

may be a feature of uræmia. (6) From the action of toxic agents. It occurs in uræmia, poisoning by lead, alcohol, and follows the use of tobacco, coffee, and digitalis. (7) In constitutional disorders, such as anæmia, chlorosis, and diabetes. (8) In diseases of the nervous system. Apoplexy, epilepsy, the cerebral tumors, affections of the medulla, and diseases and injuries of the cervical cord may be associated with very slow pulse. In general paresis, mania, and melancholia it is not infrequent. (9) It occurs occasionally in affections of the skin and sexual organs, and in sunstroke, or in prolonged exhaustion from any cause.

It is seen most frequently in the convalescence from acute fevers, then in disorders of the digestive system. The significance of this symptom is variable. It is only in diseases of the heart or brain that it is ominous. It may be due to direct irritation of the vagi, to diminished excitability of the cardiac ganglia, to reflex influences acting upon the vagus centre, or to weakness of the heart-muscle itself. The pulse-beat rarely sinks below 20. Prentice, at the Association of American Physicians at Washington, showed a patient with attacks of unconsciousness, who had, particularly during the attacks, but also in the intervals, a pulse as low as 12 per minute. Such cases are extremely rare. Cases are on record in which the pulse has fallen to 8 or 9 beats in the minute. At the discussion which followed the exhibition of Prentice's patient, both Jacobi and Kinnicutt referred to similar cases associated with epileptic seizures, in one of which the pulse fell as low as 7 in the minute.

**Treatment of Palpitation and Arrhythmia.**—An important element in many cases is to get the patient's mind quieted, and he can be assured that there is no actual danger. The mental element is oftentimes very strong. In palpitation, before using medicines, it is well to try the effect of hygienic measures. As a rule, moderate exercise may be taken with advantage. Regular hours should be kept, and at least ten hours out of the twenty-four should be spent in the recumbent posture. A tepid bath may be taken in the morning, or, if the patient is weakly and nervous, in the evening, followed by a thorough rubbing. Hot baths and the Turkish bath should be avoided. The dietetic management is most important. It is best to prohibit absolutely alcohol, tea, and coffee. The diet should be light and the patient should avoid taking large meals. Articles of food known to cause flatulency should not be used. If a smoker, the patient should give up tobacco. Sexual excitement is particularly pernicious, and the patient should be warned specially on this point. For the distressing attacks of palpitation which occur with neurasthenia, particularly in women, a rigid Weir-Mitchell course is the most satisfactory. It is in these cases that we find the most distressing throbbing in the abdomen, which is apt to come on after meals, and is very much aggravated by flatulency. The cases of palpitation due to excesses or to errors in diet and dyspepsia are readily remedied by hygienic measures.

A course of iron is often useful. Strychnia is particularly valuable, and is perhaps best administered as the tincture of nux vomica in large doses. Very little good is obtained from the smaller quantities. It should be given freely, 20 minims three times a day.

If there is great rapidity of action, aconite may be tried or veratrum viride. There are cases associated with sleeplessness and restlessness which are greatly benefited by bromide of potassium. Digitalis is very rarely indicated, but in obstinate cases it may be tried with the nux vomica.

Cases of heart hurry are often extremely obstinate, as may be judged from the case of the physician reported by H. C. Wood, in whom the condition persisted in spite of all measures for fifty years. The bromides are sometimes useful; the general condition of neurasthenia should be treated, and during the paroxysm an ice-bag may be placed upon the heart, or Leiter's coil, through which ice-water may be passed. Electricity, in the form of galvanism, is sometimes serviceable, and for its mental effect the Franklinic current. For the condition of slow pulse but little can be done. A great majority of the cases are not dangerous.

#### ANGINA PECTORIS.

Stenocardia, or the breast-pang described by Heberden, is not an independent affection, but a symptom associated with a number of morbid conditions of the heart and vessels, more particularly with sclerosis of the root of the aorta and changes in the coronary arteries. True angina, which is a rare disease, is characterized by paroxysms of agonizing pain in the region of the heart, extending into the arms and neck. In violent attacks there is a sensation of impending death.

**Etiology and Pathology.**—It is a disease of adult life and occurs almost exclusively in men. Arterio-sclerosis, hypertrophy of the heart, increased arterial tension, or aortic insufficiency are often present, while anatomical changes in the aorta, arteries, and myocardium are almost constant. No instance of true angina has come under my observation in which there were not signs of cardio-vascular changes. The immediate exciting cause of an attack is most frequently sudden exertion or emotional excitement. The paroxysm may come on in the daytime, but in some of the worst cases they occur at night. The nature of the affection is doubtful. The following views have been entertained.

(1) That it is a neuralgia of the cardiac nerves. In the true form the agonizing cramp-like character of the pain, the suddenness of the onset, and the associated features, are unlike any neuralgic affection. The pain, however, is undoubtedly in the cardiac plexus and radiates to adjacent nerves. It is interesting to note in connection with the almost constant sclerosis of the coronary arteries in angina that Thoma has found marked sclerosis of the temporal artery in migraine and Dana has met with local thickening of the arteries in some cases of neuralgia (2) Heb-



erden believed that it was a cramp of the heart-muscle itself. This would explain the agonizing character of the pain and the suddenness of the onset as well as the frequency of the fatal termination; but if the cramps were general in the heart-muscle and similar to those which occur in the voluntary muscles, death would invariably ensue with great rapidity. Cramp of certain muscular territories would explain the attack. (3) That it is due to the extreme tension of the ventricular walls, in consequence of an acute dilatation associated, in the majority of cases, with affection of the coronary arteries. Traube, who supported this view, held that the agonizing pain resulted from the great stretching and tension of the nerves in the muscular substance. A modified form of this view is that there is a spasm of the coronary arteries with great increase of the intracardiac pressure.

In fatal cases of angina the coronary arteries are almost invariably diseased, either in their main division, or there is chronic endarteritis with great narrowing of the orifices at the root of the aorta. Experimentally, occlusion of the coronary arteries produces slowing of the heart's action, gradual dilatation, and death within a very few minutes. Cohnheim has shown that in the dog ligation of one of the large coronary branches produces within a minute a condition of arrhythmia, and within two minutes the heart ceases in diastole. These experiments, however, do not throw much light upon the etiology of angina pectoris. Extreme sclerosis of the coronary arteries is common, and a large majority of the cases present no symptoms of angina. Even in the cases of sudden death due to blocking of an artery, particularly the anterior branch of the coronary artery, there is usually no great pain either before or during the attack. The lesions of the nerves described by Lancereaux, Hadden, and others cannot yet be correlated satisfactorily with the symptoms of true angina. Various forms of true angina have been recognized, but the differences, in the majority of instances, are not sufficiently marked to permit a separation. Reference may be made, however, to the angina pectoris *vaso-motoria* described by Nothnagel. In this the attack may come on after exposure to cold. There is general spasm of the peripheral arteries with a sense of stiffness and deadness in the extremities, and pallor, cyanosis, and lowering of the temperature. The arteries are small and contracted. There is sometimes a feeling of faintness or even a loss of consciousness. With this there is a sense of pressure, tension, or even agonizing pain in the cardiac region. The pulse, however, is regular, and there are no signs of disease of the heart. The condition is supposed to depend upon a wide-spread spasm of the peripheral arteries. I have never recognized a case of this kind, although certain of its features are not at all uncommon in the pseudo-angina.

**Symptoms.**—Usually during exertion or intense mental emotion the patient is seized with an agonizing pain in the region of the heart and a sense of constriction, as if the heart had been seized in a vise. The pains

radiate up the neck and down the arm and there may be numbness of the fingers or in the cardiac region. The face is usually pallid and may assume an ashy-gray tint, and not infrequently a profuse sweat breaks out over the surface. Dyspnoea is not usually present. The paroxysm lasts from several seconds to a minute or two, during which, in severe attacks, the patient feels as if death were imminent. There is great restlessness and anxiety, and the patient may drop dead at the height of the attack or faint and pass away in syncope. The condition of the heart during the attack is variable; the pulsations may be uniform and regular. The pulse tension, however, is usually increased, but it is surprising, even in cases of extreme severity, how slightly the character of the pulse may be altered. After the attack there may be eructations, or the passage of a large quantity of clear urine. The patient usually feels exhausted, and for a day or two may be badly shaken; in other instances in an hour or two the patient feels himself again. The attacks may recur at intervals of a few weeks, or perhaps not for many years. There are individuals who have well-marked anginal attacks for years, and, except during the paroxysms, suffer but slight inconvenience.

**Diagnosis.**—There are many grades of true angina. A man may have slight præcordial pain, a sense of distress and uneasiness, and radiation of the pains to the arm and neck. Such attacks following slight exertion, an indiscretion in diet, or a disturbing emotion may alternate with attacks of much greater severity, or they may occur in connection with a pulse of increased tension and signs of general arterio-sclerosis. In the milder grades the diagnosis cannot rest upon the symptoms of the attack itself, since they may be simulated by the pseudo-angina; but the diagnosis should be based upon the examination of the circulatory system. In true angina, even in the milder forms, signs of arterio-sclerosis are usually present. In a case presenting attacks of præcordial pain or pains in the cervical or brachial plexuses, if the aortic second sound is clear, not ringing, the pulse tension low, and the peripheral arteries soft, the diagnosis of true angina should not be made. After all, the chief difficulty, however, arises in the cases of the hysterical or *pseudo-angina*.

This is a common affection in women, but may occur also in neurasthenic men. It is in this form particularly that we see vaso-motor phenomena. The patient may complain of great coldness of the hands or feet, or a general feeling of deadness and stiffness, often with pain in the back of the head and neck. The attacks recur frequently, and sometimes become worse at each monthly period. They may come on with great severity at the menopause. Worry and disturbing emotions of all kinds may at any time precipitate an attack. Huchard has given in concise form the following points in diagnosis between the true and hysterical angina:



## TRUE ANGINA.

Most common between the ages of forty and fifty years.

Most common in men. Attacks brought on by exertion.

Attacks rarely periodical or nocturnal.

Not associated with other symptoms.

Vaso-motor form rare. Agonizing pain and sensation of compression by a vise.

Pain of short duration. Attitude: silence, immobility.

Lesions: sclerosis of coronary artery.

Prognosis grave, often fatal.

Arterial medication.

## PSEUDO-ANGINA.

At every age, even six years.

Most common in women. Attacks spontaneous.

Often periodical and nocturnal.

Associated with nervous symptoms.

Vaso-motor form common. Pain less severe; sensation of distention.

Pain lasts one or two hours. Agitation and activity.

Neuralgia of nerves and cardiorplexus.

Never fatal.

Antineuralgic medication.

There are cases in women which are sometimes very puzzling; for instance, when the patient presents a combination of marked hysterical manifestations and attacks of angina and has aortic insufficiency. In such instances the patient should receive the benefit of the doubt and be treated for true angina.

**Prognosis.**—Cardiac pain without evidence of arterio-sclerosis or valve disease is not of much moment. True angina is almost invariably associated with marked cardio-vascular lesions in which the prognosis is always grave. With judicious treatment the attacks, however, may be long deferred, and a few instances recover completely. The prognosis is naturally more serious with aortic insufficiency and advanced arterio-sclerosis. Patients who have had well-marked attacks may live for many years, but much depends upon the care with which they regulate their daily life.

**Treatment.**—Patients subject to this affection should live a quiet life, avoiding particularly excitement and sudden muscular exertion. During the attack nitrite of amyl should be inhaled, as advised by Lauder Brunton. From two to five drops may be placed upon cotton-wool in a tumbler or upon the handkerchief. This is frequently of great service in the attack, relieving the agonizing pain and distress. Subjects of the disease should carry the *perles* of the nitrite of amyl with them, and use them on the first indication of an attack. In some instances the nitrite of amyl is quite powerless, though given freely. If within a minute or two relief is not obtained in this way, chloroform should at once be given. A few inhalations act promptly and give great relief. Should the pains continue, a hypodermic of morphia may be administered.

In the intervals, nitroglycerin may be given in full doses, as recommended by Murrell, or the nitrite of sodium (Matthew Hay). The nitroglycerin should be used for a long time and in increasing doses, beginning with one minim three times a day of the one per cent solution, and increasing the dose one minim every five or six days until the patient complains of flushing or headache.

Huchard recommends the iodides, believing that their prolonged use influences the arterio-sclerosis. Twenty grains three times a day may be given for several years, omitting the medicine for about ten days in each month. In some instances this treatment is certainly beneficial. Two men, both with arterio-sclerosis, ringing, accentuated aortic sound, and attacks of true angina, have under its use remained practically free from attacks—one case for nearly three, and the other for fully four years. This treatment is, however, not always satisfactory, and I have had several cases in which the condition has not been at all relieved by it.

For the pseudo-angina, the treatment must be directed to the general nervous condition. Electricity is sometimes very beneficial, particularly the Franklinic form.

## VI. CONGENITAL AFFECTIONS OF THE HEART.

These have only a limited clinical interest, as in a large proportion of the cases the anomaly is not compatible with life, and in others nothing can be done to remedy the defect or even to relieve the symptoms.

The congenital affections result from interruption of the normal course of development or from inflammatory processes—endocarditis; sometimes from a combination of both.

(a) Of *general anomalies* of development the following conditions may be mentioned: *Acardia*, absence of the heart, which has been met with in the monstrosity known by the same name; *double heart*, which has occasionally been found in extreme grades of foetal deformity; *dextrocardia*, in which the heart is on the right side, either alone or as part of a general transposition of the viscera; *ectopia cordis*, a condition associated with fission of the chest wall and of the abdomen. The heart may be situated in the cervical, pectoral, or abdominal regions. Except in the abdominal variety the condition is very rarely compatible with extra-uterine life.

(b) *Anomalies of the Cardiac Septa.*—The septa of both auricles and ventricles may be defective, in which case the heart consists of but two chambers, the *cor biloculare* or reptilian heart. In the septum of the auricles there is a very common defect, owing to the fact that the membrane closing the foramen ovale has failed at one point to become attached to the ring, and leaves a valvular slit which may be large enough to admit the