Acute Rheumatism and its complications.

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by.

John A. Cook M.B., C.M.

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789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 – 1346

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Acute Rheumatism or Rheumatic Fever.

(ῥεῦμα - a flowing)

By ancient writers the words rheuma & catarrh were used as having similar meanings, their etymology being also alike. The notion was that of an acrid humour generated in the brain & distributed over the body. In the course of time diseases of the mucous membranes became known as catarrhs, while the name of rheumatism was applied to a number of pathological conditions which had little or no connection with each other except in the presence of pain in the muscles or about the joints. Gradually the conception of rheumatism became modified, & external cold came to be considered the principal factor in its causation. Accordingly all sorts of complaints have been termed rheumatic, some because they were painful, others because cold was the supposed cause. The disease which we now call rheumatism was originally confounded with

Gout, & the two were described together under the common name of arthritis. Sydenham was the first to distinguish between the two maladies, & to give anything like an accurate description of rheumatism properly so called.

Acute Rheumatism is a disease extremely difficult to define. It may be described as an acute non-contagious fever dependent upon an unknown infective agent, & is characterised by inflammation of several joints at the same time or successively, with pyrexia, profuse sour smelling perspiration & a marked tendency to inflammation of the fibrous tissues.

In its usual type it has all the characters of a specific affection, though when the unusual forms of the disease are studied, it is seen that it is one of a large group of diseases each member of which possesses definite characters, but all of which bear a certain family resemblance to one another.

The synovial membranes of the joints of the extremities are those usually attacked, & the pericardium (next to the endocardium) is the most frequently affected of the serous membranes. The pleura is however more frequently attacked than is generally recognised, & in rare instances the peritoneum is affected. It is important to recognise this specialisation of the inflammation to parts of related structure & functions. The serous membranes & the endocardium not only resemble the synovial membranes in structure, but they also subserve an analogous purpose, that of facilitating the functional movements of internal organs. In the majority of cases the joint affection does not involve any anatomical changes, beyond inflammatory hyperæmia of the synovial membrane, & effusion of fluid into the joint, & this is consistent with the frequent rapid subsidence of the articular inflammation & swelling, & the manner in which the

inflammation will quickly subside in one set of joints & attack others. The joints, though swollen & very painful, are not very red, and the patient's sufferings depend greatly on the number of joints involved.

Acute rheumatism is also peculiar in the tendency it has to move rapidly from joint to joint. The phenomena of acute rheumatism, as it occurs in childhood, are more various than in the adult, & present many points of difference. Certain affections of other parts are so frequently associated with acute rheumatism of the joints that it is generally believed that some pathological connection exists between them, for example, endocarditis & pericarditis. These occur more frequently in rheumatism of childhood than in rheumatism of the adult. Then the affections - viz. chorea, Erythema, & Subcutaneous Tendinous nodules often appear as concomitants during the course of acute rheumatism

in childhood; in fact, these several conditions may be present in a marked degree, while the arthritis itself may only be slight. Tonsillitis is an affection which occurs both in the adult & in the child. Thus, in the case of children, arthritis may not be a characteristic symptom, & it appears that at this age the joint tissues are less susceptible to the infective agent than are the other fibrous tissues, the nervous system & the skin. As the age of the patient increases, the inflammation of the joints becomes more prominent while the other phenomena become less frequent, & practically cease when adolescence is reached. At the age of 12 or 14 the symptoms present resemble those of adults. These different conditions may occur independently from each other, or all may occur together, or they may occur in succession - for example, arthritis at one time, followed later by endocarditis, & then again by chorea; thus

The rheumatic attack may be characterised by the presence of only one of these manifestations. Combinations of the several phases may follow any order of sequence.
Acute Rheumatism must therefore be regarded as a General febrile disease with local manifestations —

Prevalence. The general idea is that acute rheumatism is more prevalent in the British Isles than elsewhere. Statistics however are not very reliable & probably show a higher death rate than actually occurs from acute rheumatism itself, many different diseases being included under this heading. The Registrar General's returns for the five years (1886 — 1891) showed the death rate to be 84 per million living. This however cannot be considered at all accurate, as a large proportion of the deaths attributed to heart disease are due to lesions caused by

acute rheumatism. Rheumatic fever might well carry the badge of the Royal Engineers - "Ubique" as it is met with everywhere. It is most prevalent however in temperate & humid climates.

The immediate cause of Rheumatic fever is not known & various theories have been set forth. It has been attributed to the presence in the blood of some morbid material produced in the body from defective assimilation, or to the presence in the blood of an excessive amount of some of the products of chemical change in our bodies. The similarity existing between rheumatic fever & Gout led to the chemical theory of its causation. Prout suggested that the exciting cause was due to the presence of lactic acid. Richardson states that he produced rheumatism by injecting lactic acid & by administering it internally; while Foster mentions the presence of arthritis in diabetics under treatment by lactic acid. Latham considered the exciting cause of rheumatism

to be the presence of lactic acid together with uric acid, the latter acting as an irritant to the nervous centres. He showed that lactic acid could be obtained as a by-product in the decomposition of albumen into urea & carbonic dioxide, & that salicylic acid could prevent the formation of lactic acid by combining with its chemical antecedents. But there is no trace of either uric acid or lactic acid in the blood of rheumatic patients. Haig was of opinion that any cause producing pyrexia might bring about the deposition of uric acid in the joints, & so set up arthritis. It is most unlikely that the presence of uric acid in our bodies would give rise to the two diseases, gout & rheumatism, the pathological conditions of which differ so widely.

It has been advocated by others that rheumatic fever may be nervous in its origin. This suggestion was first made by Dr Mitchell of

Philadelphia, Lewis supported by Comstatt & others. They regarded the articular lesions here as analagous to those occurring in myelitis & locomotor ataxia. According to this theory, either the nerve centres are primarily affected & the local lesions are trophic; or the nervous lesion gives rise to some change in metabolism which results in the production of some morbid material in the system.

In several of its aspects the cause of acute rheumatism resembles an <u>infective</u> disease, though so far no specific micro-organism has been discovered. Different observers have found micro-organisms in acute rheumatism, but in most cases they were staphylococci, streptococci, or other organisms belonging to the septic group.
Poynton and Paine have discovered a diplococcus and have produced experimentally in rabbits an arthritis with fever. They have also obtained the organism from the rheumatic nodules in pure culture, and have reproduced in the rabbit arthritis, endocarditis and pericarditis.

From the fact that tonsillitis is frequently an early symptom of acute rheumatism it has been suggested that the tonsils may be the point of entrance of the infection.

Newsholme has pointed out that Rheumatic Fever occurs in Epidemics, recurring at intervals which vary from 3 to 6 years. He also states that a severe Epidemic is likely to be followed by two or three milder outbreaks.

Church draws attention to the fact that the curves formed by the statistics both of the mortality of acute rheumatism & of its occurrence, are similar to those of pyaemia, puerperal fever & erysipelas, all of which diseases are associated with specific micro-organisms.

Again the symptoms of acute rheumatism are similar to those produced by the toxines of micro-organisms. Acute rheumatism closely resembles pyaemia in the implication of the joints, the character of the fever, the sweats, the liability to relapse, the anaemia, the great tendency to endo-carditis, & the involvement of the serous membranes, & might be regarded as the type of an acute infectious disease.

The infectious theory is also supported by the fact that rheumatic fever appears to occur frequently in certain houses. Friedländer mentions a series of 12 cases occurring in the same house in three years, and other authorities record groups of cases arising within short periods in the same house.

Atmospheric causes may influence the occurrence of acute rheumatism, but so far there is no satisfactory evidence to prove any connection between rainfall, low temperature, or sudden change in atmospheric conditions, and the prevalence of the disease. Hirsch considers that the absence of any constant atmospheric influence, and the marked fluctuations in the prevalence of the disease, are both points in favour of placing rheumatic fever among the acute infective diseases.

Church has brought forward statistics, which he has collected from the army medical reports for the different stations, and from the official returns for the colonies, showing the ratio of admissions to

hospital for rheumatic fever, and these statistics support the general view that rheumatic fever is comparatively rare in tropical climates; whilst in sub-tropical and temperate climates its occurrence is very variable and not in any way dependent on the mean temperature of the locality.

Racial Differences. It is stated that acute rheumatism is more prevalent among British troops when stationed in India, than when stationed at home. Amongst the native troops in India the prevalence of acute rheumatism is not nearly so common as among the British.

Chill. Exposure to cold, a wetting, or sudden change of temperature are among the most important factors in determining the onset of an attack. This is borne out not only by experience, but also

by the geographical distribution of the disease. Localities which are high & dry and where the temperature varies greatly during the twenty-four hours are especially conducive to acute rheumatism; thus acute rheumatism is frequent at the Cape & also in Egypt. It does not occur so frequently in low & moister localities, where the temperature is equally high, but does not vary so much in the twenty-four hours. At some of the Mediterranean ports, e.g. Gibraltar, the average admissions to hospital from acute rheumatism are high. During certain months of the year there the temperature falls greatly after sunset, and so may account for this.

Fatigue & exposure are also determining causes, as shown by the increase in the number of cases of rheumatic fever during the Egyptian & Cape wars, the climate in both of these localities being dry and otherwise healthy.

There is a general impression that Rheumatic fever is more prevalent in the British Isles than elsewhere, & this belief seems to be particularly strong on the continent. The disease appears to occur more frequently in large towns than in country districts. It is said to be a very common ailment in the Isle of Man. Scotland suffers less than England, but there is no proof that the disease is less frequent in the Isle of Wight than in many other parts of the British Isles. Senator has quoted London as having the highest percentage of any city in Europe. This may or may not be the case, but at any rate the disease is met with all over the world.

Season. Changes of season also play some part in the prevalence of rheumatic fever. All statistics show that the frequency of its occurrence varies during the different months of the year. Newsholme has produced statistics to show that rheumatic fever is most prevalent in dry years & specially so when the sub-soil water is low & the temperature of the earth high. He is of opinion that

low ground water is an indication of dryness of the subsoil which condition favours the growth of the infective agent of rheumatic fever. He admits that low ground water of itself may not produce rheumatic fever, but maintains that rheumatic fever is never very prevalent with a high level of ground water. Gabbett & Phillips have drawn up statistics from admissions to the London Hospital & St. Bartholomew's Hospital during the different months of the year, & these show that the disease was most prevalent during the months of October & November. The monthly ratio of the occurrence of rheumatic fever in London is found to be somewhat similar to that of Enteric fever - in both diseases the number of cases falls during January & is at its lowest from February to June; then Enteric fever rises rapidly during July, August & reaches its maximum in September and October - after which it rapidly falls. Rheumatic fever does not rise till later in the year when the number of cases rises rapidly & reaches its maximum in October, after which the numbers fall off again.

These variations with season seem to support the view, that

The immediate cause of rheumatic fever is a micro-organism which is capable of multiplication in a suitable nidus outside our bodies. The constancy of this seasonal variation is contradictory to Newsholme's theory - viz - that rheumatic fever is most prevalent when the Sub-soil water is abnormally low, as it cannot be said to be low in October & November —

Sex. It is generally stated that males are oftener affected than females in consequence of their greater liability to exposure, but in large towns the disease is as prevalent among indoor workers as it is among those following out-door employments — It has also been shown that the disease is most prevalent in October & November when out-door workers are not exposed to the severe weather that we have during the Spring months. Up to the age of twenty it may be said that more females are affected than men, but it is difficult to ascertain in which sex the disease is more common.

In most of the large hospitals the numbers of the two sexes are nearly the same, the males being slightly in the majority. Women who are exhausted by parturition & prolonged lactation appear to be specially liable to the disease. In childhood the disease is more common in girls. Between the ages of 10 and 15 years, girls suffer in the proportion of nearly 2 to 1. This probably accounts for the prevalence of chorea in girls at this period of life.

Age. Acute rheumatism is essentially a disease of youth & early adult life. When considering the influence of age on the disease, first attacks only should be taken into account, for the occurrence of frequent attacks at short intervals will render any statistics invalid. Statistics show that the disease is most prevalent in persons between 10 & 20 years of age, & the number of cases

occurring between 20 & 30 years is only about 5% less. Between the age of 30 & 40 years the disease is not nearly so common. Still it may occur at any period of life. As age advances the resisting power of the constitution seems to increase.
Senator has described a case in an infant of four weeks, and a case of a first attack in a man over 80 years of age was reported in the B.M.J. (1888).
Rheumatic fever is extremely rare after 50 or 60 years.

Heredity. It is a general belief that rheumatism is a family disease. Its frequent occurrence in several members of the same family is used by those who believe in the infectious origin, as an argument in favour of it being a house disease. At any rate the frequency with which several members of the same family are affected certainly shows a predisposition to the disease. Cheadle is of

opinion that the hereditary predisposition to rheumatism is transmitted as strongly as in the case of Gout, while Church is of opinion that further evidence is required to prove that rheumatism is hereditary in the same way as Gout. He states that he has met with families where there was a strong tendency to Rheumatic Fever & Tubercular Disease. Sheadle maintains that the influence of hereditary disposition is clearly shewn in the case of children. He also states that when the disease exists in the families of both parents, then the predisposition to the disease & the severity of the attack are but increased. This views is also upheld by Goodhart & Garrod. It is probable that in rare instances direct infection of the foetus takes place through the placental circulation, thus giving rise to congenital heart disease, though Poynton affirms that more usually there appears to be not a direct infection, but an "inherited vulnerability of the tissues".

Pathology
and
Morbid Anatomy

Mental & Physical Strain. There is good reason to believe that the strain of education & examinations among certain children who are probably ill fed and not robust, assists in the causation of the chronic type of rheumatic fever.

Whatever view we take of the origin & nature of acute articular rheumatism, it must be admitted that the blood is of an unusually irritating character, being the carrier of some irritant the nature of which is not known. The occurrence of acute inflammation in several joints & the frequent supervention of endocarditis & pericarditis are sufficient evidence of this. The irritant, whatever be its nature, seems to act specially on connective tissue membranes & on such as are exposed to friction of their surfaces. It affects the

joints when the synovial membranes lie against each other and are exposed to friction in the movements of the joints; it attacks the pericardium where the movements of the heart cause continuous rubbing — when it attacks the endocardium it attacks exactly the localities where the surfaces come in contact. It is as if in addition to the irritant in the blood, the mechanical irritation of friction were necessary to the occurrence of inflammation. Further it may be noted that in the adult the inflammation is usually limited to the valves of the left side of the heart, where the higher tension of the blood + greater force of the heart make the mechanical force of friction greater than on the right side.

There are no morbid changes characteristic of the disease, though numerous local lesions are found. The appearances in acute articular rheumatism may be said to be negative on the whole.

On opening an affected joint the synovial membrane & fibrous tissues connected with the articulation are found to be injected & swollen. The synovial surfaces present a somewhat opaque & granular appearance. A considerable quantity of inflammatory effusion may be found in the joint. This is generally a thin, clear, alkaline albuminous fluid; occasionally it is turbid with flakes of fibrin & cell products.

The cartilages connected with the joint probably share in the inflammatory changes especially if the process be severe, & the associated soft parts including the tendons and their sheaths are very frequently hyperæmic & the seat of effusion.

In the subcutaneous structures in young subjects there may be found, over the articular ends of the bones & connected with the fasciæ & with the tendon-sheaths, small nodules of fibroid tissue of a translucent appearance. Microscopically these present the characters of rapidly growing connective tissue—

The non-articular lesions are far more important - The most frequent of these are endocarditis, pericarditis & myocarditis, and congestion or inflammation of the lungs. Pleurisy is met with less commonly - & in rarer instances peritonitis, bronchitis, meningitis & nephritis - When pyrexia has been high, the solid viscera including the heart present granular degeneration and are liable to rapid decomposition.

The most characteristic lesions produced in acute endocarditis are the so-called warty vegetations which are pale irregular projections from the surface of the endocardium, generally of small size & somewhat shaggy in appearance. The vegetations are composed partly of the swollen inflamed tissue of the valve and partly of fibrine deposited on the inflamed surface. The inflamed connective tissue produces round cells & is converted into granulation tissue, and the affected parts are thus increased in bulk and

rendered more friable, & irregular projections are formed. These projections are enlarged by the deposition of fibrine which is derived from the blood flowing over their surfaces and not from the vessels of the part - It is perhaps more correctly a thrombosis and as the blood is in motion the white thrombus is the form produced. The fibrine generally forms the greater part of the bulk of the vegetations. On their first occurrence the vegetations are limited to those parts of the valves which come against each other when they close, & this localization continues more or less throughout. The occurrence of these changes in the tissue renders it unduly brittle & bits of the vegetations are frequently broken off and carried by the arteries to distant parts & produce embolism there. The pieces broken off are mostly small and beyond the usual phenomena of embolism in small arteries & capillaries they do not produce much disturbance, in this respect differing

from the emboli of ulcerative endo-carditis. The softening of the tissue may result in further lesions - viz - rupture of the chordæ tendineæ and valvular aneurysm, either of which conditions interferes with the function of the valves.

In regard to the phenomena which occur at the onset of an acute pericarditis we may presume that the irritant induces the usual changes in the vessels which take place in inflammation in General, but as the patient survives this early stage, opportunity is not afforded to observe the consequent hyperæmia of the membrane. Exudation from the vessels soon follows & serous fluid begins to accumulate in the sac. The inflammatory exudation is accompanied by an extensive destruction of the lining endo-thelium, and in most cases is of a sero-fibrinous character. A fibrinous layer covers both visceral & parietal pericardium, and a quantity of flaky albuminous fluid fills the

intervening cavity. The fibrinous layer varies from a fine deposit just concealing the natural gloss of the surface to a rough shaggy coat. The subsidence of the inflammation is followed by absorption of the fluid & by organisation of some or all of the fibrinous layers. This results in obliteration of a proportionate amount of the pericardial cavity & in the formation of fibrous bands passing across it, which unite the parietal & visceral layers of the sac more or less completely together. New vessels grow in the investing lymph & fibres of connective tissue are gradually developed. The amount of firm connective tissue thus formed, and the completeness of the union effected, vary greatly in different cases.

During the acute stage the heart's action is slightly impeded by the friction between the roughened surfaces especially of the auricles and right ventricle; by the pressure of any marked effusion of fluid; and by the diminished support afforded by the weakened pericardium.

In later stages the action is also impaired by the presence and contraction of such adhesions as have not been torn asunder during the earlier stages of their development by the movements of the muscular walls of the heart; and by the contraction of the inflammatory fibrous tissue in the visceral pericardium and in the outer layers of the myocardium itself.

The impairment is generally sufficient to cause uniform hypertrophy of the heart.

On the surface of the pericardium smooth white patches may often be observed. These sometimes indicate the termination of an old acute pericarditis, but are more frequently due to local friction between the visceral & parietal surfaces induced by some source of pressure outside the pericardium. At such places the pericardium becomes thickened, and therefore whiter and more opaque.

Myocarditis or inflammation of the cardiac wall is less frequent than the preceding. It is met with in association with pericarditis, & less

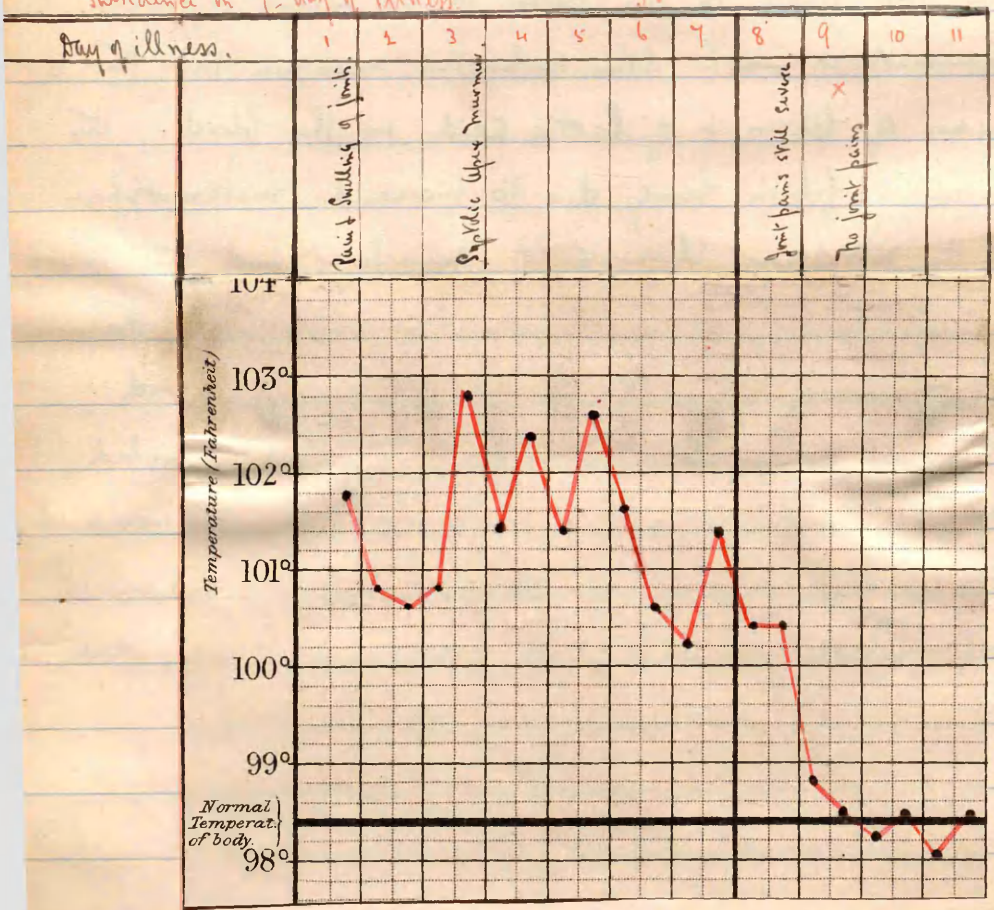
commonly with Endocarditis. Here the inflammatory process involves the adjacent layers of the muscular wall of the heart. It is found to be infiltrated with small cells, the fibres themselves being clear & structureless from coagulation necrosis, or softened & granular from degeneration. A more diffuse form of myocarditis, in which the heart is more generally involved, is found in certain cases. The microscopic appearances are much the same as in the less intense form. Leucocytes infiltrate the intermuscular tissue, which may also be the seat of minute haemorrhages. The change is most marked in the left ventricle, and is also usually associated with pericarditis or endocarditis.

In these non-articular lesions also it will be seen that the conditions found <u>show nothing peculiar</u>, nothing to distinguish them from other forms of inflammation. In death from hyperpyrexia no special changes occur. In the secondary rheumatic inflammations, as pleurisy and pericarditis, various pus organisms have been found. These are possibly the result of a mixed infection.

Chemical Analysis of the Blood — Gives no positive result of a pathological kind. As in health the reaction of the liquor sanguinis is alkaline. The fibrin is said to be slightly increased in amount. The amount of urea present is not more than normal, & neither excess of uric acid, lactic acid nor any other abnormal principle has been found in the blood in an attack of acute rheumatism — (Other authorities maintain that there is excess of fibrin & of lactic acid in the blood, the excess of fibrin being due to increased metamorphosis of the nitrogenous elements of muscle, and the excess of lactic acid to increased metamorphosis of the non-nitrogenous.) The presence of micrococci and bacilli in the blood & serum has been described, but not substantiated. The leucocytes are increased. During the acute stage the red corpuscles diminish in numbers, as well as in haemoglobin value, and are rapidly restored during convalescence —

Symptoms

Case of acute rheumatism uninfluenced by drugs shewing subsidence on 6th day of illness.

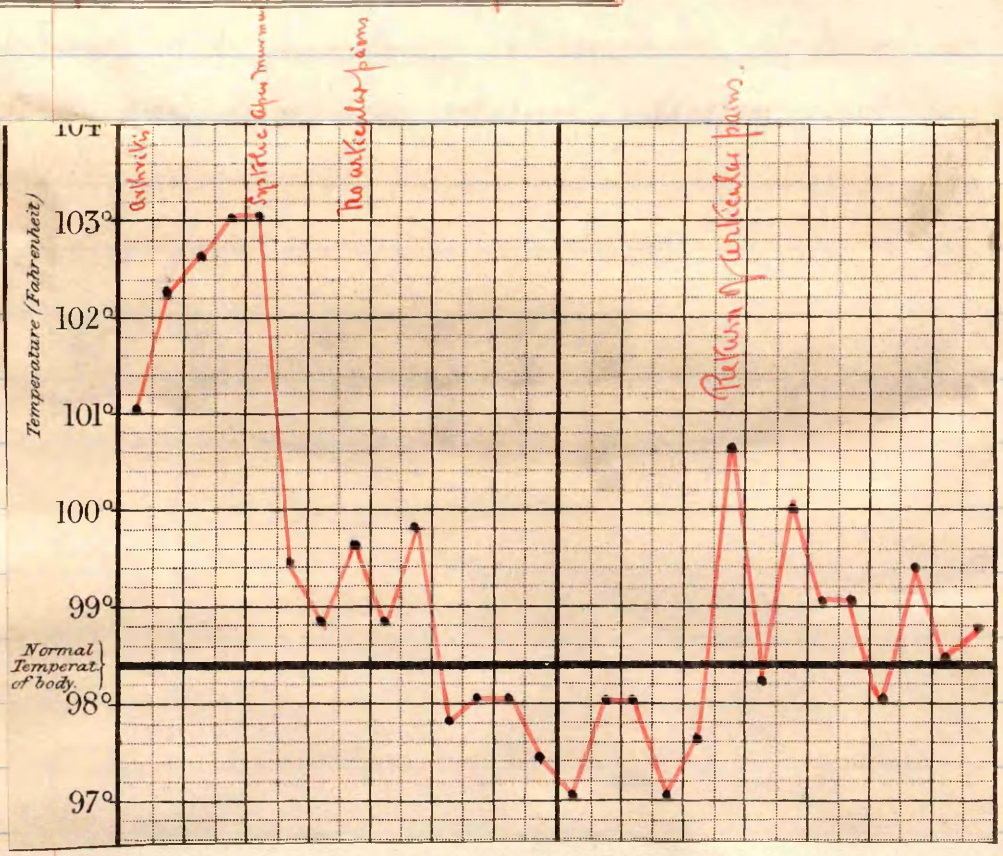


The onset in acute rheumatism is usually somewhat rapid. A definite rigor is unusual, more often there is slight chilliness. Commonly it is preceded by slight malaise, irregular pains in the joints, sore throat, and particularly by tonsillitis. On the other hand the onset may be quite sudden, severe pain may come on abruptly in a joint. When rigors occur they are often frequent.

Febrile Symptoms — The temperature rises quickly & with it one or more of the joints become painful. There are the ordinary symptoms associated with an acute fever. The face is flushed, and the pulse is frequent & soft and usually above 100. The temperature may rise to 103°F. or more. The appetite is lost and the tongue becomes furred, thirst increases, and constipation is usually present. The urine is scanty, high colored & strongly acid. The mind is clear, delirium being rare even in severe cases.

The duration of the fever is somewhat variable. In young and healthy adults the acute symptoms usually subside in eight or nine days when not influenced by drugs and provided they escape complications, and convalescence is usually complete in other ten days.

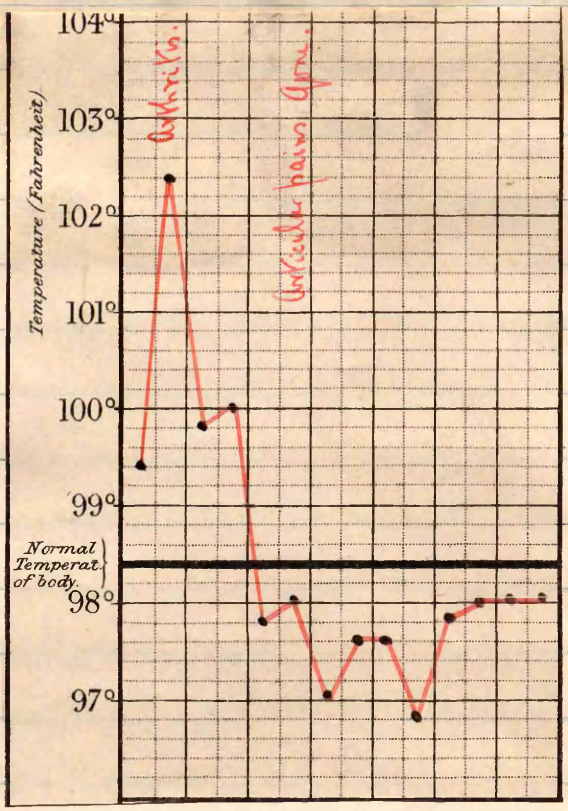
Acute Rheumatism treated with Sod. Salicyl.
shewing recrudescence on 10th day of illness.



Much more commonly however the disease runs a protracted course, the acute symptoms subsiding and recrudescing time after time. These relapses are also common under any form of treatment. They are said to occur with almost equal frequency in first and second attacks, though not so frequently in third and subsequent attacks. The average stay of a patient in hospital is probably about a month, and neither age nor previous attacks seem to affect the duration of an attack.

The temperature rises rapidly with the pain in the joints, and ranges from 102°7 to 104°7. In the large majority of cases the temperature does not exceed 103° or 104°. Except in cases of hyper-pyrexia the temperature is highest in the evening. It is very irregular and there are marked remissions and exacerbations, which seem to depend greatly on the severity and extent of the articular inflammation. The fall in temperature is usually gradual. The profuse sweats seem to influence the temperature, the

Acute Rheumatism treated with Sod. Salicyl., shewing fall of temperature to normal on 3rd day.



remissions being coincident with the sweats. In the case of children the fever is rarely high. It seldom rises above 101° or 102°7., & does not often reach 103° or 104°. When complications, such as endocarditis, pericarditis, pneumonic or pleurisy occur, there is usually a rise in the temperature though this does not by any means always occur. When the disease is treated with salicylate, the temperature usually falls to normal about the fourth or fifth day, and in many cases about the third day. In uncomplicated cases the fever follows a tolerably definite course. It marks its appearance at the invasion of the attack and continues as long as the local symptoms remain acute or sub-acute, and with them it declines and disappears. The type of the fever in uncomplicated cases is remittent, the temperature rising ½° to 1° in the evening. The decline of the temperature is more gradual than the onset, although it is generally irregular being almost invariably broken by temporary rises, or

interrupted by the supervention of some pyrexial complication. The occurrence of a true relapse is marked by a return of pyrexia which probably presents the same general characters as before.

Pain usually begins in one of the large joints. The joint or joints first affected may remain the seat of pain or recover, but by the third or fourth day of the illness, pain and swelling have usually attacked several joints in succession, often the knees, ankles, elbows & wrists, the inflammation subsiding in one joint while increasing with great intensity in another, thus nearly all the larger joints of the extremities may be affected. The sterno-clavicular and inter-vertebral and phalangeal joints also suffer though not nearly so frequently. Perhaps no disease is more painful than acute rheumatism. The posture cannot be changed without great suffering.

The affected joints are painful to move. They soon become painful when the skin over them has a reddish flush. The knees, ankles, elbows and wrists are the joints usually attacked, not simultaneously but successively; the pain & redness disappearing from the joint first affected as the next to become affected turns painful then, leaving the joint first affected only a little stiff in movement. This migratory nature of the joint affections is one of the most characteristic features of the disease. The affection is seldom limited to a single joint. The amount of swelling varies considerably. Extensive effusion into a joint is rare, and much of the swelling is due to infiltration of the tissues around the joint with serum. The swollen tissues round the joint seldom pit on pressure. The swelling may be limited to the joint itself, but in the wrists and ankles it sometimes affects the sheaths of the tendons and causes considerable swelling of hands & feet.

In very severe attacks all the larger joints may be affected. So long as there is pain in a joint, although there is neither swelling nor redness, it is usually possible to detect increased heat by placing the hand over the joint. When in pain, the joints are kept by the patient in certain positions — viz — Knees and Elbows flexed; ankles and wrists extended; and fingers turned slightly towards the ulnar aspect of limb. The joints most frequently involved are the larger articulations, especially the Knees, ankles, wrists Elbows and shoulders; the hip joint less frequently than the others. The fingers come next in order of frequency; then the toes; while the remaining articulations are more rarely affected. As regards their order of invasion, the ankles are most frequently the first joints to be involved, then the Knees and so on. In other instances it is observed that the disease passes along the joints of the lower limbs.

including the hips, to those of the upper limbs. In many cases its distribution is symmetrical on both sides, while in other cases it is unilateral, the homologous joints of the upper and lower limbs being simultaneously involved. The smaller joints suffer as a rule towards the termination of an attack. In children the joints are usually only slightly affected. There is less pain, less swelling & less tenderness. It is rare to find a child afraid to move in case of pain as is often the case in adults. Often there is only slight pain, stiffness & tenderness with no swelling, & only one joint may be implicated. Sometimes the joints may escape altogether, only the tendons being affected, e.g. those of the hamstring muscles under the knee, causing stiffness & pain on movement, and the child is observed to walk on tiptoe with the knee bent to avoid stretching the tendons. Such mild attacks are apt to be overlooked altogether.

Sleeplessness is a common complaint. It is due rather to the severe pain in the joints than to any excited mental condition. The mind is clear and delirium is rare even in severe cases, though it is sometimes met with in those who have indulged freely in alcohol. The salicylate treatment, if pushed too freely, may give rise to slight wandering of the mind.

Though the temperature may be 103°F., yet the skin does not feel hot to the touch. In most cases there are profuse acid sweats of a peculiar sour odour except in cases of hyperpyrexia. Perspiration collects on the forehead and runs down the cheeks, in fact head body and limbs all sweat profusely. The perspiration is said to be acid in reaction and to have a sour smell, though it has not been shewn that this sour smell is due to any abnormal constituents in the perspiration. It is probably due to fermentative changes which take place

after it is poured forth on the surface of the body. The same smell can be felt about persons in good health who have perspired freely and have not changed their underclothing. Normal sweat differs according to the part of the body from which it is secreted. Other states that the perspiration is sour smelling and acid at first, but when persistent becomes neutral or even alkaline. Church states that in his experience the perspiration on the face & chest is feebly acid as it is in health. These profuse perspirations are not common in children.

In connection with the excessive sweating <u>sudamina & miliary vesicles</u> are usually abundant, the vesicles being usually surrounded by a minute ring of redness. The sudamina are really the same as occur in other febrile conditions where there is free perspiration, only they do not run the same course. The vesicles are at first clear, then become milky and opaque, and become surrounded by a ring of

hyperaemia. Church states that the vesicles of miliaria rubra in rheumatism are the late stage of sudamina. The contents of the vesicles in the clear stage are acid in reaction and after becoming opaque they are usually neutral or slightly alkaline.

The urine really presents the same characteristics as in other febrile states and does not throw any light on the causation of the disease. Even though the patient is drinking freely in consequence of the thirst, and is kept on a fluid diet, yet the urine is reduced in quantity because of the great loss of water by the excessive secretion of sweat. It is very acid and in clear when first passed but invariably throws down on cooling a deposit of pinkish urates. Crystals of uric acid may sometimes be detected. It is high coloured and the specific gravity is also high (1020 - 1030). The high colour depends on

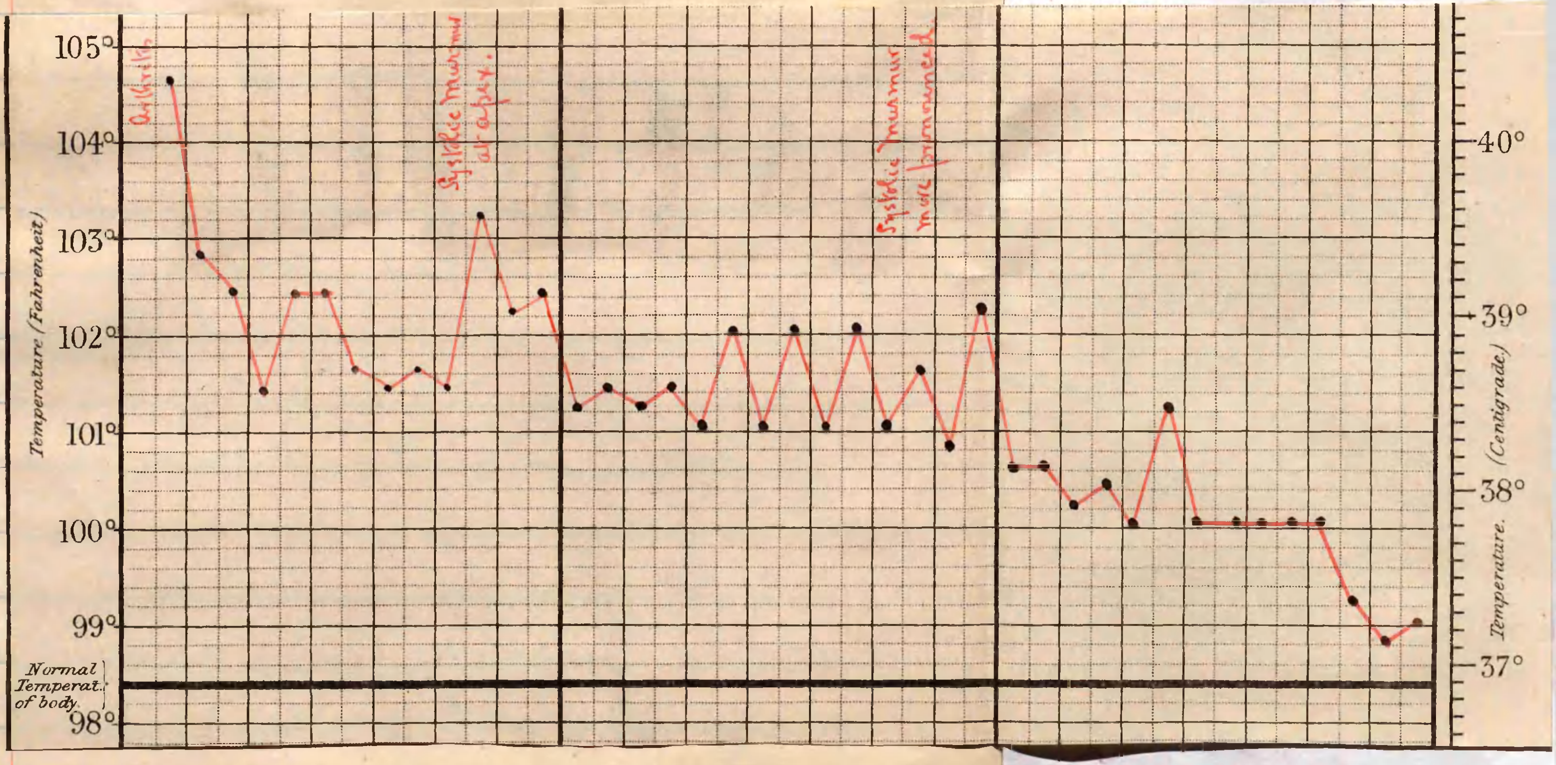
Complications

a large quantity of haematoporphyrin and also urobilin, though the amount of colouring matter present does not seem to have anything to do with the severity of the attack of the disease. The high specific gravity is due to the diminished amount of water passed. The chlorides may be diminished or absent, and febrile albuminuria is not at all uncommon. Senator states that an excess of urea is passed.

Cardiac.

Endocarditis, pericarditis and myocarditis can scarcely be considered complications of rheumatic fever. They are really as much part of the disease as the arthritis. Just as in some cases certain joints escape, so in others the lining membrane of the heart may escape. The younger the patient, the greater is the liability to cardiac complications. Strauss has pointed out that a general carditis is more frequent in children than in adults, Endo-

Case of Acute Rheumatism complicated with Endocarditis —



Endocarditis, pericarditis and myocarditis all occurring together. This however chiefly arises towards the close of fatal cases where there have been recurrences of attacks, and endocarditis has already caused valvular lesions; then pericarditis and myocarditis are added to the original endocarditis. As a rule however endocarditis occurs first and alone.

Endocarditis - is the most frequent and most serious complication. The liability to its occurrence diminishes as the age of the patient advances. It is said to occur twice as often in children as in adults. Each successive attack of the disease also renders the patient the more liable. In a number of cases collected by Mackenzie he found that 58.1% suffered from endocarditis in the first attack 63% in the second attack, and 71% in the third attack. The sexes are equally affected. Endocarditis in itself is rarely dangerous. It produces few symptoms and is often overlooked. Unfortunately the inflammation sets up

changes which lead to sclerosis and retraction of the valves and so to chronic valvular disease. If no murmur be detected during the first ten days of an attack, the endocardium may escape. In children endocarditis may occur as an acute affection during the course of the disease, but more often it comes on insidiously. It may appear early or late in the course of the disease. It may occur alone, or associated with any or all of the following; viz — arthritis, pericarditis, chorea, or subcutaneous nodules. As a rule it comes on early and recurs, in this way differing from pericarditis, which is apt to occur late in the course of the disease. Usually however it occurs in association with slight arthritis or with chorea.

Symptoms. Acute endocarditis is sometimes easy, at other times most difficult to recognise, and at times the characteristic lesions on the heart valves may be found after death without there having been any symptoms of endocarditis during life. The subjective symptoms vary with the age of the patient, the effects

many previous attacks of Endocarditis, & with the possible presence of pericarditis also. The physical signs may sometimes be absent, or appear only when the acute process has passed into a chronic state, and they are sometimes difficult to distinguish from those of a functional disturbance of the heart. In some cases the symptoms are absent, and it is only perhaps when patient is found to be suffering from an attack of hemiplegia by embolism, that Endocarditis may be detected. We find in many cases no subjective symptoms to lead us to suspect an Endocardial affection; the febrile symptoms, such as temperature, pulse and perspiration, do not differ from those in cases of rheumatic fever without Endocarditis, and it is by the physical examination of the heart only that the existence of Endocarditis is detected. In another group of cases, the patient, who has generally been affected with the rheumatic fever for a week or more, has suddenly a rise of temperature without any fresh pain, or he complains

of oppression uneasiness or pain over the region of the heart and palpitation, the pulse becomes small and quick, and the heart's action irregular. Again in other cases of subacute carditis, dyspnoea on exertion is the only symptom complained of. On physical examination of the chest reveals the existence of an endocardial murmur.

In children, when pericarditis complicates endocarditis, which it frequently does, the symptoms are more pronounced, the breathing is hurried and laboured & there is orthopnoea; the child has an anxious look and is slightly cyanosed; sleep is much disturbed and there is generally delirium; the pulse is quick and small and there may be persistent vomiting. In children the first affection may be so slight as to be overlooked. It may happen that the only noteworthy feature is a rise of temperature with profuse sweating which may go on for some time. The daily examination of the heart shews at first nothing, but in a short time the physical signs

of Endocarditis present themselves.

The physical signs are sometimes very marked, at other times they are indefinite. On inspection of the chest nothing abnormal is noticed unless there be pericardial Effusion, nor do we get any evidence on palpation unless the affection has already existed for some time. On percussion it is only in Exceptional cases that we notice the increase of the area of cardiac dullness due to dilatation of the left ventricle, the right, or of both. An increase in the area of dullness however, more especially in the transverse diameter, is often noticed in children, and may be due to pericardial Effusion. The most trustworthy and important physical signs of valvular Endocarditis are noticed on auscultation. As the mitral valve is most frequently affected, and as the fibrinous deposit is apt to prevent the complete closure of the valve, we get the signs of mitral regurgitation, that is, a Systolic murmur heard best at the apex and conveyed towards the axilla & also towards the sternum. The appearance of a Systolic murmur is preceded for days

by a roughness and prolongation of the first sound, which is in itself suggestive of Endocarditis. Prolongation of the first sound is the first indication of an approaching murmur. This is probably due to the soft gelatinous deposit, which alters the first sound while the valves are still smooth and elastic. According to Gibson we may notice occasionally, besides the mitral bruit, a tricuspid systolic murmur also, but this is not heard at the very beginning of the Endo-carditis. As regards Acute Endocarditis in children, Strange gives as the earliest physical indications:-

"Tumultuous, quickened and unsteady heart-sounds especially the first; Sounds reduplicated at and above the apex (not at the base); a temporary tricuspid murmur; accent commencing the first sound, whether mitral or tricuspid."

Occasionally however, even in children, a loud systolic murmur may rapidly appear; this is sometimes only heard when the child lies down, in the erect position it becomes fainter and may even disappear.

Diagnosis. A systolic murmur may be heard under conditions other than that of Endocarditis, therefore when

we hear such a murmur, we must not conclude at once that there is Endocarditis. The murmur may be due to relaxation or other changes in the heart muscle, or to a change in the blood. (Haemic murmur.) Although it is not always easy or even possible to distinguish these conditions, certain signs will help us.

The murmur of acute Endocarditis is generally soft in quality, systolic in rhythm, and limited to the area of the affected valve, i.e. either the mitral or aortic area, the tricuspid & pulmonary valves being practically out of the question.

In myocardial affections the pulse is often quick, small and irregular, and there is marked dyspnoea and vertigo.

The haemic murmur is often harsh in quality, and is noticed when there is well marked anaemia. It is heard not only over the mitral, but often also over the pulmonary and aortic areas, and is accompanied by venous murmur in the neck, while the pulse may be dicrotic. (According to Sansom, marked dicrotism occurs only in the severe cases of Endocarditis).

The murmur of chronic valvular disease is often loud

and harsh, heard over a larger area, and accompanied by some alteration in the size or shape of the heart.

Besides the mitral murmur, especially if the heart muscle is weak and early dilatation of the right ventricle comes on, we may note reduplication of the second sound, accentuation of the second pulmonary sound and sometimes also a systolic murmur over the tricuspid valve.

If the endocarditis affects the aortic valves, we may find no special physical signs if the vegetations are very small, at other times we get evidence of aortic regurgitation, a diastolic murmur heard best at mid-sternum, and if there be much regurgitation we get other indications of aortic incompetence. The aortic valves alone are rarely affected; when they are involved, disease of the mitral valves also is nearly always present.

The physical signs denoting stenosis of either mitral or aortic valve are very rarely to be noticed, as the narrowing results from a contraction of

the valves which generally takes place as the endocarditis becomes chronic. Sansom states that in some cases he has observed reduplication of one or other of the heart sounds as an early sign of endocarditis, and in these cases the endocarditis was followed by stenosis, rather than by regurgitation.

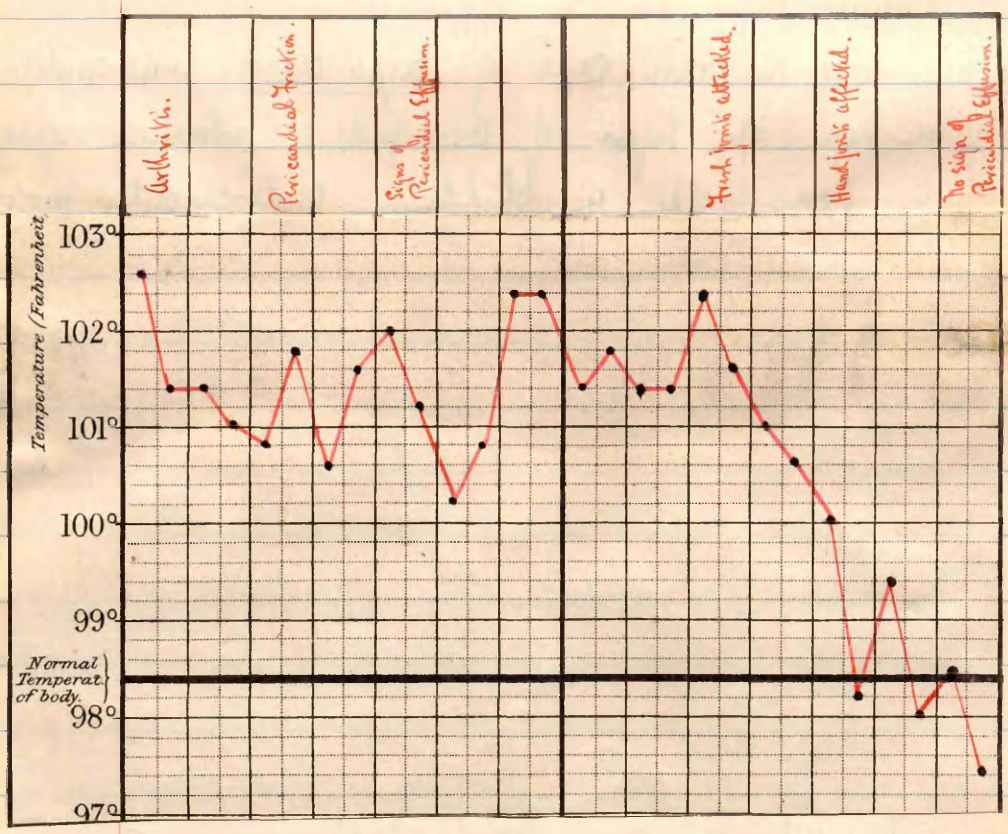
In the rare cases of <u>right-sided</u> endocarditis we have the signs of tricuspid or pulmonary regurgitation.

Occasionally in children endocarditis progresses with great rapidity; in these cases there is more fever and other constitutional disturbance, so that a murmur which begins as a soft blowing sound may become loud in the course of a week.

When the disease is accociated with an eruption of subcutaneous nodules, it is considered a grave sign of valvulitis, often accompanied by pericarditis also.

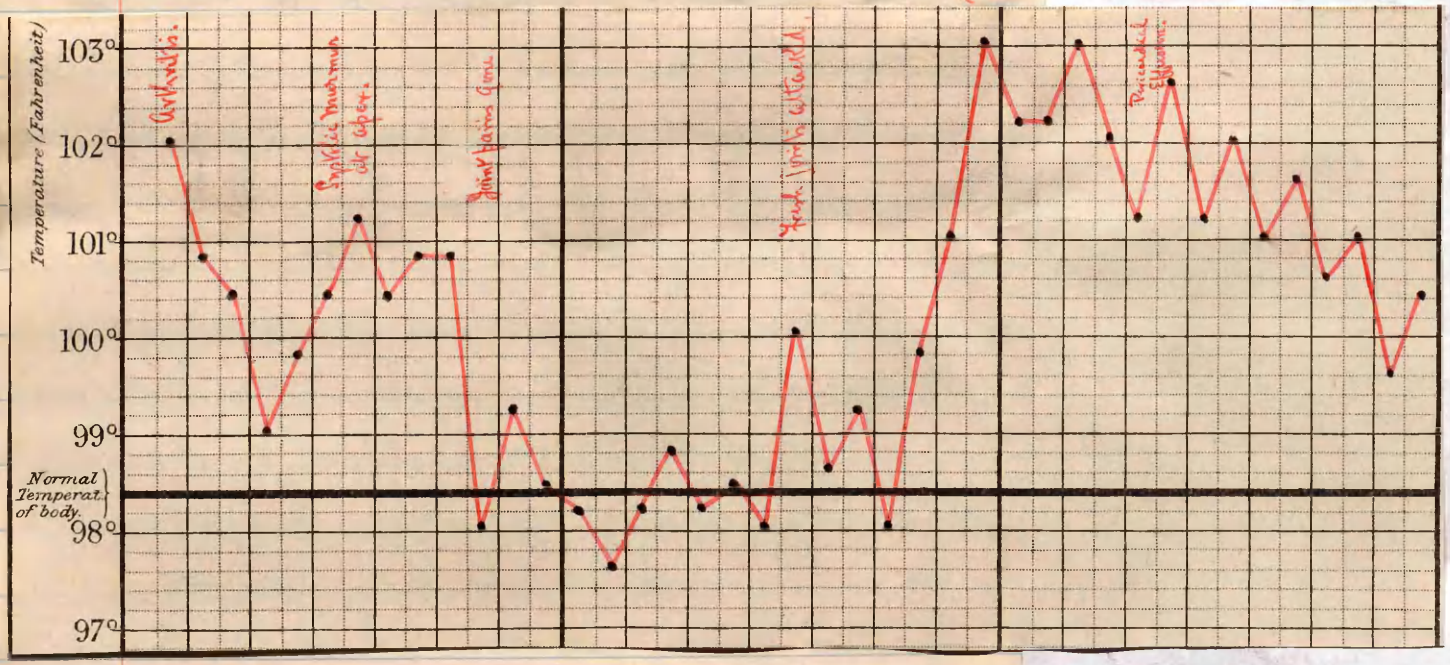
<u>The ulcerative variety</u> of endocarditis is extremely rare. It may be met with in patients broken down by drink and disease. It is of very rare occurrence in children.

Case of Acute Rheumatism complicated with pericarditis.



Pericarditis - may occur independently of or together with Endocarditis. It may be simple fibrinous or Sero-fibrinous, or in children purulent. Cases vary greatly in the rapidity with which Effusion takes place. In many instances the Effusion is slight in amount, reaches a maximum in 48 hours and then gradually subsides. In other instances the Effusion is much more Gradual. The Effusion may be absorbed with great rapidity. Recovery is the rule with inevitable adhesion however of the pericardial layers. The physical signs of pericarditis are characteristic, in this way differing from Endocarditis. It occurs more frequently among males than females. It often begins much later in the course of the disease than Endocarditis. It is also more frequent in first attacks than in subsequent ones. Like Endocarditis, the younger the patient, the greater the liability to its occurrence. A peculiar form of delirium is said to occur occasionally. In children it may occur alone, or combined with

Case of Acute Rheumatism complicated with Endo-carditis and pericarditis.



one or more of the other manifestations, viz., arthritis, endocarditis, chorea, or nodules. Most frequently it is a later development. Like endocarditis in children it is usually subacute & recurrent. It may be acute, with rapid effusion of fluid into the pericardium, distension, and cardiac distress, but this is not a frequent occurrence.

Symptoms. Its onset may not be indicated by any special symptoms. In other cases there may be quickened pulse, feeling of oppression or pain in the cardiac region, rise in temperature, and an alteration in the heart's sounds, before any pericardial friction can be detected. Dyspnoea is a common and important symptom. The patient lies on the left side, and as the effusion increases, sits up in bed, and the countenance may be deathly and anxious. These symptoms are due in great part to the direct mechanical effect of the fluid within the pericardium which embarrasses the heart's action. Other pressure effects are distention of the veins of the neck,

dysphagia and irritative cough from pressure on the trachea. Aphonia is not uncommon and is due to pressure on the recurrent laryngeal as it winds round the aorta. When there is very considerable effusion into the pericardial sac it may exercise considerable pressure on the left lung, and in this way be an additional element in the production of dyspnoea. Another significant symptom is the rapid action of the heart, which continues in spite of treatment. Its rhythm may also be disturbed. A quickened pulse, without a corresponding rise in temperature, is an indication of pericarditis. Great restlessness, insomnia and in the later stages low delirium and coma are symptoms in the more severe cases. Apart from the ordinary delirium, there may be peculiar mental symptoms. Subcutaneous nodules often appear on elbows, knees, ankles or occiput, and these always suggest implication of the fibrous tissues of the heart.

Physical Signs. The most important sign is the presence of praecordial dullness, the extent of which indicates the amount of effusion. As the pericardial sac distends, it pushes aside the margins of the lungs, and a large area may come in contact with the chest wall. The form of the percussion dullness is somewhat conical, the base being directed downwards and the apex upwards.

The pericardial friction may be constant or intermittent or disappear altogether. The friction-sound heard in the early stages may disappear when the effusion is copious, but often persists at the base or at the apex. With the absorption of the fluid, the friction returns. Pericardial murmurs are usually present with both sounds of the heart. When present with only one, it is almost invariably the first. When roughening has occurred over the auricles as well as the ventricles the friction may have a triple rhythm. The murmurs have the special character of friction or grating, and are liable to change

both in rhythm and position from time to time. Their character and intensity may be altered by the position of the patient. They may be audible in the erect and not in the recumbent posture. They are also altered in their character by pressure with the stethoscope. They are sometimes heard along the left margin of the heart or at the apex, but they most frequently occur over the right ventricle and at the mid-sternum. Pericardial murmur may be simulated by pleural friction sound at the borders of the heart. As a rule this friction coincides with the respiratory rhythm, and ceases when the breath is held, but in some instances the friction, though due to roughening of the pleura, is produced by the cardiac movements. The distribution of the friction, the absence of symptoms of cardiac derangement, and the presence elsewhere of signs of pleurisy will aid the diagnosis.

Another very important sign is the gradual weakening of the heart-sounds, which, as the effusion increases, may become so indistinct, as to be scarcely audible.

On palpation the cardiac impulse may be diminished or lost. The position of the apex beat is not constant. In large effusions it is usually not felt. The pericardial friction may lessen with the effusion, though it often persists at the base. When it can no longer be felt over the right ventricle, or it may be felt in the erect and not in the recumbent posture.

In children bulging may be observed in the praecordial region, and when the effusion is copious the antero-lateral region of the left chest becomes enlarged. The intercostal spaces are seen to bulge a little, and there may be oedema of the chest wall. The pressure thus exercised on the lung diminishes the expansion of the left side. The diaphragm and the left lobe of the liver may be pushed down and so produce a fullness in the Epigastric region.

When the pericardial effusion is large in quantity, considerable pressure is exercised on the left lung. The antero-lateral margin of the lower lobe is pushed to the side and sometimes compressed, so that percussion in the axillary region, in and just below the transverse nipple line, gives an

altered percussion note - usually a flat tympany, and on auscultation there is either feeble or tubular breathing. Variations in the position of the patient may change this modified percussion area.

Diagnosis - The area of cardiac dullness may increase, and the heart-sounds become less distinct, yet this may not be due to effusion, but to an increase in the size of the heart and thickening of the pericardium. There is difficulty in distinguishing between dilatation of the heart and pericardial effusion particularly in stout persons. In dilatation the cardiac impulse is commonly visible and wavy, especially in thin-chested people, and is more distinctly felt; the area of dullness too rarely has a triangular form, nor does it usually reach so high along the left sternal margin, nor so low in the fifth or sixth intercostal spaces without visible or palpable impulse. Where the upper limit of dullness varies with change of position there the case is one of effusion. In effusion too the sounds are distant and muffled, whereas in dilatation they are clear and sharp; and rarely in dilatation is the distention sufficient to

compress the lung and so produce the tympanitic note in the left axillary region which is sometimes met with in large effusion.

When the effusion is very large the pericardial sac may occupy such a large portion of the antero-lateral region of the left chest that the condition may be mistaken for pleurisy. The feeble & muffled cardiac sounds, the absence of well-defined movable dullness, and the flat tympany in the infra-scapular region are points which would indicate pericardial effusion. Many of these cases have been regarded as encapsuled pleural effusions.

In cases of peri-carditis which terminate fatally, it is usually associated with endo-carditis. Recovery may take place without leaving behind much serious damage. Even though the surfaces of the pericardium become adherent, little harm may result unless the adhesions be dense, or the parietal portion of the pericardium is also adherent to the pleura or chest wall.

Cheadle has pointed out that serious consequences may

result in children from its interference with the growth and nutrition of the heart. The pericardium may become so thickened, and its two surfaces so closely adherent, that it forms a close-fitting fibrous sac around the heart. This interferes with the contraction and dilatation of the heart, and also with the development of the organ, so that it fails to grow as the rest of the body in the child develops, and dropsy results from the weak cardiac power. When the pericardium becomes adherent to the pleura and they become matted together in a fibrous mass, then there will be respiratory and cardiac distress.

Myocarditis - occurs most frequently in connection with endo-pericardial changes. There is a granular degeneration of the heart muscle which leads to weakening of the walls and to dilatation. It is not so common a complication as endocarditis and pericarditis, but it is probable that it occurs in all cases of pericarditis except the mildest. In cases which end fatally from pericarditis, the outer layer of

the muscular wall of the heart is usually found to be affected and shews degenerative changes under the microscope. Occasionally a similar condition of the inner layer of the muscular wall is found, but in a less degree. West states that dilatation of the heart may occur in acute rheumatism, or as an early sequel of it, and also records a case in which there were symptoms of cardiac failure without evidence of endocarditis or pericarditis. It may be said that post-mortem examination never reveals myocarditis apart from endocarditis or pericarditis.

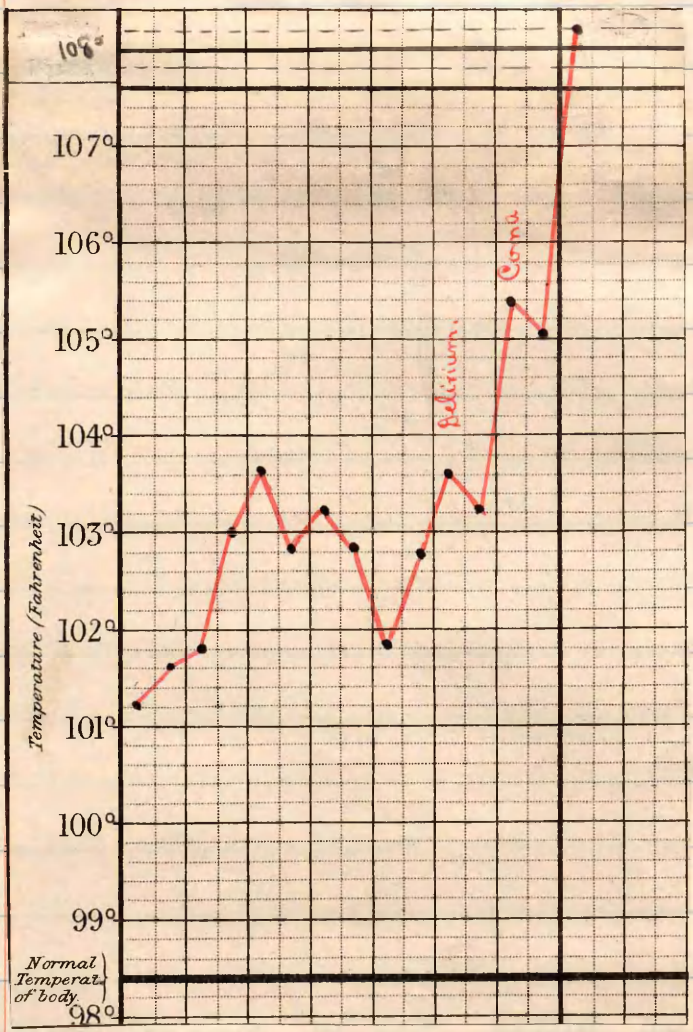
Phlebitis and Venous Thrombosis are among the more unusual occurrences. French observers state that phlebitis is most common in the lower extremities. Poynton states that he has met with it most frequently in the large veins of the arm and neck. All the tributaries of the superior vena cava, including the upper part of the vein itself, may be occluded. The recognition of this condition rests upon the occurrence of localized oedema of the arms face or chest, with

Case of Acute Rheumatism complicated with Hyper-pyrexia. (Recovery).

tenderness along the affected veins, dilation of the collateral vessels, and sometimes firm cords may be met with in the position of the veins.

Hyper-pyrexia — The temperature may rise rapidly a few days after the onset of acute rheumatism, and be accompanied by delirium, but in other cases the temperature may rise to 108°F. or even 110°7 (Balfour), and yet not be accompanied by cerebral symptoms. Hyperpyrexia is most common in first attacks, and is most apt to set in during the second week though it has been known to occur as early as the second day, and much later than the second week. In association with the high fever there is extreme prostration, the pulse is quick and feeble, and latterly coma sets in. The death rate appears to be greater in first attacks than in subsequent ones. Certain cases show decided cerebral symptoms. These cases were formerly termed Cerebral Rheumatism, and it was thought that the rheumatic inflammation

Case of Acute Rheumatism complicated with Hyperpyrexia (ending fatally).



proceeded from the joints and heart to the membranes of the brain. Many of these cases were no doubt pyæmic in their origin, yet meningitis apparently does occur. Hyper-pyrexia is said to occur more frequently in males than in females. In cases where hyper-pyrexia intervenes, the onset of the attack may be as usual, or the attack may be considered mild, until the alarming symptoms arise. In some of these cases the patients are said to have been weakened by previous alcoholic excess, in others their mental condition is said to have been depressed before the onset of the attack. Hyper-pyrexia does not occur in the young. It has not been met with under the age of twelve years, but may occur at any other period of life. Church states that a case can hardly be considered one of hyper-pyrexia where the temperature does not exceed 105°F. The higher the rise in temperature, the more grave is the prognosis. With the rise in temperature the

articular pain usually diminishes, though it may remain unaltered. The patient may become restless at first, then delirious, and latterly comatose. Convulsions are not uncommon. The profuse sweats are diminished or cease altogether when the skin feels burning to the touch. The breathing is more rapid, and the pulse is quickened. Sometimes a large quantity of urine is passed by the patient, and occasionally diarrhoea sets in. The patient is usually comatose before death ends the scene.

The temperature may reach its maximum a few hours after the commencement of the symptoms, or not until there have been several days of high temperature. When the case has not been treated by the application of cold the highest temperature is usually at the time of death, and in a few cases the temperature has been observed to rise for a short time after death. One might suspect hyper-pyrexia when the temperature remains high, and there is no evidence of pericarditis or other complication,

especially if the articular pains have diminished, and the patient has become restless.

A similar condition to the hyperpyrexia occurring in acute rheumatism is also met with in pyæmia, pneumonia, Small-pox, typhus and enteric fevers, and Scarlatina, but this Group of symptoms is met with more frequently in acute rheumatism than in any other disease, and seem to occur oftener in some years than in others, yet it does not seem to appear at that season of the year when acute rheumatism is most prevalent, but during the Summer months. (Clin. Soc. Report.)

The pathology of this condition is not known. It is supposed that the mechanism which regulates the heat of the body is disturbed, and the cerebral symptoms are produced by the over-heated blood circulating through the brain. The symptoms are similar to those produced by very high temperature in other specific diseases and in Sun-stroke. Andrew has pointed out that

the sudden rise of temperature is very similar to that which occurs at the termination of certain cerebral diseases eg. meningitis, cerebral tumour, and softening. It is not known in what way the heat-regulating centres are affected. Leberts view was, that under certain conditions, a poisonous substance is formed in the body which causes paralysis of the nerve centres. Others are of opinion that the increased heat produced in the metabolism of tissue in febrile conditions is sufficient to paralyse the heat regulating centres. In what ever way this paralysis is brought about, a condition is set up, which produces an over-heated condition of the body and a deterioration of the tissues, in which the muscular fibre of the heart seems to suffer most. Green asserts that although we do not know the nature of the rheumatic poison, yet we know that it is especially liable to be followed by, or associated with hyperpyrexia, indicating a "selective action" of the poison upon the cells of the cortex cerebri.

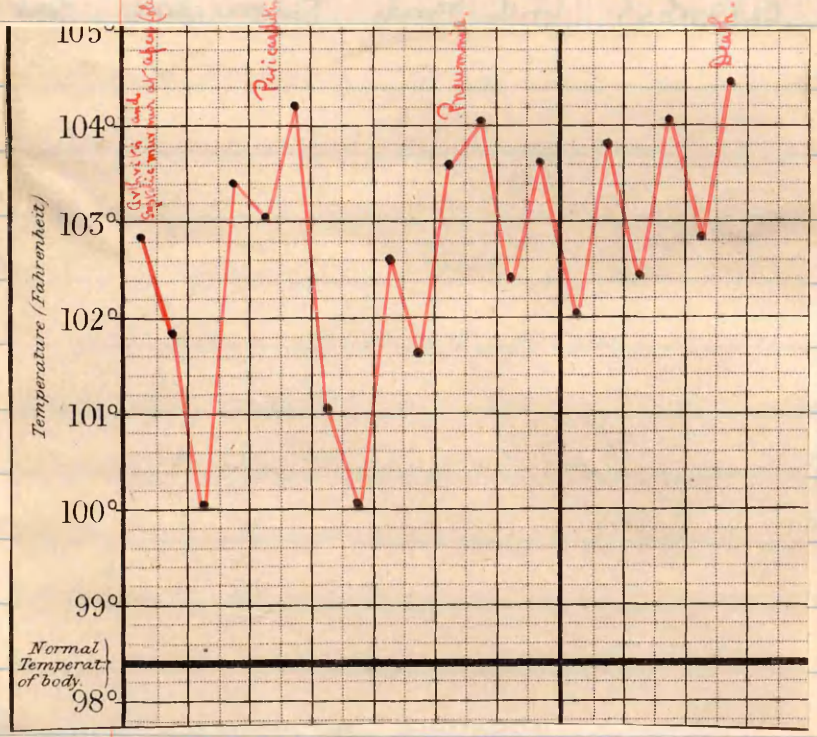
Tonsillitis — is a condition which is perhaps more common in children than in adults, and the frequency with which it occurs before any other symptoms has led to the suggestion, from those who uphold the microbic origin of the complaint, that the tonsils are the source of entrance of the micro-organism. It has also been pointed out that tonsillitis is frequently the precursor of endo-carditis, erythema nodosum and chorea. Cheadle describes it as a "phase" of acute rheumatism in childhood with which articular attacks or chorea may alternate. The mere existence of pain in the limbs upon which some lay stress, is not sufficient evidence to connect the affection directly with acute rheumatism. The tonsillitis is seldom of great severity. The temperature has some relation to the degree of the tonsillitis, the higher the temperature the more acute the attack of tonsillitis. In rare instances cases of endo-carditis have been noted when the only evidence of rheumatism has been tonsillitis. There is however nothing distinctive in the outer appearance of rheumatic tonsillitis, and a case

can only be pronounced rheumatic with any certainty when other evidences of rheumatism are present.
Besides ushering in acute attacks, tonsillitis often occurs in rheumatic children in the intervals between them. It may be that repeated attacks of tonsillitis are evidence of the rheumatic tendency, when there has been a total absence of the more definite signs of the complaint. The faucial inflammation is usually catarrhal and rarely suppurative, but there may be a membranous deposit upon the tonsils or a condition of follicular tonsillitis.

Pulmonary. Pneumonia - Pleurisy + Bronchitis sometimes occur as complications in the course of acute rheumatism, but they have no distinctive characters. These pulmonary complications frequently accompany cases of Endo-cardiris or pericarditis, or Endopericarditis. Pneumonia and pleurisy are the two most important concurrent conditions.

Pneumonia occurring in acute rheumatism presents certain clinical features which differ

Case of Acute Rheumatism (with old Syphilic murmur) complicated with Pericarditis and Pneumonia – (ending fatally).



somewhat from those generally present. The amount of consolidation may be considerable, yet the cough may be slight with very little expectoration. Pneumonia occurs more frequently than pleurisy, and is very often an accompaniment of peri-carditis. It is essentially a broncho-pneumonia. It has been maintained that it occurs more frequently on the left side than on the right, but this is doubtful when we make allowance for collapse of the left lung which always occurs when the heart is much enlarged. It may be present on both sides. The actual pneumonic change may be small, yet the physical signs may be more extensive than the lesions would lead one to suspect. The temperature rises suddenly, and falls by lysis rather than by crisis, and resolution is said to take place rapidly.

Pleurisy. Sometimes leads on to effusion, but the amount of it is not usually great. Rheumatic pleurisy is not infrequent when there is pericarditis, and those parts of the pleura which overlap the pericardium are especially liable to be attacked. Pleuro-pericardial friction is perhaps more frequent in rheumatic fever

than in any disease, for as a rule this inflammation is plastic. As in other pleurisies we usually meet with a catch in the breath, pain in the side, and a pleural friction rub. Of course rheumatic pleurisy may be met with apart from pericarditis. It is a question much discussed how many primary pleurisies (which are non-suppurative) are rheumatic in their origin and not tubercular.

Bronchitis is another respiratory affection sometimes met with as a complication of acute rheumatism. No special mention need be made regarding it.

Pulmonary Oedema is rare. When it does occur, sharp crepitations may be heard over the upper lobes in front, and if the condition is going to prove fatal, these crepitations quickly spread over the entire lungs, and there is great respiratory distress. In the early stage recovery is possible. This oedema is probably not mechanical in its origin as it commences in the upper lobes,

and post-mortem evidence shows that it is more marked in these lobes. It may be mentioned that oedema in renal disease also commences in the upper lobes.

Peritonitis is a very rare complication when we consider the very great frequency with which pericarditis occurs, and the comparative frequency of pleurisy, but though rare it does occur, and with the other symptoms diagnostic of the condition local peritoneal friction may occasionally be heard.

Appendicitis has been traced to rheum-atic fever, and among others Dr. Burney Yeo, Dr. Sutherland and Dr. Robinson have supported this view. It is very difficult to trace a connection between these diseases, and this difficulty is rendered greater from the fact that a septic arthritis sometimes arises in connection with appendicitis which may closely resemble the arthritis of rheumatic fever.

Renal.

Nephritis though not common, has been observed. It is probable that the kidneys are damaged by repeated attacks of rheumatic fever, without that damage reaching the stage of an acute nephritis, thus rheumatic fever may assist in producing that condition which is recognised in late life as "Granular Kidney".

Albuminuria sometimes occurs.

Haematuria may be met with in cases of infarction. Prof. Hilton has drawn attention to its presence in some malignant types of the disease.

Nervous.

Nervous Complications are due partly to the hyperpyrexia, and partly to the action of the toxic agent of the disease upon the brain.

When Delirium is present it is usually associated with hyperpyrexia, but may be independent of it. It may be active and noisy, or more rarely of a low muttering character which passes into stupor and coma. In some cases of

pericarditis, apart from the ordinary delirium, there may be peculiar mental symptoms. The patient may become melancholic and shew suicidal tendencies. In those who have indulged to excess in alcohol a condition resembling delirium tremens may supervene. In children, curious emotional attacks may come on in which the child is moved to tears or laughter by a word. Delirium too may be excited by the salicylate treatment if pushed too freely.

Coma is a more serious complication, and may prove rapidly fatal. It may or may not be preceded by delirium or convulsions. In many cases it is associated with hyperpyrexia. It may set in during the attack or during convalescence. Cases of coma have been recorded where there was no previous delirium or hyperpyrexia. It is just possible the coma here may have been uraemic.

Convulsions are not so common, though

they may precede the coma.

Meningitis is a very rare complication, though it does occur. It should be remembered that in ulcerative endocarditis, which is sometimes associated with acute rheumatism, meningitis is frequent.

Chorea is most apt to occur in the slighter attacks in childhood. The connection of acute rheumatism with chorea is almost entirely confined to childhood, and these two conditions seem to be closely associated. Cheadle states that chorea appears not only in connection with acute arthritis, but also with other affections of the so-called rheumatic series, viz. endocarditis, pericarditis, erythema multiforme and nodosum, and subcutaneous nodules. Chorea may be accompanied by one or more of these, and when it occurs alone is often followed at an interval by one or other of these rheumatic manifestations. It is said to be of particular frequency in members of

families of a rheumatic tendency, and one member of the family may be found to suffer from arthritis, while another suffers from chorea. Cheadle also affirms that the great majority of cases of chorea are rheumatic in their origin, & that it might almost be said with certainty that the endocarditis and pericarditis of chorea are invariably rheumatic both in nature and origin. He also states that "the rheumatic child in a family is the nervous child of the family", thus associating the neurotic nature of chorea with the rheumatic taint.

Peripheral neuritis. is an occasional event, and atrophy of the small muscles of the hand may sometimes reach an extreme degree. In some cases muscular atrophy and arthritis combined produce a condition resembling acute rheumatoid arthritis.

Cutaneous

Sudamina and miliary vesicles occur in connection with the profuse perspiration as already mentioned.

Exudative Erythemas and Purpura Rheumatica are more frequently met with in the case of children than of adults. They may appear at any stage, but generally appear in connection with active disturbance of other kinds such as arthritis, or with endo-carditis and peri-carditis in the more severe cases.

The erythemas occur chiefly in children. They appear sometimes as red or white papules, at others as irregular patches of redness; Erythema nodosum is not so often associated with other phases of rheumatism as the other Erythemas are, though it does occur from time to time in connection with other rheumatic manifestations.

Purpura Rheumatica is seldom met with except in childhood. Some of these cases are extreme instances of Erythema in which extravasation of blood has taken place. Others are probably instances of simple purpura or haemophilia in which swelling and tenderness of neighbouring joints may be met with. There is however a purpura closely associated with acute

rheumatism which occurs in connection with General arthritis, or in patients who have suffered from it. When it occurs in the legs, the feet and ankles will be painful, swollen, and tender, although there may be no rise of temperature.

Psoriasis & Scleroderma are also cutaneous affections which have been considered by some to be associated with rheumatism.

Rheumatic Nodules. A special feature of acute rheumatism in children is the development of nodular growths of fibrous tissue. They are not uncommon in early life, but are rare in adults. They are most frequently associated with endo-carditis and pericarditis, and in this relation they are of serious importance. Their frequency and significance were first pointed out by Dr Barlow and Dr. Warner. These nodules are in relation with fibrous tissue. They lie under the skin and are attached to tendons and fasciae. Similar

nodular growths have been found in the periosteum. They vary in size from a small shot to a large pea, and are most numerous on the fingers, hands, and wrists. They also occur about the elbows, knees, vertebrae and scapulae. They are not often tender. They may make their appearance during the fever, or on its decline, or apart altogether from an acute attack. Their growth may be rapid, and they usually last for weeks or months. When small they may not be visible, but can easily be felt. Usually three or four are present, though there may be as many as twenty or thirty or more. Their presence in children may be regarded as a positive indication of rheumatism, and it has been observed that they occur particularly in severe endocarditis. They indicate concurrent cardiac disease, and that a similar inflammatory change and proliferation is going on in the fibrous tissues of the cardiac valves, or pericardium, or

in both. When the nodules are numerous and large, they indicate serious danger, and are usually associated with progressive endocarditis and pericarditis of the most serious nature. In children they are of considerable clinical importance, as severe cardiac disease may accompany them without well marked joint pains.

Microscopical examination of a section of a nodule shows that it is made up of round and spindle shaped cells. The nuclear growth is found in all stages of transformation into fibrous tissue, and the proliferation is said to be analagous to that found in the interstices of the liver in cirrhosis.

Microscopical examination of a section of the mitral valve in rheumatic endocarditis shows proliferation of the fibrous tissue under the endothelium, which is a similar condition to that which takes place in the formation of a subcutaneous nodule.

This similarity may help to explain

the clinical significance of the nodules, and their rapid growth and quick disappearance in some cases suggest, that the mitral murmurs which sometimes appear and then disappear, are not functional, but are due to this cell growth in the valves & chordæ, which may take place as rapidly and disappear as rapidly as in the case of nodules.

Scarlatinal Rheumatism. During the course of scarlet fever and the period of convalescence pains & swellings in the joints may develop, and present all the characteristics of acute rheumatism. Some writers maintain that this is not a true rheumatism, but a condition analogous to gonorrhœal arthritis. Church states that it seems probable that when arthritis occurs during the fever, it is pyæmic rather than rheumatic in character. Ashby states that the arthritis is most common in children between the seventh and ninth days of the fever, and

is usually met with in cases where there is severe cervical adenitis or ulceration of the tonsils. The effusion may pass on to suppuration, and then the joint affection occurs at this stage of the fever, it appears to be very rarely accompanied by endocarditis, and only occasionally by pericarditis. When suppuration occurs, a single joint only is usually involved. During convalescence from Scarlet fever, that is, after the first week or later, an arthritis, which appears to be true rheumatism is not uncommon, and is as frequent when the attack has been mild, as when severe. These cases appear to be often accompanied by endocarditis + occasionally by pericarditis, and cannot really be distinguished from acute rheumatism.

Exophthalmic Goitre. Dr. Sam. West has drawn attention to the frequency with which a history of rheumatic fever is met with in these cases. The association is a very remarkable one. In rare cases

Diagnosis

inflammation of the thyroid gland has been noted.

Conjunctivitis and Iritis appear to be rare complications.

There are several affections, which in certain particulars closely resemble rheumatic fever, though its recognition does not present serious difficulty, unless in young children. Occasionally it is impossible to form a differential diagnosis at the onset. Mention may be made of the value of the salicylate treatment as an aid to diagnosis. The rapid way in which many cases of acute rheumatism subside under this treatment is an undoubted assistance in diagnosis, but it is far from certain that we are justified in making the result of this treatment a complete test of the rheumatic nature of a doubtful case, the action of the salicylate being so little understood, and the

nature of the rheumatic processes so obscure.

There is difficulty in the early diagnosis to separate rheumatic fever from other acute fevers, and in particular from scarlet fever, influenza, and enteric fever, as the symptoms at the onset of these diseases are similar.

Acute osteo-arthritis - is a condition which not infrequently occurs in women who have been enfeebled by child-bearing and lactation, and often begins in an acute manner with fever and joint-pains like those of acute rheumatism. Cardiac complications do not supervene, nor is there any improvement in the condition with the salicylate treatment. These patients after a time may slowly improve, but stiffness & swelling of the affected joints may remain and the condition may pass into chronic osteo-arthritis.

In the earlier stages of Gonorrhoeal rheumatism it is not infrequently mistaken for true rheumatism, especially when it occurs in women, but suspicion is aroused by the absence of marked fever, and the

obstinacy of the arthritis which shews no sign of yielding to the salicylate treatment. The presence or history of a urethral discharge, and the fixity instead of the migratory character of the pain in the affected joints will also help to distinguish the real nature of the affection. It shews a special preference for the knee. In gonorrhoeal rheumatism too the heart is rarely affected, and conjunctivitis and iritis are not infrequent occurrences. Other infectious diseases such as scarlet fever, dysentery and cerebro-spinal meningitis may simulate rheumatic fever, but rash, history of case, &c. should prevent mistake.

We may meet with a septic arthritis occurring in the course of pyaemia from any cause. In this form of arthritis the inflammation rapidly passes on to suppuration, and there is more or less destruction of the joints. The conditions under which the arthritis occurs help to indicate the nature of the case. Rigors rarely occur in acute rheumatism, but are frequent and

Sever in pyaemia. The swollen tissues round the joint seldom pit on pressure in acute rheumatism. In pyaemia again the pain & swelling of the affected limb do not shift, but remain fixed. The condition of the skin may also aid the diagnosis, the skin in pyaemic cases being often hot and burning, and rarely sweating to the same extent as in rheumatic fever. Infarction of the spleen may lead to tenderness and enlargement of that organ, whilst infarction of the kidney may cause the appearance of albumen and blood in the urine. Pyaemic arthritis is not infrequently met with in puerperal fever. Here the history of childbirth would differentiate the diagnosis.

When pyaemia happens to be part of an ulcerative Endocarditis (which itself may be secondary to rheumatic affection of the valves) the fever is usually of the hectic type.

When secondary to acute necrosis or osteo-myelitis of some of the long bones most commonly the tibia or fibula. There are usually general swelling and tenderness of the affected limb and also oedema, and

the Epiphyses are here involved more than the joints. When due to disease of the temporal bone, there may be the presence of discharge from the Ear, or a history of it, besides tenderness over the mastoid process and some swelling of the tissues in that region. The acute arthritis of infants is also pyaemic in its character. It is a disease which is usually confined to one joint (hip or knee), and the effusion rapidly becomes purulent.

An attack of Acute Gout may lead to Error. Acute Gout is a disease of mature years; acute rheumatism a disease of youth. Gout generally affects one joint; rheumatism several. Gout attacks chiefly the small joints; rheumatism the large. In acute gout the skin over the affected joint is red and glistening; in acute rheumatism as a rule redness of the surface is not marked. In acute gout the skin is dry and does not perspire; in acute rheumatism it perspires very freely. In acute gout the blood contains uric acid; in acute

rheumatism it does not. Acute gout is not benefited by salicylate treatment; acute rheumatism improves rapidly under that treatment. Acute gout is much less apt to affect the heart.

Rheumatoid arthritis in its more acute form is also liable to be mistaken for acute rheumatism. It is distinguished from it by the following peculiarities — Acute rheumatoid arthritis is a comparatively rare disease. It occurs chiefly among young women whose health has already been impaired by some debilitating cause, generally menstrual or uterine disturbance, or prolonged lactation. It comes on more gradually than rheumatism, and it attacks the small joints as frequently as the large. The inflammation persists in the joint first affected, although others may be afterwards implicated, and there is not the same tendency to migration which is characteristic of the arthritis of true rheumatism. The joints attacked do not return to the normal, but further changes develop in them and the spindle-shaped swelling of the finger joints quickly appears. The temporo-maxillary articulation now and then becomes stiff and painful at any early

stage. It is said to be attacked in about a quarter of the total number of cases. It is an important diagnostic sign, though it is also met with in gonorrhoeal rheumatism.

Incipient Talipes has been mistaken for acute rheumatism, in cases when the rheumatism occurred in childhood and affected principally the hamstring muscles, thus causing the child to walk on the toes with apparent inability to put down the heel.

Infantile Paralysis, in its early stage, when there is often considerable hyperaesthesia, is also liable to be confounded with acute rheumatism. In infantile paralysis the muscles are flaccid, and the affected limbs fall loosely down with drooping of the toes, while the tenderness is diffused and not confined to joints and tendons. Later the tendon reflex is lost.

In infants too Scurvy rickets may be mistaken for rheumatism. Here there is swelling, immobility and tenderness of the limbs and often slight fever. The swelling however is periosteal, and is almost invariably limited to the shafts of the long bones. Other diagnostic features are the spongy gums, Subcutaneous haemorhages,

and perhaps haematuria and albuminuria, and the disease is limited to the first two years of life, when rheumatism in children is almost unknown.

Syphilitic disease of the ends of the long bones is another condition liable to be mistaken for slight rheumatic arthritis in children. In this condition there is tenderness and swelling from accompanying periostitis, and there may even be some articular inflammation with pain on movement. Other signs of congenital syphilis may be present or the history of the case may throw light on the diagnosis, but the most distinctive feature is the early age at which it occurs when rheumatism is practically unknown.

In cases of haemophilia too, when there has been haemorrhage into a joint the swelling and tenderness may simulate rheumatism.

The pains in the joints and muscles which accompany the early stages of spinal disease are sometimes confounded with those of rheumatism.

In traumatic arthritis usually one joint only is affected, though in acute rheumatism also the arthritis

may be monarticular. The pain is persistent and not migratory, and usually some appreciable cause will be found eg. history of sprain or other injury, and there are no febrile symptoms.

Acute mon-articular rheumatism of the right hip joint may be mistaken for appendicitis. The seat of the pain and the flexing of the right thigh may be confusing, but the presence of fulness with increased resistance above poupart's ligament, and tenderness confined to the right iliac fossa, with probably gastro-intestinal symptoms, should assist in the diagnosis.

The joint trouble of tubercular disease may be misleading, but here a broad survey of all facts should clear up any difficulty.

Where tonsillitis occurs it is sometimes difficult to say whether it is a local affection or a manifestation of the more serious disease.

Among rare conditions may be mentioned glanders which at the outset may be mistaken for rheumatic fever.

Tetanus is characterised by peculiar bilateral tonic spasms of the extremities, and may be mentioned as a disease for which acute rheumatism might be mistaken.

Prognosis.

Acute rheumatism, in itself, is by no means a fatal disease. It is very rarely that a patient does not recover from a first attack of rheumatic fever. In most cases recovery takes place, but this recovery is often incomplete, and one attack does not protect the individual in the future. If untreated, the symptoms may continue from ten to fourteen days, when they will usually subside; if treated by the usual method the pains and fever are often gone within a week. Acute rheumatism shews a great tendency to relapse. The course of the illness is very indefinite, and may be protracted by repeated relapses over many weeks. After a painless interval of from two days to two weeks, with normal temperature, the joints may again become affected in precisely the same manner, when the patient runs exactly the same risks in regard to complications as he does in the first attack. Other relapses may follow. Sometimes recovery is delayed by the persistence of the inflammation in one joint for weeks or months. Another cause of delay in convalescence may be the rapid progress of endocarditis, so that the patient passes at once from rheumatism into pronounced

heart disease.

The prognosis of acute rheumatism really includes the various heart affections. Regarding the prognosis of acute rheumatism (per se) only general rules can be given. The younger the patient, and the more pronounced the hereditary tendency, the greater fear there is of a future attack, especially if the circumstances of the patient be poor and the surroundings unhealthy. Repeated attacks of rheumatic fever in early life usually leave some organic heart disease behind them.

The occurrence of endocarditis, pericarditis, pleurisy, and pneumonia point to the virulent types of the disease, and subcutaneous nodules, as a rule, are additional proof of this. The supervention of the malignant type of endocarditis is extremely grave, and such cases seldom recover.

The persistent types of subacute rheumatism, in which pericarditis and other manifestations appear from time to time, are of bad prognosis, and it would seem that when the health of the patient has been

reduced by repeated attacks and consequent cardiac lesions, a condition is reached in which active rheumatism lingers on, and is not affected by any methods of treatment.

On the other hand many cases of articular rheumatism, especially in adults, completely recover, and even if valvular disease has resulted, the mitral incompetence is often so slight as to produce no perceptible injury to health, provided there are no further attacks of rheumatic fever.

Pericarditis is much to be dreaded, but there is good reason to believe that recovery from this may sometimes be complete. When death occurs from large effusion, it is not usually until the second or third week, and takes place gradually from asthenia.

As a rule the joints recover completely, and even though pain and stiffness remain for some time afterwards, persistent treatment will generally meet with success.

There are exceptional cases in which deformity results and remains permanent. Such cases, though they resemble rheumatic fever, are more akin to rheumatoid arthritis in the character of the changes in the joint.

The prognosis in hyperpyrexia is very grave, but the prompt treatment by cold baths has made it much more favourable than it used to be.

The prognosis is more serious in the case of children than in that of adults. This is due to the greater tendency to endocarditis and pericarditis. This danger is no doubt increased by the fact that the early stages of the heart affection may be overlooked because of the slight character of the joint affection, or its entire absence, and thus the cardiac inflammation is allowed to progress.

The gravity of the prognosis in children is also increased by the great tendency of the disease to recur, the heart becoming more seriously injured by repeated attacks of endocarditis and pericarditis. In slight cases no doubt, the rapid

growth of muscle in children favours compensation, but in severe cases the soft and yielding nature of the tissue allows the dilatation to proceed more rapidly than the hypertrophy.

The mortality during an acute attack is low. When death occurs during the course of an attack it is due usually to hyperpyrexia, or to secondary lesions such as endocarditis or pericarditis, or more rarely pneumonia or pleurisy. Even from these however the patients often recover. Sudden death in rheumatic fever is due most frequently to myocarditis, and in a few rare cases it results from Embolism. In very rare instances death takes place suddenly without hyperpyrexia or any discoverable affection of the heart or lungs. Senator mentions that sudden death may occur in "paroxysms of palpitation and oppression" not dependent on cardiac complications. Alarming Symptoms of depression sometimes follow Excessive doses of Salicylate of soda.

In the Registrar Generals returns for the Six years (1887 – 1892) the average number of deaths ascribed to rheumatic fever and rheumatism of the heart was 4·67 per thousand of deaths –

Sequels

In acute rheumatism it is rare for a joint to suffer permanent injury, in this respect the disease differs from osteo. arthritis, gout, and gonorrhoeal rheumatism.

The grave consequences of acute rheumatism are those which pertain to the heart and its coverings. The evil effects of Endocarditis often do not show themselves till long after the acute attack of the disease is over, when the injury inflicted by the disease on the heart will then make itself shewn, and a very large proportion of the deaths attributed to heart disease are due to lesions caused by acute rheumatism.

Hypertrophy & dilatation are secondary changes which proceed more rapidly in children than in adults, probably because the tissues are softer and more yielding, & in the young the tissues grow more vigorously than after maturity. Compensation may be wonderfully complete at first in consequence of this hypertrophy. So long as this efficient compensation is maintained, the patient may suffer no inconvenience.

and even with the most serious forms of valve-lesion, the function of the heart may be little disturbed; but when compensation fails, the circulation becomes embarrassed and as further sequels we will meet with such symptoms as dropsy, dyspnœa, palpitation and cardiac distress, sleeplessness, cough and hæmoptysis, as well as gastric and renal symptoms.

The tendency to further attacks is another serious evil - One attack does not confer immunity, but predisposes the subject to the disease.

Another serious consequence of acute rheumatism is anæmia. There is no acute febrile disease in which anæmia occurs with greater rapidity. There is diminution in the number of red blood corpuscles, and also of the amount of hæmoglobin. There is also a slight increase in the number of the white corpuscles. Garrod states that in cases running a favourable course without serious complications, the red corpuscles soon rise to the normal standard again. In children anæmia is more noticeable than in adults. Hæmic cardiac murmurs are frequently met with -

Dilatation of the stomach is not by any means a rare sequel of rheumatic fever. When it does occur it retards recovery very much.

There is another morbid condition to which the term rheumatism is usually applied, but which is more properly a sequence of rheumatism, than a distinct form of the disease, and which is apt to be mistaken for the subacute and chronic forms of the malady - When a patient has suffered from repeated rheumatic attacks, especially when these have followed each other in quick succession, there is apt to be a state of chronic thickening of the fibrous tissues involved in the disease. This condition, though of rheumatic origin, exists when developed independently of the rheumatic poison, & may give rise to symptoms indistinguishable from those caused by it - viz - pain and stiffness of the joints -

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