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Angina pectoris

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Some Considerations of its History, Etiology, Symptomatology, and Prognosis.

> "Those who are afflicted with it are seized while they are walking or more particularly when they walk soon after eating, with a most disagreeable sensation in the breast, which seems as if it would take their life away if it were to increase or to continue. The moment they stand still, all this uneasiness vanishes. The seat of it and the sense of strangling and anxiety with which it is attended may make it not improperly be called Angina Pectoris."-- Heberdon 1768

Such a classic description as this, read before the Royal College of Surgeons July 21, 1768 by William Heberdon is the first official record of the Angina Pectoris which we know today. The accuracy of his observations and the finesse with which he placed these observations into a description of the syndrome makes us justly proud to call William Heberdon the father of Angina Pectoris. It is very probable that this combination of symptoms was recognized years before by the profession but it was not until 1768 that Heberdon read his classic paper which even today stands foremost as an

accurate description of Angina Pectoris.

Eight years later John Hunter recognized an attack in himself; his friend and pupil Edward Jenner of Berkeley after seeing him, wrote to Heberdon giving his diagnosis of the case. It was after the death of John Hunter of Angina Pectoris that it was suggested for the first time that there was a probable association of disease of the coronary arteries with Angina Pectoris. Autopsies at about that time on several cases of persons who had died of Angina disclosed thickened and hardened coronary arteries.

Attempts have been made by the French to claim priority in the description of the disease for Rougnon, professor of Medicine at Besancon, who first described a case in 1768, but credit is due Morgagni for the first detailed description of a single case. He described the paroxysms, the pain, the difficult breathing, the numbness of the left arm, and the effect of exercise.

Some regard Seneca as the first to describe it. Parry gives the following translation of Seneca's graphic account of his own disease, "To have any other malady is to be sick; to have this is to by dying. I have undergone all bodily infirmities and dangers, but none appear to me more grevious."(29)

Confusion arose following the work of Heberdon, Parry and the others, as cases were reported as Angina which did not properly belong in that category and

Which could have been more correctly termed dyspnoea or orthopnea. Allbutt described a violent angina occurring in heavy smokers, distinguished from true angina by the excessive violence and length of the attacks. Walshe later clarified the subject more by describing a pseudo-angina occurring particularly in women, in subjects of hysteria, and in the various forms of neuralgia. Laennec recognized different degrees of intensity in the true angina. Reeder in 1820 first drew attention to the distinction and the differentiation between the Angina pectoris of Heberdon and Jenner and all other closely simulating conditions terming them pseudo-anginas; but unfortunately the differentiation remains as difficult now as then.

The final outstanding contribution to the knowledge of the condition was furnished by Lauder Brunton who discovered the value of Nitrites in it and in other conditions.

The word Angina is derived from the same Greek word as are anxiety and anguish, thus we are able to gain a certain concept of the nature of the syndrome. To describe Angina Pectoris as a disease would be incorrect. Truly it is an entity and by itself but it is a combination of symptoms or a syndrome to which Heberdon and his contemporarys gave the name and the etiology of which is almost as obscure at the present time and it was then.

Sir Clifford Allbutt describes it thus: "The name signifies the general idea of a process which takes place in certain sick men, never repeating itself identically but recurring with a measure of uniformity sufficient to make it possible and useful for ourselves to construct an abstract idea of it."(1) Osler defines Angina Pectoris as "not a disease but a syndrome or symptoms group associated with complex conditions, organic and functional, of the heart and aorta. Pain about the heart of an agonizing character occurring in paroxysms is the dominant feature of all varieties of the syndrome."(29)

Although the etiology is still obscure, there are certain findings, the frequency of their occurrence warranting our acceptance of them as established truths. As stated before, it was soon after the first report of the syndrome that it was suggested that there was a probable association between disease of the coronary arteries and Angina Pectoris. In many cases dying of Angina there was no demonstrable pathology in either the coronarys or the myocardium; also there were many cases showing obvious diseases of the coronary arteries or the myocardium, or both, who had never had the slightest symptom of an attack of Angina. Still those cases dying with Angina and who also had diseased coronary arteries or a diseased myocardium occurred frequently enough to keep those working on the syndrome alert for further cooroboation of this finding.

Many theories were propounded, one man originating forty-six under six different headings. It remained for Osler to state that although the theories of its cause are numerous there is only one accepted fact that is that, "In an immense proportion of all cases, Angina Pectoris is associated with disease of the coronary arteries or of the myocardium."(29)

It was recognized early that there was a family predilection for Angina Pectoris. The well known Arnold family of Rugby having men in three succeeding generations die of it. Its occurrence more often in men (six to one in Levine's large series; only 7 of Burwinkels 117 cases were women) and in men past the fifth decade of life was noted early. The attack being initiated in by exercise was noted by Heberdon in his description of the condition. Later it was shown that the syndrome was seen much more frequently in the higher classes, in the professions, the scholars, the artists, and those who were more subject to the higher tension and strain in their everyday life. The well known effect of mental emotion was never better expressed than by John Hunter who used to say, "my life is in the hands of any rascal who choses to annoy or tease me." John Hunter died of an attack following a heated argument. The incidence in negroes was noted to be very low, while in Jews it was very high; it was thought to be closely associated with gout, then with diabetes; Trousseau believed that it had a close relation-

ship to epilepsy. Of late Levine has given it a close association to arterio-sclerosis, yet in his study of 103 cases, found that any blood pressure from sub-normal to marked hypertension may exist in patients suffering from anginal attacks. Extremely high pressures (over 250) were only found in ten percent of the cases. All this considered there still remained the fundamental process by which the symptoms were brought about. The most frequent basic pathology was found to be disease either mild or severe which caused a permanent or temporary narrowing of the coronary lumen; but this was not the entire pathology.

The theory of spasm of the coronary arteries was first advocated with Allen Burns in 1869 and was advanced by Potain in 1870. It received strong corroboration in that an attack could be aborted or terminated by the administration of nitrites as shown by Lauder Brunton.

Mackenzie as others before him propounded the theory that the attack was brought on by a relative ischemia of the myocardium. In 1866 Kreysig definitely stated that it was due to a relative ischemia of the myocardium in consequence of a defective blood supply from sclerosis of the coronary arteries. But here again the ischemia could have been brought to by a spasm of the coronary arteries.

In many instances of autopsies performed on persons dying of the syndrome, a disease of the aorta can by shown especially the first part of the ascending aorta. This also being the origin of the coronary arteries, it was noted that inflammation and degeneration was marked at this point too. Here a small tumulus of tissue may in part obstruct the coronary lumen. It is easy to assume that similar lesions may be produced in the coronary circulation producing identical pictures and causing precisely the same mechanical obstruction to take place. However aortitis is not an invariable association with Angina Pectoris nor is Angina Pectoris always present even in advanced cases of aortitis.

Disease of the myocardium probably predisposes an individual to Angina Pectoris. Any disease causing inflammation and degeneration of the myocardium would thus seem to make a person more suseptible to the attacks. Allbutt notes their occurrence after influenza; yet Verdon in writing on anginal pain, states in rejecting the "hypophysis that anginal pain is a proximate symptom of an inflammatory process. The alternative suggestion, that the proximate that is to say the intermediate and underlying and predisposing cause of the anginous seizure, is a segmentary neurosis and that the exciting cause is an impression impinging upon hyperirritable centers from spasm of visceral muscle seems to offer the better

interpretation of the symptomatology." Further he states, "Angina Pectoris is an offspring of morbidity of protective reflex function. Centers of protective reflex arcs lodged in the medulla and in the cervical and thoracic segments of the cord, are seats of the neurosis. Hence Angina Pectoris and the generic family of spasmodic complaints to which it belongs are appropriately regarded as examples of segmentary neurosis."(31)

Hirschfelder and others suggest that it could be produced by cardiac dilatation. Due to a momentary diminution in tone there is a diminution in coronary flow. Physical stress and strain coming at just this moment throws a load on the heart at a time when it has a relative ischemia; the attack is ushered in by some moderate physical or mental exertion.

Sexual excitement whether satisfied or merely stimulative is a highly productive factor and most physicians can recall instances in which occurrences of this type have resulted in immediate death in anginoid patients. Age is a definite factor in angina. It was noted very early that the attacks are much more prevalent after the fifth decade of life. The man of fifty-five who is still trying to carry on the physical activity of an athlete of twenty-four is a potential candidate for Angina Pectoris. It is doubtful whether tobacco or even alcohol are primary or very important causes, although I believe they cannot

be excluded as contributory causes.

Infectious processes are a predisposing factor. Angina is frequently seen in diabetics but a high blood sugar does not necessarily bring on the attacks. Syphilis was once thought by many to be a dominant feature in Angina especially in the younger individuals. Osler stated that Angina appearing under forty years of age was to be considered luetic until proved otherwise.

Attacks have been described in a few instances of arterio-venous fistula, disappearing following surgical closure of the fistula. It has been shown that co-existant with arterio-venous fistula, there is a lowering of the diastolic blood pressure and a consequent diminution in the coronary flow is the result.

Keefer and Resnick believe that it is possible to demonstrate conditions capable of leading to anoxemia of the myocardium in practically every case. In the few remaining cases in which this is not apparently true, either diagnosis was thought to be doubtful or the data inadequate to exclude the possibility of anoxemia being present.

Herrick and Nuzum made the important observations that Angina was sometimes associated with anemia. Later findings of Herrick, Coombs, and Bullrich who made similiar observations found that the severity of the angina was proportional to the degree of the anemia; as the condition of the blood would improve, the angina tended to disappear.

In suming up the various theories of the etiology of Angina Pectoris and neglecting the predisposing factors, we can put the cases in three different categories:

1. Cases due to disease or spasm of the coronary arteries.
2. Cases due to disease of the first part of the ascending aorta.
3. Cases due to disease of the myocardium.

This rather weak and somewhat futile attempt at classifying Angina Pectoris from an etiological standpoint is discouraging indeed; but why do some cases develop it and why do some with precisely similar lesions not develop it? Are we to always say that the fickle nature of this syndrome makes it impossible to classify it as to cause? These are questions which the profession has been trying to answer since the time of Heberdon, Jenner, and their contemporarys. They remain unanswered though many are still amusing themselves in the attempt.

The most striking and the most important symptom of Angina Pectoris is pain. Pain of a very severe and sudden onset, usually starting in the region of the heart and sometimes being referred to the neck, angle of the jaw, the shoulder, or down the left arm following the ulnar distribution. Those who try to describe the severity of the pain ultimately decide that it defies description. The only ones who know its agonizing character are those

who have suffered it. A well known way of differentiating this and false angina is by the administration of nitrites. A full dose of nitroglycerin will cause roaring in the ears, head poundings, and other disagreeable sensations, but patients whom it relieves never refuse it on these grounds. Persons with an attack will usually stop where they are whether standing or sitting; some say that with the impending sense of doom, they wonder if there is anything that will decrease the pain and keep them alive. Others take the opposite view and are afraid that death will not come to their relief. To say that it is a most severe type of pain seems inadequate. It is piercing, ruthless, and agonizing, yet is continuous in the sense that it does not fluctuate in intensity from moment to moment nor does it throb. Persons with it dare not move lest it become worse. The skin is grey in color, covered with cold sweat and the whole picture is one of tremendous inarticulate agony.

Of course it is probable that the severity of the pain differs in different individuals and it may in all probability, vary somewhat in the same individual in different attacks. However the frequency of the attacks bears no relationship to the severity of the attacks.

During an attack the patient may stand still in a position of rigid immobility, afraid to move or to speak, scarcely daring to breathe, or he may kneel down and rest his head on a chair, or roll on the floor in an extremity of agony, or the patient may become unconscious and in

rare cases, may die. If the pain is located in the arm, he may nurse it across his chest rocking backward and forward. The attack may terminate with the expulsion of air from the stomach, unconsciously sucked into the stomach during the attack.

In an attack the pain does not necessarily begin at the precordium. It may be introduced at the periphery and proceed toward the cardiac area. In one of Brooke's cases in which a chronic appendicitis was long co-existant with angina, the anginal attacks invariably originated in the right lower quadrant, extended up into the right shoulder, and thence to the precordium. Another frequent location for the aberrant pain is the gall bladder; or it may simulate a pancreatic duct calculus. Surgery has been attempted for the relief of such pain. Exercise being particularly prone to induce attacks and especially so when it comes soon after eating, and the frequency of flatulence in the same cases, may lead diagnosis to the stomach rather than to the heart.

No clearer view in the explanation of the radiation of pain in Angina Pectoris has been given than that of Dr. James Ross of Manchester in 1891--"When a viscus is diseased there is local pain which might be regarded as of splanchnic origin, (precordial pain in case of the heart) in addition the irritation is conducted to that portion of the spinal cord from which that viscus derived its splanchnic nerves and thence spreads into the grey matter

of the posterior horns, whence by law of eccentric projection, it is referred to the termination of the somatic nerves derived from that segment of the cord (the second and the first thoracic segments in case of the heart)"(29) This explains the pain shooting between the shoulders and down the inner side of the arm (second) to the elbow and the ulnar border of the forearm and hand and the ulnar fingers. (first)

It does not seem feasible to interpret this pain as anything but a referred pain. The stimulus from the heart to the spinal cord irritates the nerve cells in close proximity to the nerves converging the stimulus from the heart. The nerves thus irritated respond and exhibit the evidence of their particular functions--- sensory nerves, by pain felt in their peripheral distribution, motor nerves, by contraction of the muscles. In this way we get the peculiar distribution of pain in Angina Pectoris, and the sense of constriction of the chest wall. This violent stimulation of the spinal cord may leave, after its subsidence, an irritable focus in the cord, rendering that portion more suseptible to stimulation so that it becomes easier for future attacks to be provoked. So sensitive may this irritable focus become that attacks of Angina Pectoris may be provoked by a stimulation reaching the focus from regions other than the heart.

The profound effect that these attacks have on tissues is shown by the fact that herpes zoster sometimes develops around the course of the ulnar and radial nerves; chronic irritation of spinal segments as a result of long standing angina, so reduced the tissue resistance that the infective virus of herpes zoster was able to act. While this is apparently rare, in Angina Pectoris areas of hyperaesthesia are very common in the areas of reflection and other trophic manifestations are not at all uncommon. Gasne and Chiray in 1905 reported a case of angina in which an eruption of licken planus broke out in the inner aspect of the left arm, along the distribution of the intercosto-humeral nerve. Brooks reports a case of true non-suppurative mastitis following persistant attacks in a woman; Both Osler and Huchard cite instances in which attacks were referred to the testis and which were followed by pain and swelling of that organ.

In viewing the cause of pain, the highly reasonable hypophysis of MacWilliam and Webster in 1923, based on their experimental studies gives it a decided relationship to ischemia and to fatigue. They found that when the blood supply to a working muscle was shut off by constriction pain was not caused after thirty minutes provided the muscle remained quiet. When however, the ischemic arm was made to contract, fatigue is brought on much more quickly than in the normal arm, and at the fatigue point, there is severe pain. Moreover this pain can be elicited

even before the fatigue point is reached, at a time when the contractile power of the muscle is still good. In view of the close correspondence of these results and the clinical facts of Angina Pectoris, these authors suggest that processes of essentially the same nature are responaible for pain in the latter condition. Unfortunately the nature of the problem makes it impossible at present to obtain more evidence with regard to the question of pain by means of controlled experiments; considering that a picture analogous to that of Angina Pectoris is produced in skeletal muscle by a diminished blood supply, it seems that evidence is strong that anoxemia of the heart muscle can cause the pain of Angina Pectoris.

Angor animi or the sense of impending dissolution is the other outstanding characteristic of the true Anginal attacks. No matter how accustomed the sufferer may be to the attacks; no matter how understanding he may be of them; or how indifferent he may be to death; he is invariably terrorized by them. Most writers are at a loss to explain this symptom except as another evidence of grave sympathetic stimulation akin to that seen in true shock. Perhaps no word so well fits the condition as that of a severe anxiety. It is not a reasonable apprehension, nor a fright nor alarm, as at a snake in the grass, but an organic sensation. As even in moderate cases the pain is menacing, and in severe cases atrocious, and it is natural to attribute the dread to the vehemenence of the pain, it seems difficult that the angor (suffocation or strangulation)and the anguish

cannot be separable, and presumably therefore may own somewhat different origins. Thus we may have "Angina sine dolore" first described by Gairdner in 1894. In one case we may see flashes of pain so furiousand incessant that the sufferer may well fear indeed to be overwhelmed by them, yet he may not be possessed by the spectral horror which, in another case, may dog the mildest series of attacks. It is true that the blend of pain and horror may be fairly uniform; but a strange indescribable fear is no uncommon feature of cases which, in respect of pain, may play only a minor part. The feeling of impending doom, I presume is the result of violent stimulation to the nervous system comparable to what happens when any other viscus is violently stimulated, as after a blow on the epigastrium or on the testicle.

These two symptoms, pain and anxiety, are the two outstanding and altogether characteristic symptoms of Angina Pectoris. Attacks may almost be said to be characterized by a lack of definite cardiac disturbances. The pulse is usually uneffected; Electrocardiographic tracings are more often normal than not. After the acute attack has subsided the patient frequently voids large quantities of clear, light colored urine of a low specific gravity.

In his work on diseases of the heart, Sir James Mackenzie writes, "Another symptom is extremely common in these cases of anginous seizures, namely the belching of air;"(24) the chief feature is the noisy expulsion of air from the stomach and again, "The case may end by expulsion of air from the chest."(24) In Allbutts system of Medicine, Sir Douglas Powell remarks, "eructation gives relief."(1) "The patient vomits and becomes easier."(1) Heberdon noted that persons who have persevered in walking till the pain has returned four or five times have sometimes vomited.

The diagnosis of Angina Pectoris depends on the character and appearance of the attack. It is paroxysmal, pain is severe, substernal or precordial in location and as a rule reflection is present, usually to the left shoulder arm, forearm, and fingers. Pain is severe in degree and is accompanied by a sense of fear, or apprehension out of proportion to the calm judgment of the patient in his uninvolved moments. Except where coronary thrombosis has taken place, partial or complete relief is afforded by the giving of nitrites. Purely sedative or soporific drugs are required in very large amounts to still the agony of the true attack. Shock in a varying degree is associated.

Dyspnoea, cyanosis, edema, swollen and tender liver and other signs of true cardiac lesions are usually

wanting. In a pathological condition with a pathology so discursive one would also expect the electrocardiographic readings to also be indefinite; if a normal tracing is obtained, it lessens the probability of a diagnosis of Angina Pectoris; if abnormal it may be taken as highly confirmative evidence when clinical aspects of the case suggest Angina Pectoris.

The diagnosis turns, in subjects of suitable age and sex, almost exclusively upon the history, but this should be elicited with the greatest care and will often require a close and a prolonged questioning. In inquiring as to the type of pain, a most important point to elicit clearly is that the pain is uninterrupted; anginal pain does not throb or stab. An extremely important matter is consistency in the history of response to effort. Patients with this malady do not relate that on one day the attack is brought about only after walking briskly, and that on the next, it occurs spontaneously while the patient is resting quietly and undisturbed. When inconsistencies are obvious and frequent, the case is rarely one of Heberdon's Angina Pectoris.

The personality and credulity of the patient must be kept in mind. The diagnosis should never be hastened and no diagnosis should be made without first seeing the patient in a paroxysm.

As to prognosis, we are confronted with a disease which may strike with instant death in the midst of seeming health and yet from which an afflicted man may apparently recover and live on for many contented years. Since any course is possible between these contrary extremes, prognosis is indeed difficult and uncertain. However at present we are able to make certain few conjectures. Sudden death in angina is usually associated with occlusion of a part of the coronary system. If we were able to clinically gauge the seat and extent of the lesion of Angina Pectoris, we would be on safe ground for prognosis. Needless to say we have been unable to approach that desired position.

Hamman states that prognosis depends chiefly upon the condition of the coronary circulation and we may get some estimate of its capacity by careful inquiry into the reserve power and recuperative ability of the heart. When attacks of Angina follow slight exertion or occur when the patient is at rest, the outlook for improvement is not so good as when they come only upon vigorous exercise after meals. The disease is commonly of long duration and with proper care periods of remission are the rule. These periods of remission may be so indefinitely prolonged as to simulate a cure.

Osler in 1910 writes, "a group of most encouraging cases shows that long intervals of good health and even complete freedom may follow adoption of reasonable

habits," and that, "a severe attack of angina may save a man's life, even though the cardinal fact in the prognosis of angina is its uncertainty." He went on to say, "much depends on the patient himself, on the life he has led and the life he is willing to lead."(29)

Allbutt in 1915 wrote, "I would formally declare that the issue of Angina Pectoris is no no means always mortal."(1)

Mackenzie on prognosis says, "The recognition of the true state of matters enables us to map out a plan of life for the individual which may not only prolong his life, but enable him to make it useful and interesting, even though it has to be lived at a lower level."(25)

Signs of cardiac failure-cardiac dyspnoea, pulmonary crepitation would of course alarm us in respect of life but not concerning the Angina Pectoris.

Although this conception of the prognosis of Angina Pectoris is by far the more encouraging to both the patient and the doctor, the fact remains that out of the confused melee of clinical considerations to which the term has been applied, onecondition stands forth clearly marked from the others. It is the one condition that corresponds to Heberdon's original description, and its import is unmistakable, the patient

with this condition is doomed. Yet terrible as are some of these incidental conditions accompanying coronary artery lesions, there is a sort of kindly compensation, as in no other local disease do we so often see the ideal death--death like birth, "A sleep and a forgetting."

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