelated to general bodily exertion, especially walking rapidly or uphill. The pain secondary to lesions of the shoulder or to local disease of the chest wall may be precipitated by exercise of the local areas but not by general bodily effort.

Active or passive movements of the left arm on the cervical and thoracic spines through its complete range of motion, or deep inspiration, coughing or sneezing may reproduce the pain and disclose its noncardiac origin.

And now this is very important — the occurrence of pain with emotional states is not decisive, being as common with neuroses and functional disturbances of the gastro-intestinal tract as with angina pectoris.

CHARACTER AND LOCATION OF THE PAIN

A dull ache in the precordial region or above and to the left of the heart is common in neurotic persons, or as a result of pectoral myalgia or neuralgia. A dull ache or sharp, sticking or stabbing pain in the region of the apex or in the left breast also occurs frequently in neurotic subjects. In addition, there is often a complaint of excessive fatigability, palpitation, different pains in different parts of the body and difficulty in taking a deep breath. The pain occurs at rest as well as with effort, and especially when the patient is fatigued. There is often an hyperaesthesia in the painful area, usually in the segmental distribution of D 4 and D 5 rather than of C 8 and D 1 as in angina. I have observed a similar type of pain in subjects with indigestion, especially in middle-aged obese patients. This form of pain, variously located in the

chest and abdomen, results from gastrointestinal gaseous distension.

Occasionally the pain of a gastric or duodenal ulcer is situated in the lower sternal region; it has a burning or boring quality, is not related to effort and is relieved by milk or alkalis.

The pain due to pleurisy or pericarditis is unlikely to be confused with the pain of coronary disease because of associated clinical symptoms, the presence of fever and other objective evidences of infarction and local disease, the sharp nature of the pain and its frequent occurrence with deep inspiration.

When doubt remains, and this is not a rare occurrence, one can seek help in the X-ray department; this applies to

cholelithiasis, peptic ulcer, diaphragmatic hernia, aortic aneurysm, pleuropulmonary diseases, destructive lesions of the ribs and shoulder pain lesions.

I conclude by quoting Dr. Richard Cabot from his "Case Teaching in Medicine": "The most important lesson to be learned by every student of medicine is the art of recognising the physical signs of disease — a displaced cardiac apex, an Argyll-Robertson pupil, a friction rub. But these data have to be interpreted. They do not crystallise spontaneously with conclusion. They do not arrange themselves in those significant groups which we call diseases. They have to be worked up with diagnosis by a reasoning process and this reasoning needs practice."