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RHEUMATOID ARTHRITIS:  
its clinical symptoms, etiology,  
and pathology.

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## RHEUMATOID ARTHRITIS:

its clinical symptoms, etiology, and pathology.

### HISTORICAL.

Many and varied were the names by which Rheumatoid Arthritis was designated before the disease came to be recognised and differentiated from rheumatism and gout. A few of these, such as "Chronic rheumatism of the joints", "Rheumatic gout", "Dry arthritis", "Nodosity of the joints", show the confusion that existed, and it was not until the year 1800 that its clinical and pathological features took a clearer outline. Of recent years, the terms rheumatoid arthritis, osteo-arthritis, and arthritis deformans have their different advocates, but, in this country at least, the term which was first applied to the disease by Garrod is the one most generally adopted. Osteo-arthritis is usually kept for those more chronic forms of the disease, which are common in the old and exhibit more marked osteo-sclerotic changes. "Arthritis deformans" is used very little in this country but is that which is most popular in Germany.

From earliest years it has been known that (rheumatoid) changes existed in bones, and the first description of the disease was given by Sydenham in 1683, who called it a modification of rheumatism. In 1800 it was differentiated for the first time from gout by Beauvais under the title of Goutte Asthenique Primitif, and four years later Heberden<sup>(1)</sup> pointed out its differences from rheumatism and at the same time he drew attention to the nodes which occur on the terminal phalanges of fingers and go by his name. In 1805 Haygarth<sup>(2)</sup> described the disease fully, and differentiated it from both gout and rheumatism. It continued a subject for discussion and difference of opinion, and in 1853 Charcot<sup>(3)</sup> gave it the name of Rheumatisme Chronique Primitif and held that it was only a form of chronic rheumatism, and this is still the view that is largely prevalent in France. In England, America and Germany, however, it is recognised as a disease with a distinct and separate identity, differing entirely in its essential features from gout and rheumatism. Coming down to more recent times, Sir A. Garrod<sup>(4)</sup>, by his work on gout, has clearly separated that disease from rheumatoid by proving the invariable excess of uric acid present in the one, and entirely absent in the other. Senator<sup>(5)</sup> and Virchow<sup>(6)</sup> regarded it as a true constitutional disease, and Ord<sup>(7)</sup>

and Spender<sup>(8)</sup> as purely of reflex nervous origin.

Forsbrook in 1893 held that anaemia was responsible for the vaso motor and trophic changes, trophic malnutrition being accountable for the joint changes. In 1896, attention was drawn to the infective phenomena and various organisms were isolated from joint fluids by Chauffard<sup>(9)</sup> and Ramond, Bannatyne<sup>(10)</sup> and Wohlmann, and Schuller. Professor Baumuler of Freiburg also supports the bacterial theory, and in this country Hale White, Macalister Poynton<sup>(11)</sup> and Paine have secured evidence in favour of the infective nature of at least the acute forms of the disease.

THEORIES.

There have been many theories in the past as regards the causation of rheumatoid arthritis, but most of these have become discredited with a more intimate knowledge of the etiology, symptoms, and course of the disease, and at the present time there are three outstanding views advanced by different observers as to its origin. These are the nervous, the bacterial and the toxic theories.

Amongst the supporters of the nervous theory, of whom are Remak, Senator, Ord and Spender, there is a difference of opinion as to the lesion being one of central nervous origin, or reflex in nature and secondary to a lesion elsewhere.

They all argue, however, that the joint changes in rheumatoid arthritis are similar to those met with in the chronic spinal arthropathies such as tabes dorsalis, syringo-myelia, ataxic paraplegia, etc., and that in a certain number of cases neuritis has been present which is believed to have a distinct relation to the trophic changes. An inflammatory condition of the nerves supplying the affected joints, has also been found. They argue that the extensive muscular atrophy is one of the most important and earliest symptoms and that it is out of all proportion to the joint lesions, and that the associated skin phenomena are purely nervous in origin.

They note the symmetrical onset and progress of the disease, and Senator holds that a history of the disease being started by violent emotion and grief is evidence of its origin in a central nervous cause. Dr Ord is of opinion that the disease is reflex to some peripheral irritation which usually has its seat in some uterine or visceral derangement. He believes that the uterine condition causes impulses to be conveyed to the cord, which, being in a state of excessive irritability owing to anaemia, sends impulses by the peripheral nerves to the joints and influences their nutrition.

The most common seat of the visceral derangement is said to be the uterus or ovaries, but the disease occurs in a fair proportion of men (about one in eight) and also in women under 18 in whom one would not expect to find uterine or ovarian trouble. Again, it is contrary to experience to expect, as a result of reflex action, even though spread over a period of years, advanced joint changes. The evidence in favour of a nervous theory which has been deduced from the apparent similarity of the joint changes in some spinal arthropathics such as tabes, cannot carry much weight on closer examination. In these nervous diseases there is a slow painless effusion into the joints which does not



limit their movement, there are various objective nervous phenomena, and with each disease there is associated a definite gross lesion of the cord. So far there is no evidence of constant change in the case of rheumatoid arthritis. The neuritis which has been found in several cases is usually secondary to the arthritis, and has only been found in the muscle nerves and not in those supplying the articulations.

That muscular atrophy which is a pronounced and an early feature, cannot allow of the supposition that it might be explained by an extension of inflammation along the nerves. The atrophy does not spread, but is general over the muscle, and selection is shown in the extensors being chiefly affected. An atrophic condition of the cells of the anterior cornua has been found<sup>(12)</sup> in several cases and Dr Bannatyne<sup>(13)</sup> of Bath found degeneration and vacuolation of the pyramidal cells of the anterior horn in one case.

These changes were so inextensive, however, that the idea of their being the source of such a widespread disorder could not be held. And again, if this muscular atrophy were due to an affection of the cord a reaction of degeneration would be obtained, but this is never got.

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The bacterial theory.

Many hold the theory that this disease is due to a specific organism, and a large amount of work has been done and evidence collected in support of it. One of the most striking features as regards causation is the frequency with which rheumatoid arthritis follows acute infections, as example, scarlet fever, influenza, acute rheumatism, dysentery. Frequently this disease itself has an acute onset suggestive of an acute microbic infection. With one type also - that which occurs mostly in children - there is associated a widespread enlargement of glands and swelling of the spleen. Then again the fact that there are numerous nerve symptoms, for which no adequate nerve lesion has been found, constitutes, to Dr Bannatyne's mind, a strong argument in favour of the organismal theory. He attributes these symptoms to toxins of bacterial origin. He also holds that the course the disease runs of quiet intervals, alternating with periodic exacerbations, accompanied by joint swellings, is very suggestive of an infective process. And lastly, that the result of treatment, for eliminating bacterial products, as by guaiacol, points to its origin and adds to the evidence.

Prof. Baumuler<sup>(14)</sup> of Freiburg points out its

polyarticular character, to which he attached importance as showing that the morbid products must be carried by the circulation and therefore are probably infective. It has been suggested that if bacterial in origin, the disease may be due to the action of organisms in the joints themselves whilst the secondary symptoms may be attributed to the evolution of toxins acting on the system generally, but principally on the central and peripheral nervous system. Or again, it might arise from the action of the toxins of an organism which had its focus of infection not in the joints, but elsewhere in the body: for example, the genito urinary, intestinal or respiratory tracts. The evidence in favour of a specific organism with its site in the affected joints, as the cause of this disease, is varied and somewhat contradictory. As early as 1893 Schüller<sup>(15)</sup> describes a bacillus which he took from the joint fluid of a rheumatoid case, which showed bipolar staining and easy decolouration. In 1896 Dr Bannatyne<sup>(10)</sup> and Wohlmann isolated from the synovial fluid of an acute case, a bacillus with marked polar staining, which was difficult to stain and easily decolourised. It was cultivated by Dr Blaxall on beef broth and agar, but their inoculative experiments into animals have always been negative. It was obtained also from the blood of an

acute case and was found in many of the joint structures.

Chauffard<sup>(9)</sup> and Ramond later isolated a similar organism, but they failed to obtain cultivations.

In 1898 Von Dungern<sup>(16)</sup> and Schneider discovered a minute diplococcus in a case of rheumatoid arthritis which appeared to have followed rheumatic fever and this organism when injected into the knee joint of a rabbit gave rise to rheumatoid changes.

Dr Poynton<sup>(17)</sup> and Dr Paine isolated a diplococcus from the synovial membrane of the knee joint of a case of chronic rheumatoid arthritis. This was cultivated on blood, agar, and on an acid milk medium, and injected into rabbits, with the result in one case of a severe arthritis with no cardiac lesion, and in the other of a typical monarthritis with erosion of cartilage, alteration of bony articular surfaces and atrophy of muscle.

Gask got an organism in a case of acute rheumatoid arthritis, which he considered a streptococcus pyogenes.

Odery Symes<sup>(18)</sup> has been led to the conclusion after investigating the bacteriology of many cases "that in the majority of cases no organisms can be detected either in the blood or in the fluid of joints." He had positive results in only three

cases. In one an organism similar to diplococcus rheumaticus, and in the other two a staphylococcus albus. The latter being so often an accidental contamination of cultures, he does not attach much importance to it.

In 1903 the joints in 48 cases were aspirated and examined by Crawford and Malim with a negative result. In 1904, at the John Hopkins Hospital, Dr McCrae was equally unsuccessful in 110 cases.

The want of uniformity in the evidence for a bacterial origin of this disease is very striking, and it seems probable that the organism does not as a rule inhabit the joint fluids. But Poynton and Paine found their diplococcus in the synovial membrane of the affected joints, and it is possible that as in acute rheumatism the organism may rather lie in the surrounding tissues than in the joint fluid. Post mortem examinations upon cases of rheumatoid arthritis being rare, the few opportunities of getting sections of joints for bacterial and microscopic examination, may explain the want of success which has attended these investigations.

#### The toxaemic theory

suggests a union between the neural and infective, as individually neither of these can satisfactorily explain the clinical phenomena. It

assumes an initial microbic infection - the site being one of the great tracts, or some septic focus thence the toxins are absorbed, involving joints and nervous system.

The chief exponent of this theory is Llewellyn Jones<sup>(19)</sup>, who draws attention to the similarity of clinical phenomena in this disease and the so-called chronic toxæmias such as exophthalmic goitre, Raynaud's disease, tetany, migraine, etc. Rheumatoid arthritis is frequently found associated with one or other of these diseases, a history being sometimes got of Graves' disease for an indefinite period, followed by subsidence of the thyroid swelling, supervention of Raynaud's phenomena in the extremities and finally well marked rheumatoid. In other cases, rheumatoid may appear first, then Graves' disease; or again both diseases may appear together and become well marked within a few months of onset.

In all three diseases, the incidence is heaviest upon women, and as regards etiology, the proneness of women to gastro intestinal disturbances in connection with menstruation, pregnancy and the menopause, is to be reckoned.

The clinical features in common are vaso motor phenomena, motor and muscular spasms, and paresis, sensory pains and paraesthesia, increased tendon reflexes. Jones thinks that the fact of there

being prodromal symptoms in rheumatoid, forms an important argument in favour of the disease being of the nature of a cerebro-spinal toxaemia.

The vaso motor phenomena and muscular cramps at first come and go in both diseases, and as one or other is more prominent there is a condition clinically indistinguishable. In all there is a periarticular swelling of joints which in the early stages comes and goes, and which might be either Raynaud's disease with periarticular swelling, or rheumatoid arthritis with Raynaud-like paroxysms, or tetany with its joint lesion.

There is also similarity in condition of the skin, sensory changes, scleroderma, atrophy, and especially in pigmentation.

There is an early muscular paresis in rheumatoid, this being sometimes present in exophthalmic.

Increased reflexes, transient obscuration of vision with on examination a contracted field, occasional transient alternating ptosis and paresis of other external eye muscles, are symptoms in common.

To sum up, Jones is of opinion that the first stage with its fluctuating temperature, rapid wasting, and vaso motor phenomena, etc. is the true rheumatoid, and that the features of the later stage

are simply secondary to changes induced in the cerebro spinal axis by the previous vascular disturbances with segmental failure in nutrition of the nerve centres.

Another view as to the source of the toxin is that it may be produced in the intestinal canal, especially in the duodenum, as the result of fermentative changes. Absorption may take place, and exert a poisonous influence on the cord and through it on the joints and other tissues. In support of this theory is the effect of the administration of certain antiseptics, such as guaiacol carbonate on certain cases, especially those which are accompanied by a fermentative dyspepsia. Improvement also sometimes follows washing out of the colon, and it is possible that these measures act by keeping down an excessive growth of bacteria in stomach and intestines.



PATHOLOGICAL FEATURES.

Most observers are of opinion that there are at least two different types of rheumatoid arthritis, and very probably there are several others, but for the purposes of anatomical description two are sufficient for the present.

The one type is of an acutely inflammatory and destructive nature, whilst the other, the chronic form, is a degeneration.

In acute rheumatoid arthritis the affected joints externally are swollen and pulpy, and on opening into the joint, it is found that the capsule and ligaments are thickened and matted together, thus limiting movement. There may be slight excess of synovial fluid which may be cloudy with flakes of lymph, but very often there is little or no fluid in the joint.

The most marked change is in the synovial membrane, which is thickened, vascular, friable. The synovial fringes are especially thickened, red and friable.

The cartilages are redder than usual, and small ulcerated patches may be scattered over the surface and edges. This pitting and erosion is often opposite the thickened synovial fringe, and it may

extend through the cartilage and involve the subjacent bone, which may be reddened, and break down easily on scraping. Microscopic examination shows the synovial membrane to be thickened by a new formation of fibrous tissue, the cartilage to be thinned out, and eroded, the bone underneath showing foci of inflammation with small celled exudation here and there. The cancellous tissue may be more open than usual, and there may be a comparative absence of fat cells. This rarefaction of the ends of the long bones is sometimes brought out very clearly in an X-ray photograph, and if this change were constant it might prove a valuable aid in differential diagnosis.

It is to be noted in this form of the disease that the chief incidence falls upon the synovial membrane, and that there never is any tendency to proliferation of bone or cartilage, but that there is a marked tendency to a final stage of fibrous ankylosis.

In the more chronic form of rheumatoid arthritis the changes are more numerous and varied, and though possibly also inflammatory, are chiefly degenerative in nature. These changes involve every structure of the joint, bone, cartilage, synovial membrane, capsule, ligaments, tendon and muscles, until in the

advanced stages, every semblance of the original joint is destroyed. The deformity is caused partly by effusion into the joint, but more often by outgrowths of bone and cartilage, or dislocation of the articulating surfaces. The synovial membrane is thickened and its villi hypertrophied, and in places undergoing fatty and cartilaginous degeneration. These degenerated synovial fringes may become pedunculated and break off, becoming free in the joint fluid. Other loose bodies are derived from fibrinous exudation from the synovial surface, and still others are detached cartilaginous or bony outgrowths from the articular surfaces.

#### Cartilage.

Many authorities are of opinion that in this form of rheumatoid disease the first change begins in the cartilage which, to the naked eye, shows a loss of lustre and takes on a velvety appearance. Later, erosions appear and deepen, exposing the end of the bone. Gradually the whole cartilage gets absorbed, except at the edges where there may be a new formation with an irregular heaping up of cartilage which may become converted into bony tissue. Microscopically, this degeneration is seen to consist of a proliferation of cartilage cells with a breaking down of the matrix into filaments.

Bone.

As the cartilage erodes and becomes absorbed, the underlying bone is exposed, and takes on a hard white, polished, ivory like surface. Where there is contact with other bone, ridges and grooves are formed, and at the edges of the articulation a process of new formation of bone gives rise to lip-ping and osteophytic outgrowth, which mechanically does so much to alter the original shape of the joint and limit movement. True bony ankylosis of a joint is rare, except between spinal vertebrae. There have been various theories as to the cause of this eburnation of bone. Some have held that the process is purely mechanical, but this is disproved by the fact that it may go on underneath the cartilage. Bannatyne thinks it is one of nature's safeguards to prevent further inroads of the disease. Volkmann<sup>(20)</sup> has pointed out that the changes are caused by a rarefying osteitis followed by an osteo-sclerosis, and this is borne out microscopically. In the case of the monarticular form of the disease occurring in old people, morbus coxae senilis, the process is chiefly that of a rarefying osteitis with absorption of bone, and, microscopically, it is found that the medullary cavities are filled with a yellow, fatty substance, which differs entirely from

the red vascular marrow of acute rheumatoid disease.

The marked disintegration of joints with the increased density of bone, which are always present in chronic rheumatoid arthritis, are well brought out in a skiagram and contrast strongly with the translucent appearance which has been already mentioned as being present in the bones of the acute form.

Other changes in the joint structures are a thickening, swelling and shortening of the ligaments. Later these may undergo fatty degeneration and eventually become entirely absorbed. The capsule is thickened and fibrous adhesions may form inside and outside the joint. The tendons are stretched and thinned out, and adjoining bursae may have thickened walls with increase of fluid.

#### Muscles.

The principal change is a well marked atrophy of the muscle substance which affects the muscle as a whole. There is no diminution in the number of fibres, but each fibre is decreased in size. As a rule no degeneration of muscle has been found.

CLINICAL FEATURES.

Before entering on a description of the clinical features, it is necessary to define such varieties of the disease as are at present recognised. It may be in the future that these varieties may be again subdivided, as we come to a more accurate knowledge of the causation and pathology of the disease, and Garrod<sup>(25)</sup> is of opinion that "it may be, what are usually spoken of as varieties of rheumatoid arthritis, may ultimately turn out to be distinct diseases, due to the action of widely different pathological processes".

Types of Rheumatoid Arthritis.

As far as our experience of the disease extends at present, there are four types which are fairly easily distinguishable:

1. Acute Rheumatoid Arthritis. A polyarticular form, which is an acute systemic disease, occurring chiefly in young adults and involving synovial membranes, fibrous and ligamentous tissues of the joints, with a tendency to relapses and exacerbations. It seems to be in this form that organisms have most often been isolated.

2. Chronic Rheumatoid Arthritis. A form in which there is a slowly progressive destruction of

joint tissues with hardening, sclerosis and proliferation of every tissue in the joint. In this type, there are also marked constitutional disturbances.

3. The Monarticular form, which is an entirely different type from the two previous ones. The term osteo-arthritis would be more properly applied here, as I believe the disease to involve not only joints and bone in connection with joints, but also to invade the shafts of the long bones. It is a slowly progressive degeneration, occurring usually in old people, and often confined to one joint, but sometimes bilateral and sometimes involving both hips and knees on both sides, and more rarely the shoulder and elbow joints.

4. Stills Disease. This is yet another well defined form of rheumatoid disease which occurs in children and has been described by Still<sup>(26)</sup> in this country, and in America by Royal Whitman. It is an acute systemic disease accompanied by enlargement of glands, leaving behind it great deformities and generally terminating fatally.

The clinical cases recorded are examples of the three first types described.

#### Predisposing Causes.

It is generally allowed that predisposing factors towards rheumatoid disease are various, but

these are summed up by Odery Symes<sup>(27)</sup> in "the inheritance of an arthritic diathesis, a condition of malnutrition and debility, and the presence of a toxic focus".

#### Sex incidence.

Rheumatoid arthritis is undoubtedly commonest in women, Bannatyne's cases comprising 410 men to 2,520 women. Haygarth, Garrod, Senator, and other authorities, have made a similar observation, and the frequency amongst women is most probably due to their liability to genito urinary trouble which provides the required toxic focus.

My experience in Poorhouse practice is, that excluding the cases which show only Heberden's nodes, and which are found chiefly amongst women, rheumatoid arthritis, in its chronic form, is found equally common amongst men. In the six clinical records presented, three of these are of male cases. It is not easy to explain this, except that the conditions of life which bring women to a Poorhouse are the same for men.

#### Age.

The question of the age at which the disease commences, is a much disputed point, but it is generally conceded that the acute form is a disease of



young adults, i.e. 15-30, whilst the chronic form originates most often between 35 and 50; but it may arise even later, as is shown in Case C. The mono-articular form is most common after 50, and often is dated to some injury to the joint. Case F. is an example of this type.

Two periods at which there seems to be a special liability to the disease are puberty, and the climateric, and it seems probable that the changes which go on then in the metabolism of the tissues, act as depressant agents.

From the special predisposition to rheumatoid arthritis at the climateric, it has been suggested that this may be due to failure on the part of the ovary at that time to exercise its normal influence on general nutrition, but this is not borne out by experience. Dr Julie Cock, who writes an article on this disease in the Encyclopaedia Medica, stated recently that after twenty years experience she has not been able to establish any causal connection between disease of the ovary and rheumatoid arthritis other than the former, being an important cause of low health, acts as a predisposing agent. She has not seen a single case in which the disease started, or was markedly increased, after surgical removal of the ovaries.

Seasonal incidence.

Rheumatoid arthritis is most common during winter and early spring, thus contrasting with acute rheumatism. It is most prevalent in damp, low-lying country districts. Ireland and Holland both show a high incidence, which is accounted for by the prevalence of damp in both countries.

Previous illness.

One of the most striking features is the frequency of a history of the disease following upon some previous infective trouble, such as tonsillitis, influenza, scarlet fever, acute rheumatism, gonorrhoea, or some acute or chronic suppurative lesion such as otitis, ulceration, or abscess.

Other probable sources of infection are, septic conditions of the mouth, teeth, and gums, a catarrhal condition of the alimentary tract, and the relation, which is perhaps commonest of all, derangements of the genito urinary system.

There is no doubt that powerful predisposing factors to this disease are found in any depressing influences, as loss of sleep, mental worry, and anxiety, hard manual labour with insufficient diet, and prolonged lactation.

Symptomatology.

Of the clinical features as generally recognised, too much attention has been directed to the very obvious joint lesions, and too little to the symptoms and physical signs of disease as seen in most of the systems, and very particularly in the nervous system.

With further investigation, it may be proved that the extensive joint changes are merely a symptom of a constitutional disease, and not the disease itself, the focus being found elsewhere. An analogy is found in the case of gonorrhoeal rheumatism, which for long was accepted as rheumatism merely complicating an attack of gonorrhoea. The discovery of the gonococcus in the joint fluids, and the effects of treatment directed towards the focus of infection, have proved conclusively the symptomatic nature of the joint lesions.

Early symptoms.

It is very important from the point of view of successful treatment that the early symptoms of the disease should be recognised, but it is the early stages with their varied modes of onset that present the difficulties. In a few cases of the acute form, the onset is like an attack of rheumatic fever, and it is only at a later stage when the disease has

been found to be quite intractable to the usual remedies, that the possibility of its being acute rheumatoid arthritis may be entertained. An X-ray photograph in such a case may help towards a correct diagnosis.

The onset of the more chronic forms of the disease is more commonly a gradual one, pains being felt in one or more joints, burning in character, always worse at night, and accompanied by cramps in the muscles. In the morning, there may be stiffness of joints with creaking on movement, and neuralgic pains in the hands, forearms, or in the back of the thigh. Especially suggestive is a neuralgic pain in the ball of the thumb and on the ulnar side of wrist. Weakness of muscles and easy fatigue are often complained of, and sensory disturbances such as tingling, numbness, prickling, burning, or flushings, and chills are common.

#### Joints affected.

The joints which are first attacked are those upon which most strain is put, e.g. metacarpo-phalangeal joints of the right hand, wrists, knees, ankles. Typically the disease starts with pain and swelling in the smaller joints, and spreads to the larger, obeying what Charcot terms the centripetal

law. The last joints to be involved are the hips. The lesions are usually symmetrical and the invasion of the temporo maxillary joints and those of the cervical spine are diagnostic. There is a tendency for the joint lesions to progress in spite of treatment, and it is in this disease that the most extreme forms of joint deformities are found. These are chiefly owing to spasm of atrophied muscle, together with osteophytic outgrowths causing a mechanical ankylosis, as well as to thickening of capsules and surrounding fibrous tissues with some excess of joint fluid.

#### Affections of the nervous system.

After the joint lesions of this disease, the most striking feature is the heavy incidence which falls upon the nervous system. The very earliest symptoms are usually an affection of sensation, tingling, numbness, burning, prickling, neuralgia neuritis. The deep reflexes are exaggerated, especially on the side where most pain is felt, though they may be abolished where there is extreme wasting of muscle, or where there is neuritis.

#### Vaso motor.

The vaso motor changes are very marked - flushings, coldness of hands and feet, sweating of palms

and soles, and in some cases of trunk, cyanosis of extremities and pigmentation, varying from small freckling to dark brown smeary patches over and around affected joints, over forearms and sometimes over forehead, side of face or under the eyes. As the case improves these patches may clear up.

Areas of atrophy of skin have been observed, and "glossy skin" where it is smooth, hairless and pink in colour is common. Scleroderma has also been noted. The nails usually show changes - they may become brittle and are longitudinally striated.

Llewellyn Jones<sup>(28)</sup> has noted that contraction of the visual field is present in cases which show other signs of local syncope and asphyxia, and which is therefore probably also vaso motor in origin.

#### Condition of Muscles.

Weakness and loss of power in the muscles are early and prominent symptoms, with atrophy. Selection is shown in the extensors and interossei being usually picked out first. There is no reaction of degeneration as a rule obtained.

#### Gastric.

The digestive system always shows some change, and too much attention cannot be directed towards

such symptoms as dyspeptic phenomena and constipation. Dilatation of the stomach is found in some cases, and gastric crises may be periodic and troublesome.

#### Urinary.

The urine shows diminution of urea, uric acid and phosphates. Schuller found the calcium salts and phosphates diminished, and he also found an increased amount of calcium salts in the cartilage of the affected joints. He is of opinion that the bone changes are connected with disturbances in the secretion of bone salts. Bocker also found a diminution of phosphate of calcium and there was four times as much found in the blood.

There may be a trace of albumen present in the urine, and in cases with dyspepsia, indican, skatol and excess of organic acids, may be present.

#### General symptoms:

which indicate systematic disturbance and which are fairly constant, are fever, tachycardia, anaemia, digestive disturbances. Rises of temperature in the evening at irregular intervals are found, and are a marked feature in Case D.

Rapidity of pulse is present in most cases and cannot be explained, except on the ground of toxic absorption.

Anaemia is marked in many cases, and a degree is present in all. It is of a secondary character.

Haemorrhages are rare, but are not unknown (Case D.).

In contrast to acute rheumatism in this disease, there is as a rule, no tendency to invasion of serous surfaces.

Pericardial adhesions have been found post mortem, where there was no sign of pericarditis during life, and endocarditis has also occurred in some cases, but might these not be explained by a primary attack of acute rheumatism previous to the onset of rheumatoid disease?

Garrod<sup>(29)</sup> is of opinion "that where active cardiac lesions develop in association with rheumatoid arthritis, these tend to throw doubt upon the diagnosis of rheumatoid disease".



CASE A.

M. T., a married woman of 57, was admitted to Craigleith Poorhouse with a history of pain in and deformity of joints of 26 years duration. Both parents died of "rheumatism". She married at 27 and had one child. She had leucorrhoea for several years after its birth, and she nursed the child for 18 months. During this period her right knee took an aching pain and afterwards swelled. After weaning the child, aching pains spread to the right ankle and top of foot, which also became swollen. The left knee and ankle followed. She was able to move about with sticks, and had no medical treatment. For 20 years these were the only joints affected; then the jaw became stiff and she had difficulty in opening her mouth to feed herself for about 8 months. About 3 years ago, pain began in the cervical spine, so that the head was fixed and she was unable to move alone. At the same time, both the hands swelled up, wrists, elbows and shoulders followed. She had medical treatment which removed the pain, but the hands have gradually lost power and become deformed. She has been practically bed-ridden for the last 3 years, and of late burning pain, worse at night, in the soles of the feet, has been very troublesome.

At the beginning of her illness, she had a great deal of mental worry and grief, her husband having deserted her.

#### Objective Physical Examination.

The patient was a very pale thin woman, bed-ridden, but able to feed and wash herself, though for a time she was unable even to do this, owing to swelling and stiffness of elbows and wrists. She was exceptionally intelligent for her class, and gave a clear account of the different stages of her illness. Height and weight could not be got owing to her deformities.

Temperature normal on admission (charts at later stage).

#### Locomotory System.

Examination showed that she was unable to stand or walk, owing to loss of power in the legs and stiffness and flexion of the knee joints. The right knee was acutely flexed and drawn up - the left simply flexed, whilst both showed ankylosis with lipping of articular surfaces. The surfaces of the patellae were roughened with bony outgrowths, and faced outwards. Measurement of the knees showed the right to be three quarters of an inch larger than the left. There was no increase of fluid in either knee.



Atrophy of both leg and thigh muscles was marked, especially of the extensor groups.

The ankle joints were swollen and boggy, the capsules being thickened and some increase of fluid being present in both joints.

Great pain was complained of in the soles of the feet, sometimes preventing sleep.

Metacarpophalangeal joint of the great toe on both sides was dislocated outwards, with marked bunions over joint. This occurred before the onset of illness. Sweating was profuse and always present on soles of feet.

The right hip showed limitation of extension movement, but rotation and flexion free on the left; flexion and extension were both diminished in extent, and gave pain. No bony outgrowths could be felt.

#### Spine.

There was no pain on percussion, though previous history showed that pain had been marked in upper dorsal and lower cervical vertebrae. On examination, a degree of stiffness was present, but there was difficulty in making out any actual bony ankylosis.

#### Upper Limbs. (see photograph).

The right was flexed at the elbow at an obtuse angle - the hand being in a position midway between

pronation and supination, and could not be extended. The hand was in ulnar flexion.

There was extensive atrophy of arm muscles, all the groups being equally affected. The biceps tendon stood out as if in spasm.

The capsules of both elbow and wrist joints were thickened and boggy, and a small increase of fluid was present in the elbow joint.

#### Measurements.

	Right	Left
Elbow joint	8 $\frac{3}{4}$ "	8 $\frac{1}{4}$ "
Wrist joint	5 $\frac{7}{8}$ "	6"
1" above wrist joint	4 $\frac{3}{4}$ "	4 $\frac{1}{2}$ "
Metacarpo phalangeal	7"	6 $\frac{3}{4}$ "

#### Hand.

Showed enlargement more or less of all the joints, but most marked at the metacarpo-phalangeal joints of the thumb and first three fingers. There was hyper extension of some joints, with looseness of the joint and grating, and flexion of the terminal phalanges.

There was great atrophy of the interossei and of the small muscles of thumb and little finger.

There was present moisture of palms, freckling over the dorsum of the enlarged joints, and cyanosis of the ends of the fingers.

#### Left.

The hand showed even a greater degree of deformity than the right. Heberden's nodes and ankylosis were present in the terminal phalangeal joints. Otherwise the incidence of disease was the same as on the right, and also of the wrist and elbow.

The shoulders showed less affection than any of the joints, but there was some creaking made out in the right.

#### Circulatory System.

There were no subjective symptoms. The cardiac area was not markedly enlarged, though the second sound was accentuated in all the areas.

Pulse was 96, small and regular.

#### Alimentary System.

There was a history of dyspeptic attacks, specially marked during the last ten years, with pain after food, flatulence, and acidity. On examination, teeth were absent except for one stump and one loose tooth. The teeth had loosened and fallen out

at the beginning of illness. Tongue clean, no epigastric tenderness, and none over the edge of liver, which was found to be slightly enlarged.

Bowels were regular.

#### Nervous System.

Neuralgic pain had been very marked at every stage of her illness, the pains shooting and darting in and around the joints before they began to swell. These pains were especially severe in the face and head when the tempero-maxillary joint was affected, and in the back of head and spine when the vertebrae became affected. Knee jerks could not be obtained because of ankylosis, but contraction felt in the hamstrings.

Vaso motor phenomena as described under extremities.

#### Haemopoietic System

showed

Hb.	70%
R.B.C.	4,000,000
W.B.C.	8,750.

Differential count of leucocytes showed the usual proportion of the various kinds. The red cells were of usual size regularly rounded in shape, and no abnormal forms present.





Urinary System.

Quantity normal.

A trace of albumen was always present and some hyaline casts were occasionally found.

Further Progress.

For a fortnight she improved in the Ward. Diarrhoea began, which continued intermittently until death a month later. The diarrhoea was always worse at night and was accompanied by some pain around the umbilicus. She was carefully dieted and astringents given with no permanent benefit. She began to vomit a little, and some blood and mucus were passed in stool. Frequent and repeated abdominal examination was negative. A week before death she was greatly troubled with constant salivation, water poured incessantly out of her mouth so that her clothing and pillows were saturated. At the same time there was slight ulceration of tongue and gums; the tongue was clean and very red, the breath sweet. There was a feeling of acidity from stomach.

The urine became scanty. Diarrhoea stopped. Salivation continued in excess for four days and then ceased, but slight stomatitis was still continued. Two days later the temperature rose and the

patient complained of pain in all her joints, but there was no redness or swelling. She sweated profusely. The leucocyte count was 14,000. She gradually became unconscious, the temperature continued to rise and the pulse got smaller and more rapid. On the morning of the 27th a quantity of foetid pus was discharged from the vagina. On vaginal examination no seat of abscess could be made out, and as the examination gave much pain, it could not be continued. The patient died at 11.30 p.m.

Points of Note.

In this case, the sex of the patient and her age, 27, are typical, and the three most prominent features in connection with the causation of the disease, in Odery Symes<sup>(21)</sup> opinion, are here illustrated, for (1.) "she inherited the rheumatic diathesis" from both parents, (2.) there was present at the onset of illness "a condition of malnutrition and debility" due to mental grief and worry and prolonged lactation, and

(3.) "The toxic focus" undoubtedly was found in some catarrhal condition of the genito urinary tract with persistent leucorrhoea - the patient herself being quite clear about the swelling of the first joint appearing during the eighteen months in which she nursed her child.

The case is typical in its prolonged course - being spread over a period of thirty years, and in its steady progress towards complete crippling. In no other disease is there seen such widespread deformity of joints.

The case is a-typical in the invasion first of one of the larger joints, but typical in its symmetrical and bilateral spread from joint to joint. It is interesting to note that for about twenty years, the larger joints were only affected, and

that at the age of forty-seven, about the period of the menopause, there was a fresh outbreak, the temporo maxillary joint being invaded, and followed later by pain in the cervical spine and pain and swelling in the small joints of the hands.

A lighting up of the disease at the menopause is significant, as at that time marked changes are going on in the metabolism of the tissues, changes, which in themselves, are of a degenerative nature, when the whole system is in a depressed condition and ready to develop unhealthy tendencies.

At this stage, the disease had taken on a more active course, and progressed towards her permanently crippled condition.

It was noteworthy that her "dyspeptic" attacks were more frequent since the menopause, and an additional "focus of infection" may have been found in the catarrhal state of the alimentary tract. Histological examination of the pancreas at a later stage showed a very interesting condition and threw light on her further history after admission to the hospital ward, her symptoms then being persistent diarrhoea, attacks of vomiting, stomatitis with salivation, and lastly, a rise of temperature with discharge of foetid pus per vaginam - the seat of which could not be found - and death.

SECTIO CASE A.

M. T., aet. 57, housewife.

Died 27th March, 1906.

Sectio - 6 days later.

(It is regretted that permission could not be obtained for this sectio till six days after death, but the weather being cool at the time (beginning of April), there was no decomposition and no disagreeable odour.)

External.

State of nutrition poor.

Rigor mortis present.

Lividity present in dependent parts.

Pupils equal - of medium size.

Arms are flexed at the elbows, and in lower extremities flexion at knees and hips. Rheumatoid lesions of hands as described clinically.

The general appearance of the body is of extreme wasting. This is found to be due to atrophy of muscle for subcutaneous fat is found normally and even in excess. Hair is present in axillae and pubes, and eyebrows well marked. Hair is present on face over side of chin and a small amount over upper lip.

Scalp is also well covered.

On legs, the usual downy appearance is absent; single hairs are present at intervals and are longer than usual.

#### Thyroid

weight = .49 of an oz; shows no apparent abnormality.

#### Heart

weight = 8 oz.

No increase of pericardial fluid. No adhesions. There is increased fat on the surface of the heart, especially over the right ventricle and on section there is infiltration.

There is slight thickening of the aortic cusps, and more marked thickening of the mitral cusps - the opening admits two fingers.

Aorta is not dilated - shows slight atheroma near the valve.

#### Lungs

Right weighs 9 oz.

Left " 21 oz.

There are adhesions between the under surface of the lower lobe on the right side and the thoracic surface of the diaphragm. There is hypostatic congestion of whole of lower lobe.

The left shows no pleural adhesions, but hypostatic congestion of the lower lobe and of the posterior half of upper lobe. The apex and anterior margin with tongue shaped process show emphysema.

On opening the abdomen there was found some dilatation of the caecum, ascending and transverse colon, and collapse and atrophy of descending colon and small bowel. No adhesions.

#### Liver.

Right lobe 1" above costal margin in mammary line, whilst the left lobe comes down to umbilicus in a thin process. Adhesions over the left side of the left lobe.

Weight = 1 lb. 13 oz.

Smooth upper surface on the right side, but over the left, some adhesions are present to under surface of diaphragm; section shows fatty change.

Gall bladder empty.

#### Stomach.

Lower limit 2-3" above umbilicus. Vessels at curvatures are congested. On removal, the organ is found to contain about a pint of blackish fluid. Congestion is marked at the cardiac end. Pylorus is contracted, admits with difficulty the end of a little finger. The stomach walls are thickened;

mucous membrane apparently healthy.

Intestine shows no marked abnormality.

Spleen

weighs  $3\frac{3}{4}$  oz.; is congested and friable.

Pancreas

weighs  $1\frac{3}{4}$  oz.; is firm and on section, fibrous.

Kidneys.

Right weighs 9 oz.

Left " 5 oz.

Both capsules strip easily. Right shows a small cyst on upper surface and on section both show some congestion, especially in the right.

Bladder

shows a considerable degree of hypertrophy of its walls. Mucous membrane healthy.

Uterus

shows no abnormality. Ovaries atrophied.





Spleen.

MICROSCOPIC APPEARANCES.Heart.

Marked pigmentation of fibres is present, and there is some fragmentation which may, however, be discounted to a great extent by the date after death of post mortem examination.

There is distinct thickening of vessels which is hyaline in character.

Lung.

The vesicles show emphysema, and at parts collapse and oedema. There is thickening of some of the septa; very little change is present in the bronchioles, which contain cells, leucocytes, etc., and are crowded with bacilli, probably of post-mortem invasion. Some congestion is present, and there is thickening of vessels, the tunica intima showing the greater degree of change.

Liver.

Fatty infiltration present in the portal zone, and also a little pigmentation.

There is no other important change.

Spleen

shows fibrous thickening of the capsule and trabeculae.

There is marked thickening of all the coats of the larger arteries, affecting chiefly the tunica intima and media.

The central artery the malpighian corpuscle is also thickened and shows hyaline change.

#### Kidney.

There is no thickening of capsule.

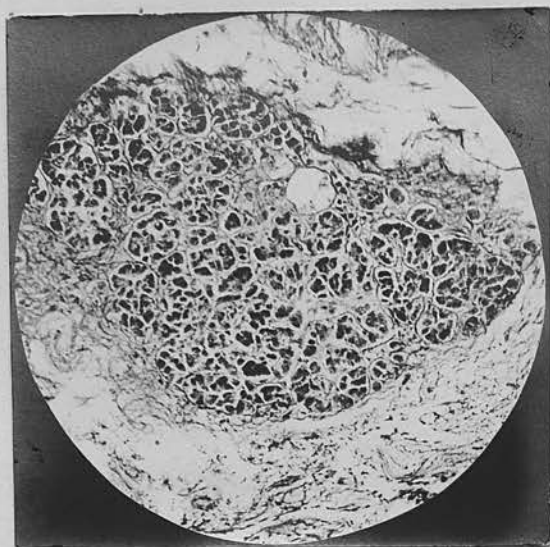
Tubules - the cells are swollen and cloudy and some hyaline casts are present. Around some of the glomeruli, there is fibrous thickening of Bowman's capsule, and some tufts are entirely fibrous and show hyaline change. There is intertubular engorgement of capillaries.

Thickening of the walls of some of the larger arteries is present, the coats affected being tunica intima and media.

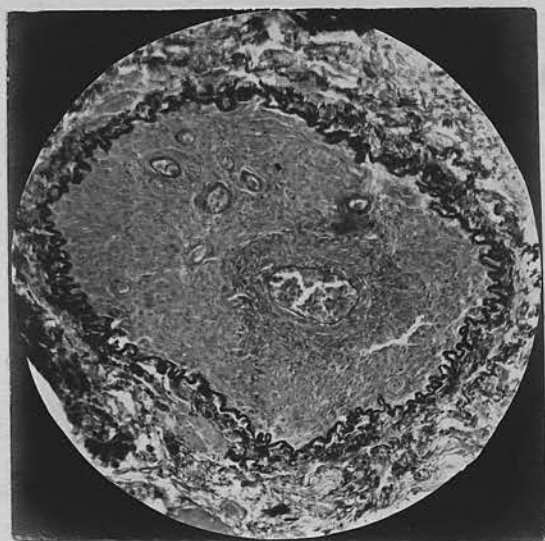
#### Pancreas.

Epithelial changes - There is very little of normal epithelial tissue left, the glandular cells showing disintegration, the protoplasm granular, and the nuclei either almost obscured or altogether lost.

The islands of Langerhans show loss of epithelial cells, these being replaced in parts by fibrous tissue; in others, granular cells are present, with an obscured nucleus.



*Pancreas*



*Thrombus.*

Ducts. Seem to be fewer in number than normal; the walls are hypertrophied and fibrous, and the lining epithelium is in a catarrhal condition.

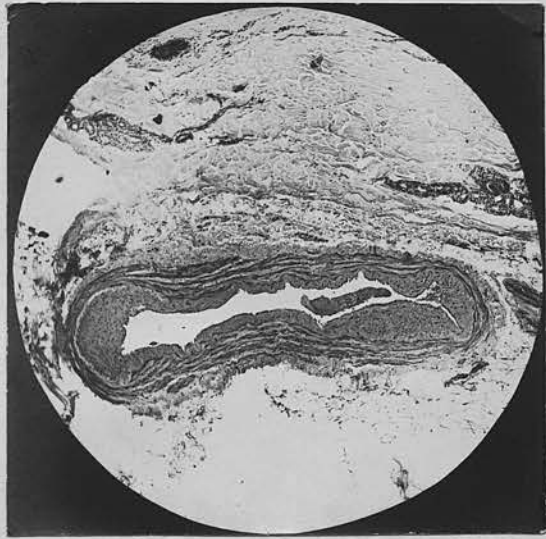
Interstitial changes. There is a great increase interstitially of fibrous tissue, which passes in between the lobes, lobules and surrounds groups of cells. The interlobular spaces are widened from oedema, whilst the lobules appear to be atrophied. In the meshes of these interlobular septa, there is new formation of many small vessels, approximating in appearance to granulation tissue.

Vascular changes. In the larger arteries there is some increase in thickness of the walls, this being due chiefly to the thickening of the tunica intima. Some of the larger arteries show the lumen to be blocked by an organised thrombus, through which channels are formed (to show this, section stained with Weigert's Resorcin Fuchsin).

Throughout the septa, a number of large dilated vessels are seen, the greater number of which appear to be veins. On the surface of the organ, a considerable haemorrhage has taken place into the substance. This is evidently of fairly recent date.

#### Thyroid.

The colloid matter is greater in amount than normal, and the cells lining the spaces are very much flattened.



Skin.

The rete malpighi is extremely thin, being represented in places by a single layer of cells covered by a thin stratum corneum. The corium is flattened and downgrowths of epithelium are few and irregular.

Near the surface are pockets whose lining is continuous with the S. corneum and filled with structureless, stratified tissue, which surrounds a rounded body somewhat refractile, and which resembles the section of a hair. There is an almost total absence of normal hair follicles.

Subepithelial tissue is composed of a layer of very dense white fibrous tissue, in which, in the deeper layers, hyaline degeneration has taken place. Throughout this fibrous tissue, atrophying glands and nerve fibres can be distinguished.

Underneath this thick layer of abnormal connective tissue, there is a thick layer of fat, the cells of which appear to be normal.

The medium sized arteries show a very extreme degree of change, the nature of which is chiefly an endarteritis. The tunica intima is greatly thickened. There is a large amount of fibrous formation in the media, splitting up and separating muscle

fibres and causing thickening of the coat. In the adventitia there is also thickening, chiefly fibrous; but to a less extent than in the other coats. The arterioles are also thickened, the tunica adventitia being most affected.



CASE B.

Isabella Kerr, aet. 24, was admitted to Craighleith Poorhouse on the 28th March, 1905, suffering from "weakness and swollen joints".

She was mentally somewhat deficient, and also a little deaf, so that it was difficult to get any definite history of her illness from her. She stated that the swelling of her hands was of recent origin. Her condition on admission showed extreme neglect; she looked very anaemic; deep pigmentation was present round the eyes; tongue heavily furred; breath of a peculiarly foetid odour, gums being pale and fungating; teeth blackened and half stumps; bowels were constipated.

The small joints of both hands showed fusiform enlargement, with grating on movement of joints, atrophy of muscles, and sweating of palms. There was a systolic murmur present over the base of the heart.

Further history in the ward

showed the bowels to be acting regularly, the tongue cleaned, but the breath remained foul. Some decayed stumps of teeth in front were extracted, but the molars could not be reached, owing to pain and stiffness in the temporo maxillary joints.

She was allowed to get up in six weeks as she had improved, was taking her food well, and had put on weight. For 2-3 months she kept very well, and was able to move about and assist in the work of the ward.

Then she had an exacerbation with acute pain in first one knee and then the other, which swelled up - the capsules containing a considerable amount of fluid. The knee condition was followed by acute pain and swelling of elbows, wrists, and later on of ankles, so that she was completely helpless till the close of her illness about nine months later.

Condition on examination - 20th February, 1906.

She looked even more anaemic, the eyes being dark, with pigmentation round the lids. Freckling was marked round both sides of the lower jaw. Deafness was more marked than on admission, and she spoke in a monotonous tone of voice.

The thyroid gland was definite in outline, showing slight enlargement. No enlargement of glands. Her temperature showed a slight evening rise (Chart).

Weight - 5 st. 8 lbs.

Height - 4 ft. 7 ins.



CASE B.Skiagram of hands shows:

1. In position of ulnar deviation most marked in the right hand.
2. Displacement takes place at the metacarpo-phalangeal joints, and also to a less extent at wrists.
3. Broadening of the bases of long bones with denser bone tissue and a heaping up of cartilage at the edges of joints.
4. Matting together of carpus, most marked in the left, and a loss of joint outline, or bony ankylosis.
5. Dislocations are very marked in both hands, especially at the metacarpo-phalangeal joints and at the terminal phalangeal joints.
6. Ankylosis is present in the terminal phalangeal joints, and
7. These also show osteophytic outgrowths.



Locomotory System. (Photographs and Skiagram)

Every joint in the body without exception was affected more or less with disease, so that the patient was unable to turn in bed without help, could not feed herself, and could not stand unaided. The heaviest incidence had fallen on the wrists and hands, ankles and feet, but the larger joints, elbows and shoulders, knees and hips, were also invaded, and gave the signs of disorganisation. Pain was present in the right wrist, cervical vertebrae, and in both ankles. The right wrist was fixed in the flexed position with marked contraction of the flexor tendons, so that attempts at extending the hand were unsuccessful.

Some thickening of capsule and ligaments, with grating of surfaces, was felt. In the hand there was wasting of all the small muscles of dorsum, enlargement of the first and second metacarpo-phalangeal joints, fusiform enlargement of first interphalangeal of middle finger, Heberden's nodes on terminal phalanx, with flexion of the terminal joint. The little finger was flexed at first interphalangeal joint.

There was grating of all the affected joints. Sweating was constantly present of palms, some freckling and thinning out of skin over the fingers

with glazing over affected joints. Longitudinal ridging of nails was present. The left hand was in the ulnar, flexed position and the smaller joints were invaded as in the right hand.

The tempero maxillary joints showed thickening and stiffness, so that the mouth could only be half opened. Grating was felt on the left side.

#### Spinal column.

Pain was felt on percussion over the lower cervical vertebrae, and some freckling was present in the neighbourhood of affected joints. No fibrous nodules were found.

#### Lower Limbs.

When examined she was only able to take a few steps with assistance on each side. There was a great deal of pain in the feet, which touched the ground on heels and outer edges.

#### Measurements.

	Right	Left
Knee	12"	12 $\frac{1}{2}$ "
Calf	9 $\frac{3}{4}$ "	9 $\frac{3}{4}$ "
Ankle	8 $\frac{1}{2}$ "	8 $\frac{3}{4}$ "

Hip Joints

showed no limitation of movement, but pain was present on pressure over the trochanters.

Knees.

Globular in form; flexion difficult; swelling doughy; patellae almost fixed; bony nodules over inner tuberosities; no grating.

Atrophy of muscles - especially of extensors of thigh and leg.

Ankles.

Movement in abeyance; enlargement of the ends of long bones and swelling of surrounding tissues which pit on pressure; flattening of foot; bony nodules over metatarso-phalangeal joints, and first phalangeal joints in position of hyperextension; grating on movement marked.

Respiratory System.

No cough since admission, and physical examination of chest negative.

Circulatory System.

No subjective symptoms. Cardiac area not enlarged. Sounds closed and regular.

Pulse 88. Vessel wall not thickened.



Haemopoietic System.

No enlargement of glands.

Hb. 60%

R.B.C. 3,912,500

W.B.C. 8,750.

Film. The red cells show slight variation in size, but shape is normal. No abnormal cells found.

Differential count of leucocytes showed no departure from the normal.

Alimentary System.

There were no subjective symptoms since admission (about eleven months). The mouth had continued in a more or less foetid condition - the breath having a curiously heavy foul smell; the gums continued soft and pale, but the tongue had cleaned. The teeth were carious on each side, and could not be removed owing to ankylosis of temporo maxillary joints.

The appetite was good. Bowels constipated.

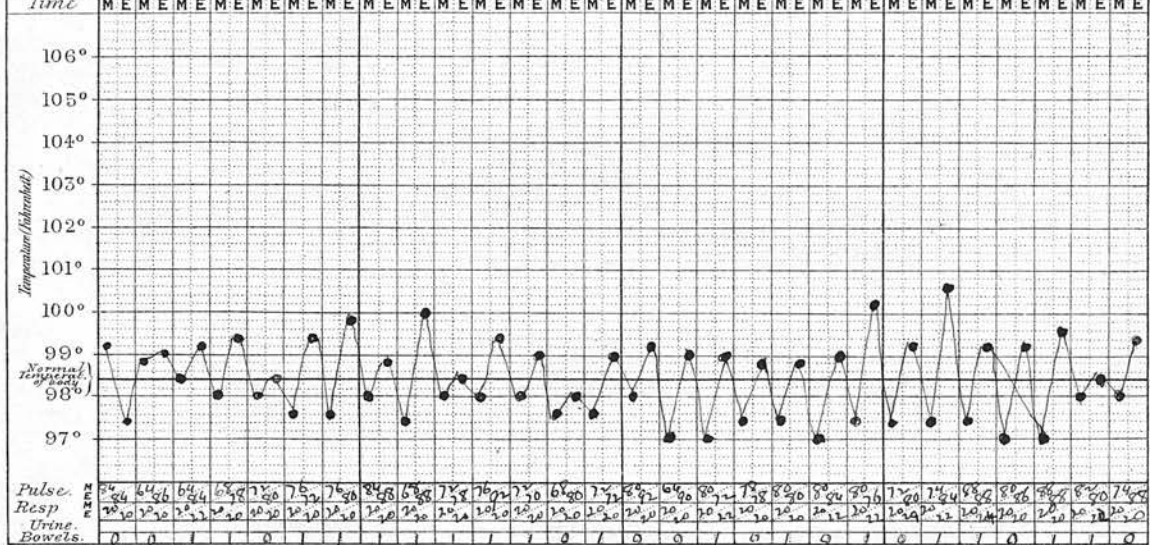
Urinary System.

Quantity normal.

A trace of albumen was always present, but no casts or renal epithelium were found.

Name *Isabella Kerr* Age *24* Disease *Rheumatoid Arthritis* Result *Died*

Date *March 1906*

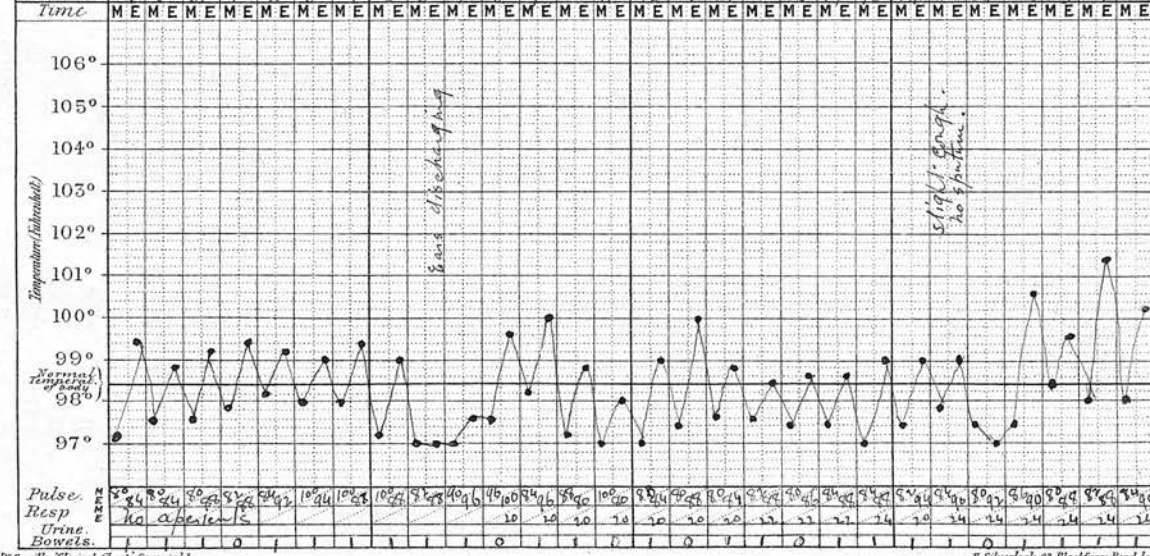


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Name *Isabella Kerr* Age *24* Disease *Rheumatoid Arthritis* Result *Died*

Date *March 1906 April*



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*H. Silverlock, 82, Blackhorse Road, London.*

Nervous System.

Mental condition under the average. Vaso motor phenomena, sweating, pigmentation, cyanosis, etc. of extremities, as described. The knee jerks on both sides are much exaggerated, especially on the left.

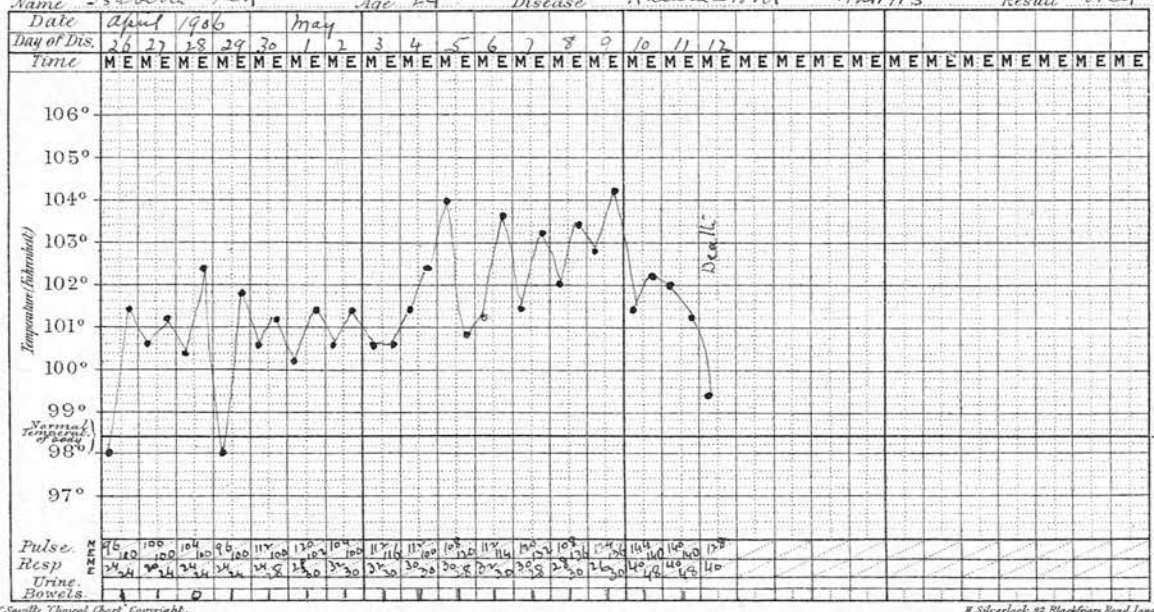
Further Notes.

Treatment continued to be directed to the mouth condition, which was frequently swabbed out and cleansed with mouth washes, but the mucous membrane remained pale and unhealthy-looking, and the breath remained more or less offensive. Guaiacol Carb. gr. X. t.i.d. was given and a regular aperient of Lig. Ext. Casc. and Liquorice. The painful joints were painted with equal parts of Tinct. and Lin. Iodi, on alternate nights - intervening nights, Carbolic Glycerine and Glycerine were applied. At the same time she was having extra feeding and cod liver oil *3ii t. i. d.*

The temperature continued to rise a little at night.

On April 8th both ears were discharging freely, the pus being very offensive. The ears were syringed and examined, and perforation found in both tympani. The patient now states that she had

Name Isabella Key Age 24 Disease Rheumatoid Arthritis Result Died



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11, Silverlock, 92, Blackhorse Road, London.

discharging ears previous to admission. She had lost 10 lbs. weight in seven weeks.

On April 24th there was a small quantity of vaginal haemorrhage which continued for several days. The patient had not menstruated since admission, 13 months previously, and she was unable to give any history of the menses previous to this.

On April 29th a dull note on percussion was found over the right apex anteriorly and posteriorly with bronchial breathing and increased vocal resonance.

Rhonchi were present posteriorly; right, and harsh breath sounds.

She emaciated rapidly. There was no cough or sputum. Temperature was swinging, evening rise 102° and normal in morning. Pulse 112. Leucocyte count 12,500.

During the next fortnight, there was rapid extension of the physical signs in both lungs, with a breaking down at the right apex. The pulse rate rose to 140, resp. 40, and temperature remained high. There was still no cough or sputum, and no sweating, only increasing and rapid emaciation. She was quite free from joint pain and the periarticular swelling had largely disappeared.

The patient died on the 11th May.

Points of Note.

This is a typical case of rheumatoid arthritis, occurring in a young girl, who had evidently been subjected to considerable hardship, and consequent malnutrition, owing to her friendless state and defective mental condition. When first seen the disease had followed a normal course, attacking bilaterally the smaller joints of the hands, which showed fusiform enlargement.

The focus of infection was most probably in the mouth condition, which was foetid to a degree, owing to an unhealthy mucous membrane and carious teeth. Treatment directed towards the mouth and alimentary tract resulted in some improvement, so that she was able to be up, and to do a little work in the ward for 2-3 months. The oral sepsis had not however been properly removed, as it was found impossible to get rid of all the stumps of teeth, and an acute exacerbation of arthritis set in, which in spite of all treatment made steady progress, involving bilaterally all the joints, until there was complete crippling. Deafness, which was present on admission and had been ascribed to ankylosis of the ossicles, was found to be due to middle ear disease - the history of a previous attack of otorrhoea being elicited after the ears began to discharge on

the 8th of April. Following the otorrhoea which was no doubt of tuberculous origin, was the acute lung complication, which rapidly became a generalised tuberculosis and ended in death two weeks later.

A point of note was the total absence of menstruation during the 13 months in which the patient had been under observation in the ward (no previous history of the menses could be obtained) and the occurrence of a fairly normal menstruation, whilst in a debilitated condition - a month before death. Histological examination shows the ovary to be of interest. This case is a contrast to the previous one in its rapid course and in the acute onset of an intercurrent disease, which ended in the death of the patient.

SECTIO CASE B.

L. K. aet. 24.

Died 11th May, 1906.

Sectio - 18 hours later.

External appearances.

Ankylosis at hips, knees, ankles, and right wrist.

Lividity slight posteriorly.

Emaciation marked.

The skin appears somewhat smooth, and there is a marked absence of hair all over the body.

Thyroid

weighs .81 of an oz; is firm, and on section no apparent abnormality is found.

Heart

weighs 9 oz. No increase of pericardial fluid and no adhesions. The left ventricle shows a degree of hypertrophy. The mitral cusps are thickened and a few old vegetations about the size of a pin head are present on one cusp. No other abnormality. All the valves competent.

Lungs.

Right weighs 2 lbs. 2 oz.

Left " 1 lb. 4½ oz.



Right. Masses of caseating glands are present at the root of lung. Adhesions are firm over the apex anteriorly and posteriorly, and between the lobes. The upper lobe is permeated with tubercles, some of which appear on external surface, and are about the size of a small marble. Congestion is marked at the base anteriorly. The middle lobe and anterior margin of the lower lobe are emphysematous.

Section. The whole of upper lobe shows masses of tubercle. Softening in the centre and at one part proceeding to cavity formation anteriorly; there is a recent cavity, the size of a walnut, and several smaller ones around.

Miliary tubercle is present posteriorly over the whole of lower lobe. The only part unaffected is the middle lobe in its lower half, and the anterior margins.

Left. There are no pleuritic adhesions and no increase of fluid in pleural cavity.

There are numerous caseating glands at root of lung.

Posteriorly on section there is deep congestion in the upper part of lower lobe and in upper lobe. Over congested areas there is miliary tubercle, uniformly distributed; anteriorly and at margins and base the lung is emphysematous.

Abdomen.

On opening there is no increase of fluid in peritoneum and no adhesions. There is post mortem staining of tissues in neighbourhood of gall bladder.

Masses of enlarged glands are found in mesentery from size of a pea to a walnut; no tuberculous nodules on parietal peritoneum.

Liver

weighs 2 lbs. 3 oz. Shows a degree of congestion. No evident tubercle.

Stomach.

Cavity normal in size. Some thickening of walls. Pylorus admits little finger. Mucous membrane apparently healthy.

Spleen

weighs  $3\frac{3}{4}$  oz., is soft, friable, and deeply congested.

Kidneys.

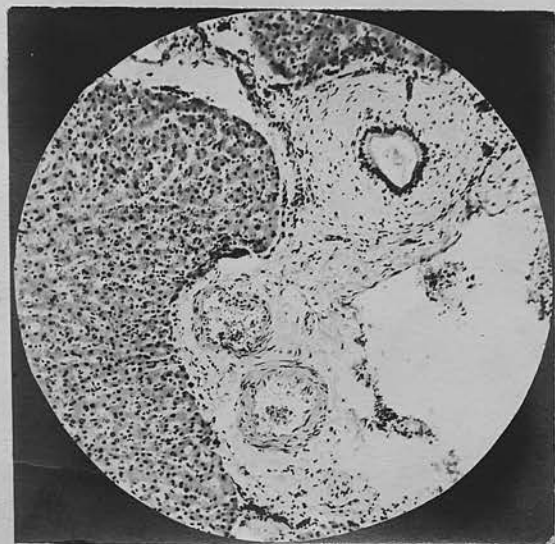
Right weighs 4 oz.

Left "  $3\frac{3}{4}$  oz.

Both show cortex of normal depth. Capsule strips easily. Consistence somewhat increased.

Pancreas.

Weights 2 oz. No evident abnormality.



MICROSCOPIC EXAMINATIONHeart

shows marked capillary congestion, a moderate increase in pigmentation of the muscle fibre, and a loss of striation in fibres chiefly under the endocardium.

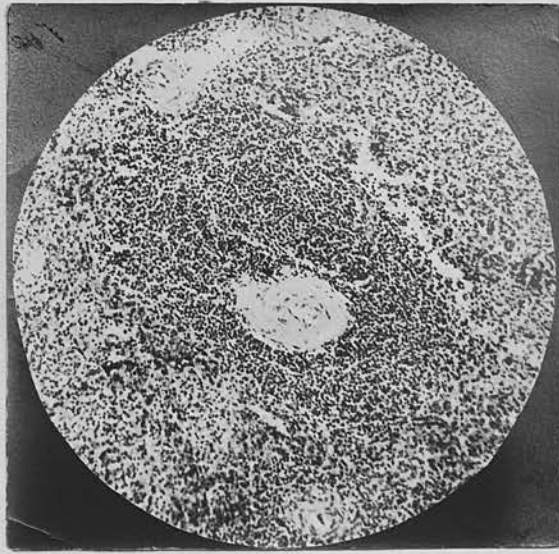
Lungs (Section taken from upper part of lower lobe right) shows miliary tubercle, the nodules not having reached advanced caseating stage. No giant cells seen. Catarrhal exudate is present in the vesicles and bronchi. There is thickening of the walls of vesicles, composed of endothelioid cells. The vessels do not show any marked degree of thickening.

Liver.

There is no thickening of capsule.

Thickening of a fibrous nature is present around the bile duct and hepatic artery. The portal vein is dilated.

In some of the portal spaces, there is round celled infiltration, and in the larger vessels, there is an increased number of polymorphonuclear leucocytes. Dilatation of capillaries is present, and there is an increased amount of pigment in the cells.



Spleen.

The malpighian corpuscles are prominent, but not enlarged.

The capsule and trabeculae are somewhat thickened, but the chief change is shown in the central artery of the malpighian body, which is much thickened and has undergone hyaline degeneration. In many of the sinuses, the epithelial lining is thickened and proliferating. The sinuses near the trabeculae are dilated and many leucocytes are present in them. There is much deposit of pigment in the organ.

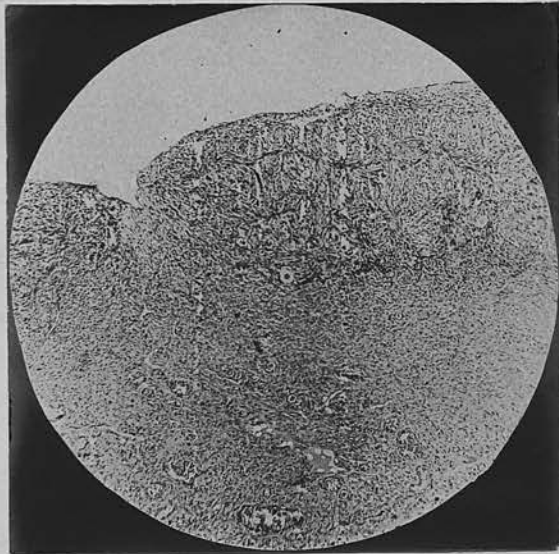
(Section of this organ, as well as of liver and kidney, stained with methyl violet excluded waxy disease.)

Kidney.

Epithelium of the tubules shows cloudy swelling in parts, and in others the epithelium is apparently healthy.

Some thickening is present in Bowman's capsule around a few glomeruli, which also show in parts hyaline degeneration.

Slight thickening is present in the tunica intima and media of some of the medium sized arteries.



Ovary.



Vessels of Ovary.

Pancreas.

The principal change is in the walls of the ducts - both small and large - which show a considerable degree of hypertrophy. The smaller ducts contain colloid material in their lumen. Epithelium of the ducts apparently healthy.

There is some thickening of the walls of the larger arteries.

The islands of Langerhans are small, but apparently healthy.

Thyroid

Vesicles appear to be a little larger than normal, and the lining cells appear flattened. No important change made out.

Femoral Artery

shows no evident abnormality.

Ovary.

There is a total absence of surface epithelium. In the organ at one end, there are a few Graafian follicles, some of which appear comparatively normal, but the greater part of the organ is composed of cellular tissue, mostly fibrous, in which are embedded numerous blood vessels and tube like spaces, some of which are lined by cubical epithelium. Some of the vessels, evidently arterioles, have



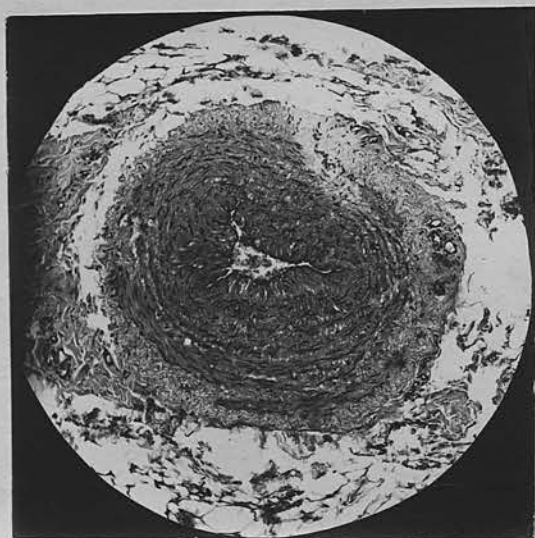


distinct muscular walls, and in some a distinct thickened T. intima is to be made out, so that the changes correspond to those found in other organs. (This change is well marked in section stained with picro fuchsin.)

### Skin.

The squamous epithelium is remarkably thin, consisting at parts of only two layers of cells. The papillae are flattened all along the surface, and sometimes processes of epithelium project for a considerable distance downwards. As a rule, the deepest cells are pigmented.

In the midst of these downgrowths there are at places pockets apparently corresponding in position to the stratum corneum, for in some parts these pockets are seen to communicate with the surface, and their inner layers are continuous with the stratum corneum. Some of the pockets appear to be cut off from the surface, when they very closely resemble small so called atheroma cysts. In some of these, whether separate from the surface, or opening on it, there are little rounded yellow refractile bodies, showing fissuring. These are evidently sections of hairs, so that most probably the appearances described, are the result of degeneration of the hair follicle.



The Sub-epithelial Tissue

is composed of very dense white fibrous tissue, in which, in the deeper layers, hyaline degeneration has taken place. Throughout this fibrous tissue atrophying glands and nerve fibres can be distinguished. The nerve fibres stand out prominently. This fibrous tissue forms a very thick layer of quite abnormal aspect, and underneath it, there is another thick layer of fat, the cells of which appear to be normal.

The medium sized arteries,

underneath the fibrous layer, show a very extreme degree of change, the nature of which is chiefly a chronic arteritis. The tunica intima is very greatly thickened, and is thrown into folds, producing an irregular triangular lumen. There is extensive fibrous change in the media, separating up the muscle fibres and causing thickening of that coat.

In the T. adventitia, there is also great thickening of fibrous nature.

The smaller arteries

are also thickened, but in these the change hardly affects the intima; the media is considerably thickened and the T. adventitia shows consider-

able increase of connective tissue. This thickening of the adventitia affects also the veins.

CASE C.

Case C. is that of a man, aged 65, who was an inmate of Craighleith Poorhouse for 8 years. In his case, there was a family history of rheumatism, his father having been subject to a chronic form of the disease and having died of heart disease. The patient himself had never been subject to rheumatism, and was quite well for 2 years after admission to the Poorhouse. Then he began to be troubled with dyspeptic symptoms, accompanied by persistent and troublesome constipation. Following this, he took burning pains down both thighs, pains which were always worse at night, and made his walking stiff and difficult. For four years, these were the only symptoms. Then the left wrist became stiff and swelled. Next the right metacarpo-phalangeal joints of 1st and 2nd fingers, followed by the right wrist and the proximal phalangeal joint of the middle finger of the left hand.

There was no invasion of the larger joints. During the following 2-3 months, his condition became worse, his bowels never moving without strong aperients, his hands becoming more painful and swollen.



On examination in hospital

the hands, of which I have a photograph and skiagram, show a typical rheumatoid lesion. The right hand in ulnar flexion, the wrist showing boggi-ness, thickening of capsule, grating on movement. There was atrophy of the small muscles of thumb, of the interossei, and of the muscles of the little finger.

There was present enlargement of the metacarpo-phalangeal joint of the thumb, of the 1st and 2nd phalangeal joints of middle finger, and of the 1st of little finger. Grating present in almost every joint of fingers, with freckling at some places over dorsum, and sweating of the palms.

Atrophy was marked in muscles of forearm and upper arm.

Grating was present at the elbow and shoulder joints, but no bony proliferation and no pain.

On the left hand, the appearance was much the same except that the wrist showed a greater degree of swelling, was boggy and tender.

The thumb was in position of flexion at meta-carpo phalangeal joint, and in hyperextension at distal joint. The metacarpo-phalangeal joint of forefingers was enlarged and tender.



On examination of the hands, it was found that the bones of the hands and fingers were normal in appearance. The joints were normal in appearance. The soft parts were normal in appearance. The bones of the hands and fingers were normal in appearance. The joints were normal in appearance. The soft parts were normal in appearance.



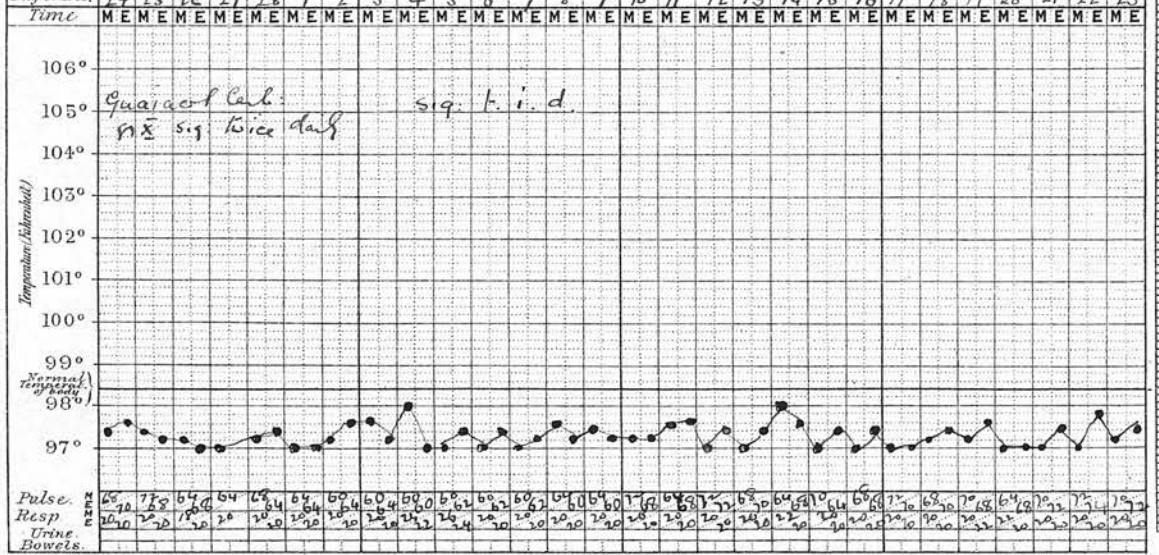
The bones of the hands and fingers were normal in appearance. The joints were normal in appearance. The soft parts were normal in appearance. The bones of the hands and fingers were normal in appearance. The joints were normal in appearance. The soft parts were normal in appearance.

CASE C.Skiagram shows:

1. Ulnar displacement of both hands, but most marked in the right. The displacement takes place both at the wrist joint and at the metacarpo-phalangeal joints.
2. Broadening of the bases of the long bones with denser bone tissue.
3. Matting together of carpus with
4. Loss of joint outline = bony ankylosis.
5. Marked distortion of articular surfaces and heads of bone, especially at the metacarpo-phalangeal joints, and most marked in the thumbs.
6. Almost complete absorption of 1st and 2nd metacarpo-phalangeal articular surfaces.
7. Dislocation of metacarpo-phalangeal joints of thumb and little finger.
8. Osteophytes at distal phalanges.

Name Thomas Bain Age 65 Disease Rheumatoid arthritis Result Died

Date February 1906 March



The proximal phalangeal joint of the middle finger was typically fusiform with thickened capsule, and some joint fluid. Grating of joints, sweating of palm, pigmented patches, atrophy of muscle, present as in right.

Atrophy of extensors of arm and forearm and some grating obtained in elbow and shoulder.

The lower limbs showed atrophy of muscle, especially of thighs, and sweating was always present in the soles of feet.

The knee jerks were much exaggerated on both sides and also the triceps jerk. The heart showed an accentuated first sound in the mitral area. Pulse 72, regular in time and force.

A degree of bronchitis was present over the chest.

There was no albumen in the urine. The blood count showed

R.B.C.	4,266,000
W.B.C.	10,300
Hb.	72%

Examination of film showed no abnormality.

#### Treatment and Further History.

The patient was kept in bed and constipation treated with equal parts of Lig. Ext. Cascara and

Liquorice ʒ i. at night and guaiacol carb: gr. X t. i. d. with the result that the bowels moved naturally, the joint pains were greatly relieved, and the swelling diminished. The patient was able to be up for several weeks, when he had a return of pain over the lower cervical vertebrae and down the thighs. The knees swelled and he was found to be losing weight. His further history was one of gradually increasing helplessness owing to swelling and pain of the larger joints, and extreme atrophy of muscle. His constipation had returned and he required aperients regularly.

He constantly complained of the "burning" pains in the joints which were always worse at night. He got slightly delirious at night and had incontinence of urine and faeces. The gradually increasing asthenia ended in death nine months after he had come under observation and treatment.

Points of Note.

In this case, the sex and age of the patient are to be noted. A man at 57 is an unusual case of rheumatoid disease, and in addition to its late development the course of the disease was a comparatively short one. Four years of a mild and stationary invasion, and three years during which there was a more acute and progressive phase, resulting in crippling, the patient becoming bed-ridden and followed by death.

In his case, there was the history of an arthritis diathesis, and a very clear history of gastro-intestinal disturbance accompanying the first pains. These pains in thighs, burning in nature, were marked all through his illness, often keeping him awake at night and very unresponsive to different forms of treatment.

The dyspeptic symptoms were well marked, persistent and troublesome, and constipation was a symptom which was present from the beginning of his illness. This is very suggestive, as with a Poor-house diet, the principal parts of which are porridge and broth, with vegetables, it is comparatively rare to find constipation, diarrhoea being a much more frequent complaint.

The effects of treatment directed towards the alimentary tract, were marked, as general improvement ensued, the joint pains were relieved, swelling went down, and the patient was able to get up and go about.

It was thought that the focus of infection was removed and that absorption of toxins was arrested, but there was an exacerbation with involvement of the cervical spine, and a bilateral invasion of the larger joints, and also constipation had returned.

Bannatyne regards guaiacol carb. as a specific for this disease, but it probably acts by controlling excessive growth of bacteria in the intestine and thus relieves fermentation.

Armstrong<sup>(22)</sup> notes the extraordinary power of absorption of the duodenum and the effect of drugs in keeping down fermentation, and the improvement got from washing out the colon.

SECTIO CASE C.

T. B., aet. 65.

Died 14th November, 1906.

Sectio - 8 hours later.

External appearances.

Rigor mortis has only developed slightly. Lividity slight posteriorly. Great general emaciation.

Skin loose over trunk and glossy over extremities.

Hair scanty over pubis and in axillae - present on back of wrists.

Slight oedema around ankles.

Contractures of both hip joints and left knee, and to a less extent of right knee.

Limited bed sore over crest of right ilium.

Thyroid

weighs .74 of an oz.; presents no abnormality.

Heart

weighs 12 oz. No increase of fluid in pericardium. Moderate increase of epicardial fat. On opening, left ventricle shows a degree of hypertrophy. Mitral cusps are somewhat thickened; aortic valve is also thickened, but competent.



Lungs.

Right weighs 1 lb. 6 oz.

Left " 2 lbs.14 oz.

The left lung is closely adherent to chest wall, anterior margin is emphysematous, and the base posteriorly is congested and oedematous.

Right lung is smaller and even more closely adherent to chest wall, and is detached with difficulty. On section, the lower lobe is deeply congested. Bronchi are thickened, and contain blood stained mucus. Glands are enlarged at the root of the lung and nodules in the substance are the seat of deeply coloured pigmentation.

Abdomen.

On opening, no adhesions or fluid in cavity.

Liver

Weights 3 lbs. 3 oz. Capsule somewhat thickened. A small area over the right lobe at anterior edge is fibroid, over which the capsule is much thickened. There is a groove antero posterior over the left lobe.

Stomach

is small; wall is thickened; vessels are tortuous around the greater curvature; small haemorrhages are present in the wall. Pylorus admits forefinger.

Spleen

weighs  $3\frac{1}{4}$  oz.; is atrophied and shows marked venous congestion.

Kidneys.

Right weighs  $4\frac{1}{2}$  oz.

Left " 6 oz.

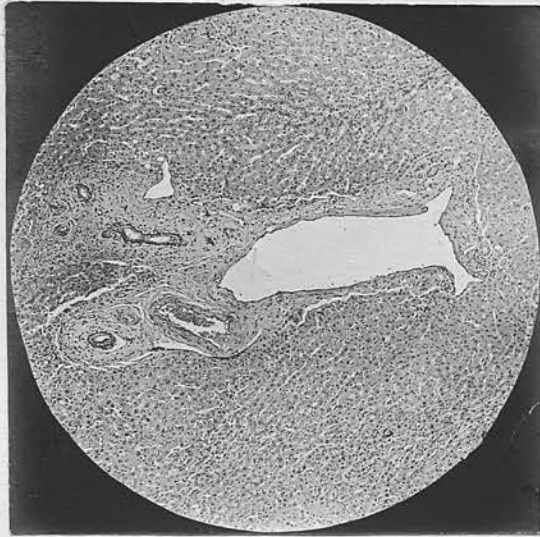
Thickened capsule strips with some difficulty. Cortex is narrow; numerous small cysts present in it.

Vessels appear thickened and a degree of congestion is present.

Perinephritic fat is diminished in amount.

Pancreas.

Weights 3 oz.; is firm and fibrous on section.



MICROSCOPIC EXAMINATION.Heart.

There is fatty loading, but no infiltration. Patches of fibroid myocarditis are present, the newly formed tissue being cellular. Marked brown atrophy is present in muscle fibres.

In the fibres near the surface of the heart transverse striation is not quite so distinct as normal.

There is general congestion of capillaries. In some places more marked than others, these are very prominent, and there is also distension of veins.

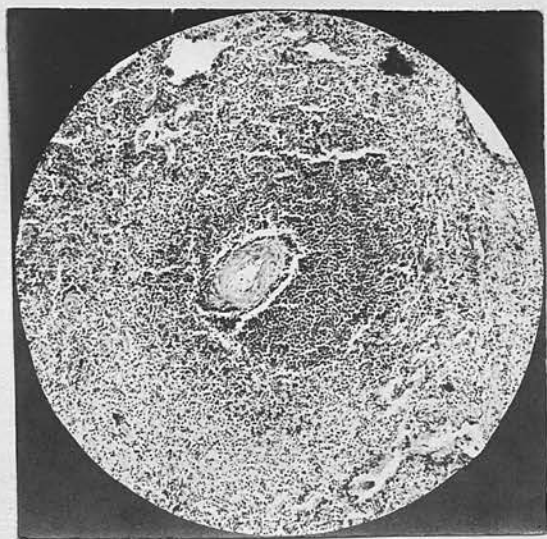
Liver

shows a thickened capsule with extensions throughout and passing through the liver tissue. In some of the larger tracts, there is a distinct increase of connective tissue, especially in relation to the larger bile ducts, and to a less extent to other structures in the portal tract. This fibrous tissue is dense and is arranged concentrically round the duct.

The portal vein is dilated.

Lobule.

The central vein is enlarged and its walls are distinctly thickened. The capillaries in the



central zone are dilated, and the walls appear to be more distinct and continuous than normal, indicating that they are thickened. There is a distinct space between the capillary wall and the column of liver cells, apparently empty, except for a little granular material.

The liver cells, with the exception of some in the portal zone, contain a large amount of golden yellow pigment.

#### Portal zone.

Many of the cells contain fat, and in many, the nucleus is less distinct than normal. In the central zone, there is a slight degree of atrophy of cells.

The epithelium of the bile ducts is apparently healthy.

The condition is one of chronic venous congestion.

#### Spleen.

There is thickening of capsule and trabeculae. The sinuses are very distinctly dilated. Endothelium is prominent, and in some cases is loaded with haematogenous pigment. The pulp between sinuses is dense, showing an increase of connective tissue. The malpighian bodies show little altera-



tion as a rule, but the central arteries in every case show hyaline change.

The condition is one of chronic venous congestion.

#### Kidneys.

The tubules show swelling of the cells, a granular disintegration and a breaking down of the inner part of the cell. The tubules appear to be atrophied in parts in the neighbourhood of fibrous tissue. Some colloid casts are seen in the lumen.

Thickening of Bowman's capsule is present, which is hyaline in character, and the glomeruli at parts are entirely hyaline.

There is congestion of capillaries.

The larger vessels show much thickened walls, the thickening being chiefly of the intima, and is hyaline in character. There is a slight localised increase of connective tissue in the neighbourhood of the vessels.

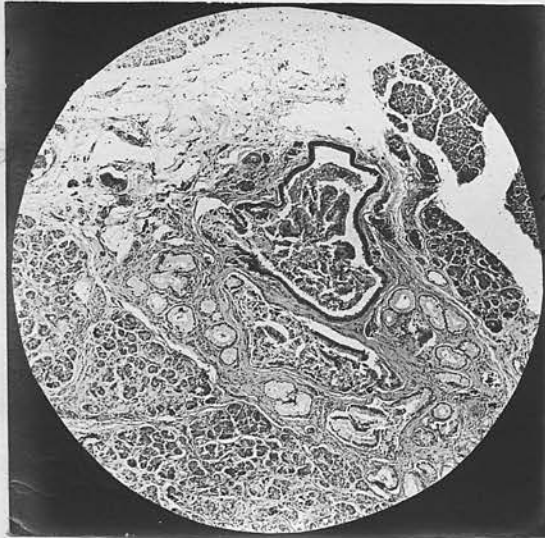
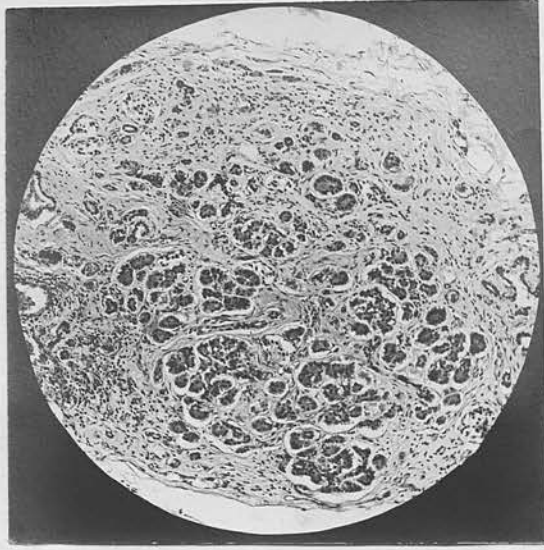
(Staining with methyl violet, excluded waxy degeneration, and section stained with resorcin fuchsin showed the elastic tissue increased in amount and split up.)

#### Pancreas.

Parenchymatous changes.

There is no marked change in the epithelium of





the acini. The islands of Langerhans are small and few in number; epithelium shows no prominent abnormality.

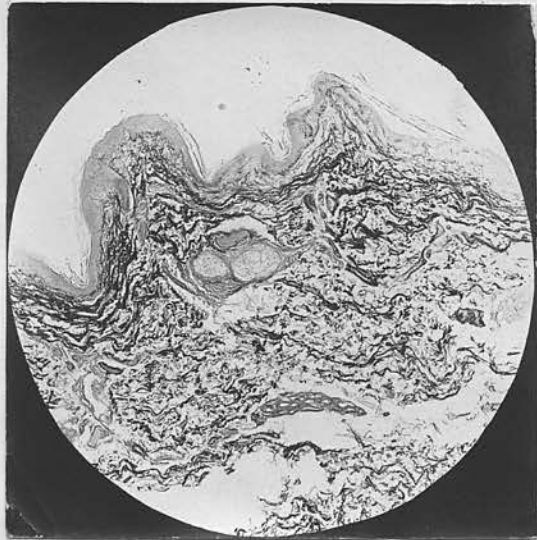
Interstitial changes. Some of the lobules show a marked increase of fibrous tissue, the fibrous strands passing in between the lobes and also penetrating the lobules, enveloping groups of cells. The fibrous changes seem in parts to be more marked in the islands of Langerhans and round the ducts.

Ducts. The larger ducts show a marked thickening of the walls, the thickening consisting of hyaline connective tissue, the epithelium proliferating and catarrhal.

In some parts, particularly near the main duct, there are collections of tubules, evidently of the nature of mucous glands. These open directly into the duct, which contains a considerable number of cast off cells, and these in appearance seem to be of a nature similar to the cells lining the mucous glands.

The smaller ducts, though the walls are thickened, do not show such marked change in the epithelium as just described in the larger ducts.

Vascular changes. There is a degree of thickening in the larger vessels, the change affecting the



T. intima chiefly. There is increased fibrous tissue in the media which shows hyaline degeneration. In T. media and adventitia, the smaller vessels are somewhat thickened. In one small vessel an old organised thrombus is seen.

#### Thyroid.

Spaces are distended with colloid material, and for the most part, the cells lining the spaces are flattened.

#### Skin.

Atrophy of all the layers of surface epithelium is marked, these being represented in parts by only two or three layers of cells with an overlying thin layer of stratum corneum. On the surface are pockets similar to those seen in the other two sections of skin. They are rather more numerous here, and some are cut off from the surface and give a cyst like appearance. Stratum corneum is continuous with the surface pockets, dipping into them and surrounding atrophied hairs.

Underneath the cornium is a dense layer of fibrous tissue in which, in its deeper layers, the fibres appear swollen and hyaline.

Underneath this thick layer, in a looser tissue, lie bundles of cellular tissue which has undergone

some fatty change. Nerve bundles are numerous and prominent, the perineurium being somewhat thickened.

The medium sized arteries are much thickened, the change taking place in all the coats, but affecting chiefly the intima and media.

The smaller vessels are also thickened.



CASE D.

J. H., aet. 55, has been an inmate of Craigleith Poorhouse for  $7\frac{1}{2}$  years.

His arthritis seems to have commenced with an attack of rheumatic fever 18 years previously - with a return of it 9 years after. His work as a navy exposed him to weather changes, and he had frequent "rheumatic" attacks which culminated in his admission to this Poorhouse. His history since, has been one of gradually increasing deformity of joints, but a correct history of the order of involvement cannot be obtained. He has had gastric trouble at intervals, and several "feverish" attacks. He has been bed-ridden for the last 3-4 years. The temporomaxillary joints were affected for some time, and there was difficulty in feeding him. His pains are always worse at night, the right hand being worse than the left.

Examination of patient (Photographs)

shows extensive ankylosis of the principal joints. He lies on a water bed, always in the extended position, and he is unable to sit up. His feet are abducted, and he cannot raise his hands

and arms to feed himself. An attempt to make him sit on the edge of the bed for examination results in the legs being stretched out stiffly in front, the feet resting on the outer border and slightly on the ball of the great toe, whilst the heels do not reach the ground. He requires to be held up, and an attempt to flex the knees causes pain and grating. Every joint is more or less affected, but the heaviest incidence of disease has fallen on the right side and on the hands and feet. Ulnar flexion is present.

#### Upper extremities.

The right hand is kept extended and pronated, but with exertion he can half close the fist from the metacarpo-phalangeal joints without flexion of the phalanges. There is hyperextension with undue mobility of some joints, flexion and ankylosis of others, with bony enlargement at 1st and 2nd metacarpo phalangeal and at carpus, and with grating on movement.

There is atrophy of muscle; skin dry and cracking, and glazed in places; nails longitudinally scarred, dry, brittle; pronation and supination of hand interfered with -  $\frac{1}{4}$  of a turn only possible.



Left wrist movement is rather better and deformities of hand not so marked.

Wrist, elbow and shoulder on both sides invaded. Cyanosis of hands and forearms up to elbow.

#### Lower extremities

show an almost complete ankylosis. The right heel is drawn up so that the left fits into it and is at a lower level (This is well shown in photograph). The metatarso phalangeal joints are enlarged and the great toes are turned out, forming an obtuse angle. The other toes are crowded together and the 2nd raised above the dorsum of the great toe. There is enlargement of the tarsus of both feet and of the lower ends of the long bones.

Cyanosis is very marked (as shown by the photograph). There is malnutrition of skin and nails and atrophy of muscle; bony outgrowths at knees; patellae fixed; ankylosis complete in left; slight movement in right; no increase of fluid in joints.

Hip joints have slight lateral movement with pain.

Measurements of joints show enlargement to be greater in each joint on right side than on left, and atrophy of muscle also more advanced on right side - though it is pronounced on both sides.

Pulse is 76, small and regular. Vessel wall is thickened.

The blood shows

Hb.	70%
R.B.C.	4,600,000
W.B.C.	7,500

The thyroid is palpable, but not enlarged. No enlargement of lymphatic glands.

#### Alimentary System.

There is always a feeling of distension after meals and flatulence is passed. The bowels are always constipated and do not move except with medicine. During 6 years residence in hospital he has had several attacks of acute dyspepsia, when off food for days and complains of nausea, sickness, epigastric pain and a feeling of constriction. His temperature is always raised and he loses ground very rapidly. There is no pain in joints during these attacks.

#### On objective examination -

The gums are soft and bleed easily, the teeth have been gradually crumbling away during the last three years, leaving sharp edges which cause small ulcers on tongue.



The stomach is dilated. The bowels constipated. No haemorrhoids. A trace of albumen is always present in urine - amount measures 40-60 oz. per diem - and on microscopic examination hyaline casts found, and the field is crowded with bacteria.

Further progress.

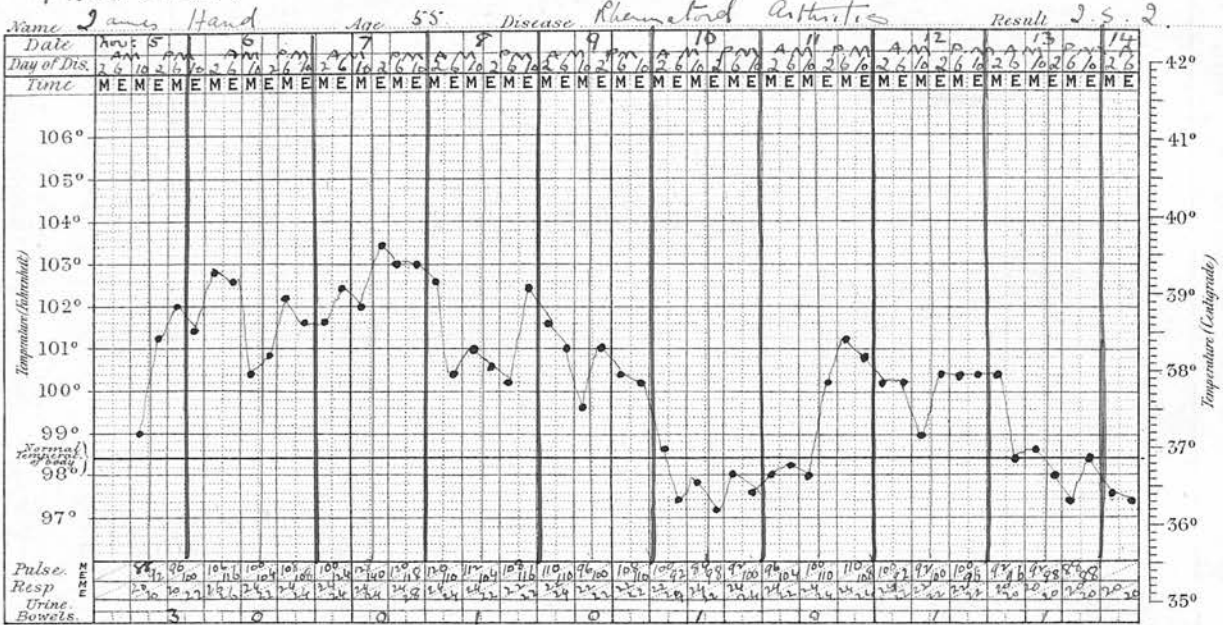
The patient was treated with regular aperients and guaiacol carb. gr. X. t.i.d. with at first some improvement.

At intervals of about 2 months, he has a gastric attack with rise of temperature ranging from 100 to 102° and continuing for 2-3 days.

His symptoms always are rigor, nausea, pain, vomiting and tightness across the lower part of chest; hiccough sometimes supervenes. The stomach refuses to digest even diluted milk, but a course of whey and beef juice usually controls the vomiting and the temperature gradually falls. There is usually stomatitis with ulceration of the buccal mucous membrane. These attacks are periodic and no definite cause can be elicited. The joint condition is quiet; there never is any pain or increase of swelling.

On the 30th January, 1907, the patient took a rigor with pain in the lumbar region, and vomited.

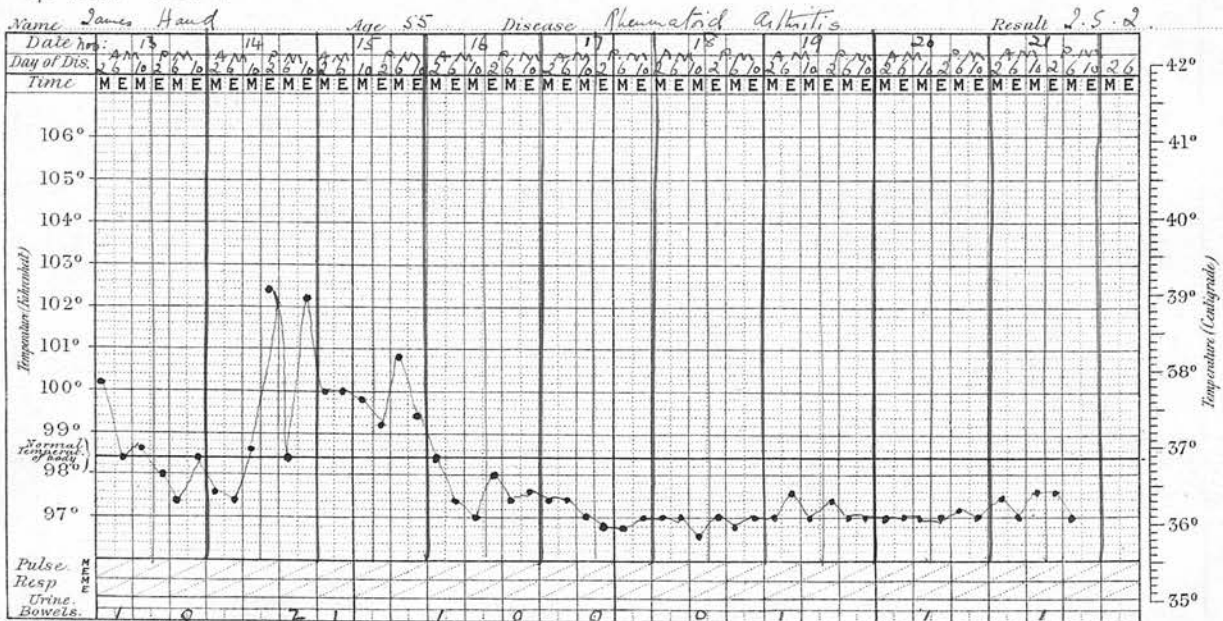
### 4 Hour Chart.



H. Saville 'Clinical Chart' Copyright. No. 7.

H. Silverlock, 92, Blackfriars Road, London.

### 4 Hour Chart.



H. Saville 'Clinical Chart' Copyright. No. 7.

H. Silverlock, 92, Blackfriars Road, London.

His temperature rose and continued at 102° for two days, accompanied by the usual gastric symptoms. Three days later he had an epistaxis which was controlled, but recommenced later and continued to drip slowly for several hours. Then he had a large haemorrhage from mouth and nose and lost about 50 oz. (measured) of bright red blood. He collapsed during the bleeding and was given hypodermics of strychnine and morphia.

No bleeding point was found - there was no coughing - the haemorrhage came per oesophagus.

For a day or two he was fed per rectum. There has been no return of haemorrhage, and he has recovered his usual health.

Points of Note.

Case D. is that of another man in middle life but with a history of arthritic trouble going back for 18 years. He began with what he thinks was an attack of acute rheumatism, followed by another nine years later. These may have acted either as predisposing or excitant causes, but it is noteworthy that if these were true attacks of acute rheumatism there was no damage done to the valves of the heart.

2. Later, history is a typical rheumatoid one of steady and bilateral invasion - the heaviest incidence falling upon the right side - until every joint is more or less involved, and there is complete crippling and marked deformity.

It is to be noted that eventually a stage of comparative painlessness and quiescence of the joints is arrived at, and the patient becomes fairly comfortable.

3. In this case as in the others, constipation is a marked feature, and in addition what I have called gastric crises are of interest. These are periodic, occurring roughly from once a month to once in two months or even longer. The sequence of symptoms never varies, and with each attack the condition is acute. The stomach is somewhat dilated, but the vomited matter is not of an accumulation of

partially digested food, but resembles that of an acute gastritis. It is most probable that these attacks are toxic in character, and that they originate in putrefactive processes set up by septic organisms.

Improvement in his case resulted in treatment by guaiacol carbonate.

4. Haemorrhage from nose and mouth. Bannatyne states that purpuric haemorrhages are not uncommon, and he shows a photograph of an interesting case with haemorrhages under the finger nails. He has also seen haematemesis and haemoptysis, but he states that bleeding from mucous membranes almost never occurs. In this case the bleeding began as an epistaxis, and it was thought that there was such a rush of blood that some was partially swallowed and returned by mouth.

Bannatyne is of opinion that "haemorrhages are undoubtedly due to the rheumatoidal toxic poison inducing anaemia, with dilatation of blood vessels and extravasation of their contents".



CASE E.

A man, J.C., aet. 41, has complained of pain and distortion of joints for 7 years.

His history is that he had good health until he was 34, except for ague which he took whilst in the army abroad. He has had one attack of ague since he came home. There is no family history of rheumatism or of joint trouble.

About 7 years ago he had pain in both ankles, but this was not severe enough to lay him up until 3 years ago, when he was compelled to come into Craighleith Poorhouse. He was treated at first for a suppurating gland in the neck, which healed up. Two months later pain began acutely in left hip. There was marked limitation of movement, jarring pain - worse on movement - and always worse at night. At the same time the proximal phalangeal joints of left hand were enlarged and tender. Later on, the same joints on right hand were attacked. Later still, it was noted there was atrophy of left thigh muscles, grating at left knee and hip, and tenderness over great trochanter. The left leg was everted and movement at the hip was in abeyance. After this there was a quiet period when the patient was able to get up and go about, using crutches. He was transferred to the Main House, where the conditions of life, food, warmth, etc. are not quite so



good. In a short time he noticed that he was losing power in the hands; the smaller joints became swollen and tender, also the right elbow and the left shoulder. He lost appetite and the bowels were very constipated. Later, the wrists swelled up and at times he was much troubled with a stiff neck and shooting pains in the cheek anterior to the right meatus. He was therefore transferred back to Hospital.

On physical examination

the patient was very pale and hollow eyed, confined to bed with pain in the left hip running down the inner side of the left thigh, and pain in both hands. These pains are always worse at night.

Height - 5 ft. 4 in.

Weight - 7 st. 7 lbs. (weight 5 months ago  
8 st. 8 lbs.)

From the photograph it will be seen that the hands were markedly rheumatoid - the right in position of ulnar flexion - showing more or less affection of all the joints.

The terminal phalangeal joints were partially dislocated and hyperextended, and atrophy of the small muscles of hand was well marked. The palm was smooth, pink, moist in contrast to the dorsum

which showed brownish diffuse pigmentation. The nails were longitudinally ridged, the wrist swollen and boggy, and its definite outline lost. Grating was very marked in wrist and small joints of hand. The elbow could not be fully extended, there was thickening of capsule, fluid in excess in the joint and spasm of the biceps. There was marked atrophy of all the muscles of the arm, particularly in those of extensors of forearm. Grating was felt in elbow and shoulder.

The left hand and arm was in much the same condition; the thumb and middle finger joints showed the heaviest incidence of disease (see photograph).

Wrist and shoulder show grating; elbow is at present unaffected.

#### In Lower Limbs -

Pain was always present more or less in left hip and thigh; on measurement the left leg was  $\frac{3}{4}$ " longer than the right, and he was unable to put his foot to the ground.

The reflexes were much exaggerated, the left more than the right.

Pulse 92; 1st sound in mitral area accentuated. No dyspeptic symptoms.

Bowels persistently constipated.



## Blood count:

Hb.	70%
W.B.C.	7,812
R.B.C.	3,400,000

Urine showed no abnormality.

In left hip, where the original pain was felt, there have been intervals of quietness, but when examined there was acute pain on movement, which at the same time was very limited. There was thickening of the trochanter, and pain on pressure over the ischial tuberosity, but no disintegration of joint was made out.

He had flat foot and the soles were moist and clammy.

There was a large growth of hair on the dorsum of the feet - most abundant at the base of the toes and around the ankle joints. It also extended over the outer side of the legs and round the knee joints. There was none on the trunk. Knees and ankles enlarged, but no pain or grating felt. There was slight excess of fluid in right knee. Atrophy of muscle below knee; no pigmentation.

Further Progress.

The treatment consisted of aperients, of arsenic and iron, and extra feeding. For the first two

months, pain continued in the joints and he lost weight. The arsenic and iron were then stopped and he was put upon guaiacol carbonate Gr. X t.i.d. and this was continued for six months along with regular aperients. During the summer, he was encouraged to be out in the open air as much as possible, and he steadily gained in weight. The improvement continued during the winter. He had had no joint pain for six months and was able to walk about without either crutches or stick.

Height - 5 ft. 4 in.

Weight - 8 st. 1 lb. (gain of 8 lbs.)

The bowels were acting regularly, seldom requiring an aperient, and he was dismissed to the Main House.

Points of Note.

This is a case of a younger man attacked by rheumatoid disease at 34, and with no history of previous infective disease except ague contracted when in the army. There was no evidence of specific disease or of gonorrhoea. The invasion of the larger joints first, and those joints the ankles, and the fact that he has been troubled with flat foot since, has a similarity to an attack of gonorrhoeal rheumatism where the organism has a special affinity for the ligaments and fascia of the feet.

Stewart<sup>(23)</sup> points out the importance of gonorrhoea and its frequency as an infective agent in rheumatoid arthritis, and how though gonorrhoeal arthritis may be monarticular, the subsequent rheumatoid disease is polyarticular. It is also important to notice its frequent association with tubercle in some form or another.

There was no further invasion of joints for 4 years, when coincident with a suppurating gland in the neck, he had an affection of his left hip, which led to the diagnosis of tuberculous hip joint disease being made. The sequence, however, of the smaller joints of first one hand and then the other becoming painful and swollen and followed by atrophy of muscle, threw light on the condition. This with



treatment improved, only, however, to relapse again later on. These relapses are very typical of rheumatoid arthritis, and in this case, it may have been encouraged by untreated constipation and a less nourishing diet. The improvement which steadily followed a correction of these, helps to support this theory of the case.

The growth of hair on the dorsum of the feet and around the ankle joints and the knees, is an interesting feature, for the association in rheumatoid disease is an atrophy of skin and its glands, hair, etc. This is illustrated in some of the sections shown. The hairs for the most part disappear, but Bannatyne states that he had seen a recent growth of hair, especially on the forearms, in some of his cases.

CASE F.

M. McL., 78, was admitted on January 26th, 1906, with a history of injury to the left hip joint one month previously. She had caught her foot and fallen on the left hip, and had not been able to stand since. She was told by a doctor that the hip was "sprained" but not broken.

On examination the left leg and thigh were lying in the everted position, the toes pointing outwards. Pain was referred to the great trochanter and was acute when movement attempted. There was ecchymosis down the inner side and back of thigh. No fracture was made out. The bowels were regular.

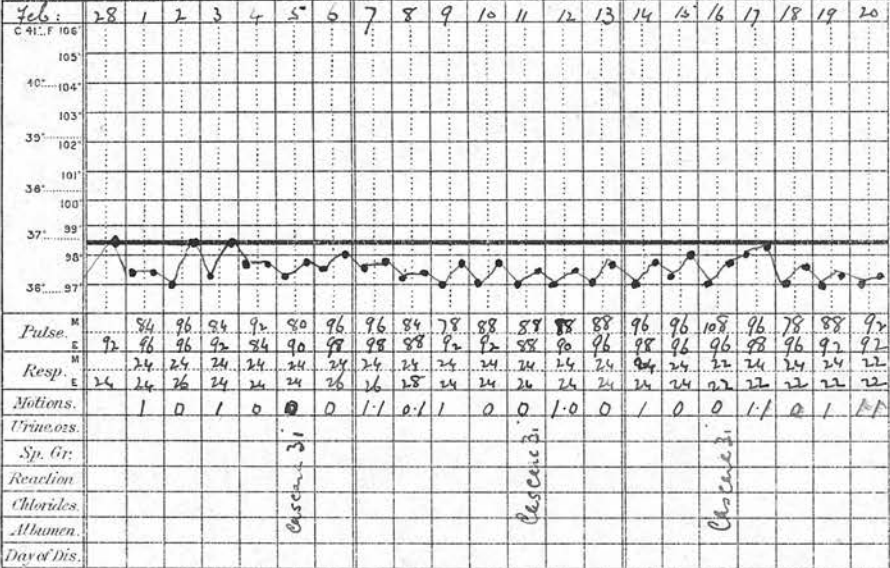
Pulse small - rate 78.

Further history

showed constant burning pain running down the inner side of the left thigh, with a gradual atrophy of the thigh muscles, especially of the extensors. Pain complained of later in the knee, and below the knee to ankle.

She then began to move the hip, but lay with flexion at hip and knee, though she could extend with some difficulty. Atrophy began in the right thigh muscles, but no pain was complained of in the

1906 March



Name *Henry J. de la*  
 Disease *Osteo - arthritis*  
 Age *78*  
 Result *Disch.*

joints. Pigmentation, which was present to a slight degree on admission, became more marked in the neighbourhood of the joints, especially around the knees on the posterior aspect. The pigmentation took the form of a large size of freckle which lay thickly around the joints, stray spots being over thigh and outer side of leg, but none around the ankle or foot.

Pigmentation was also well marked around the shoulder joints and elbows, down the sides of neck and around the eyes and forehead.

Measurement showed shortening of the left leg by 1".

There was no sensory disturbance.

The knee jerks were both exaggerated, the right more than left.

The bowels became very constipated and the pulse rate increased to 96.

The blood count showed

R.B.C.	4,600,000
W.B.C.	12,500
Hb.	72%

There was slight dulness at the bases, and a few crepitations were heard.

There was a trace of albumen in urine.

About 2 months after admission, pain began in the right hip, very acutely - always complained of as burning and worse at night. At the same time

the left knee became contracted, spasm of the hamstrings being present, and great pain felt if an attempt made at extension. There was marked atrophy of left leg and thigh muscles.

The right hip and knee joints settled into flexed position, and atrophy of thigh and leg muscles, also marked pigmentation behind and around the knees became less marked; the outline of spots less well defined. The arms and hands, especially in the small muscles of right hand, showed atrophy of muscle with diffuse freckling of skin.

The contractures increased, face almost touching the knees, muscles atrophied, joints prominent and nodular. Pain had decreased and latterly only felt over left great trochanter. She became restless at night and gradually lost strength, and died five months after admission.

Points of Note.

This type of case, which may be called one of osteo-arthritis, is generally recognised to differ very materially from the previous types, and some hold that it is not a true rheumatoid condition, but is more of a senile and degenerative nature. It usually attacks one joint only, and is commoner amongst men. It is also said to be unlike both acute and chronic rheumatoid arthritis in being accompanied by no nervous symptoms, but in this case at least, that is not borne out. I consider the greatly increased knee jerks, the marked atrophy of muscle, the pigmentation around the affected joints, the burning pain, which was excessive at times, and the emotional disposition shown by the patient, to be marked evidence of the involvement of the nervous system.

The case is unlike the morbus coxae senilis in the involvement of more than one joint and in the bilateral invasion, but there is similarity in the age of the patient and in the common history of an injury to the hip - an injury of which the evidences were present in this case on admission. The rapid sequence of invasion from left hip to left knee, right hip and right knee, the progressive nature of the disease, and its comparatively short course, are points of interest.

The septic focus may have been found in whatever was the original injury to the left hip, a chronic toxaemia being accountable for the other changes.

Bannatyne<sup>(24)</sup> found the joint condition, post mortem, in what he calls senile arthritis, to differ from chronic rheumatoid disease. In senile arthritis the cartilage strips off easily, showing a rarefied condition of bone. The cartilage is soft and yellowish, and there is fatty degeneration of the medullary substance of bone. He considers the disease to be a pure degeneration due to some trophic or vascular malnutrition. It is to be regretted that a post mortem examination was not obtained in this case.

CLINICAL.

Before summarising the clinical data, which, to my mind, require prominence, it is necessary to go back to the theories of causation as discussed at the beginning of this thesis.

That rheumatoid arthritis owes its origin to some lesion of the nervous system cannot be held, in the light of the fact that pathological evidence in favour of this theory has not been obtained.

The bacterial theory - by which one means that a specific organism with its nidus in the affected joints is the cause of the disease - is improbable because no specific organism, present in all cases, has been discovered, and that, although an immense amount of experimental work has been done by many observers, there has been no uniformity in their results. It therefore seems clear that the joint lesions are not the direct result of specific organisms contained in the joints.

But it is very probable that the disease is of organismal origin, the organisms having their seat or focus distant from the joints in some tract or organ, where under suitable conditions they evolve toxins, which being thrown into the blood stream, get carried far and wide throughout the body.



The clinical evidence in favour of rheumatoid disease being a chronic toxaemia is very suggestive, and in reviewing the six clinical records presented, it has seemed to me that the outstanding feature of all six cases is the invariable disturbance of the alimentary tract. This symptom is more marked in some cases than in others, but it is present in all. Gastric crises, occurring at regular intervals, with no dietetic or external cause, undoubtedly point to a toxaemic origin. These are very marked in Case D. and are looked for periodically.

Febrile attacks are in the same category and may occur alone, or accompanying alimentary disturbance. As a rule, the temperature runs a normal, or it may be a subnormal, course for weeks or even months.

Constipation is very common and was marked in the majority of cases - Case A. alone showing a persistent and troublesome diarrhoea.

A very strong point in favour of the disease being a chronic toxaemia is the relapses and exacerbations which one finds in most cases. Periods of quiescence, when no doubt betterment is sometimes attributed to successful treatment, are followed by a fresh outbreak with increased disability of joints. Again a quiet period comes, and again an acute attack,

but all the time the disease is progressing. Cases B. C. D. and E. showed this feature very markedly.

An increased pulse rate, without any organic cardiac disease, is a well recognised symptom, and is present in a majority of the clinical cases. It points to a poisoning of cardiac nerves and their centres.

The anaemia of chronic rheumatoid arthritis is of a secondary nature and is fairly uniform in all six cases. Atrophy of muscle, present very extensively in all my cases, is a symptom which is most suggestive of a toxic absorption. Selection is shown by a special affection of the extensor groups and the interossei, and occasionally one muscle, or one set of muscles, may be picked out. One compares this condition with alcohol poisoning where the extensors of the legs are affected, or lead poisoning where the extensors of the arm and hand are picked out, or diphtheria toxin where the eye muscles are specially selected.

Increase of reflexes, which I have found an almost invariable symptom, point to some irritative cause.

As regards the joints, the bilateral character of the invasion, and the progressive involvement of joints, point to the blood stream as the actual means

of transit of the poison, wherever the site or focus of infection, bowel, uterus or elsewhere, may happen to be. The beneficial effect of washing out of stomach and colon, and the action of certain so called intestinal antiseptics on the joint condition, is some evidence in favour of the toxin being generated in certain cases, in the intestinal canal.

PATHOLOGICAL.

In the course of a review of the literature on this subject, one recognised that the joint lesions in chronic rheumatoid arthritis have been very fully examined and described, both as to naked eye and microscopic characters, and a large amount of bacteriological work has also been done upon these, with generally a negative result.

So little, however, has been published with regard to the organic changes, occurring simultaneously throughout the rest of the body, that I considered it would be interesting and profitable to make the observations detailed in this thesis.

Before proceeding to summarise my own observations, I may mention that the only literature I have had access to on this branch of the subject is some observations by Bannatyne of Bath, published in the recent edition (1906) of his book on rheumatoid arthritis. He has noted some microscopic changes in the muscles, in the central nervous system, and in the nerves, which have already been referred to. He mentions changes in the heart in regard to endocarditis and pericarditis, and he goes fully into the blood condition and also into the skin changes where his observations are similar to those I have found and described.

He has apparently made no examination of the other organs of the body.

In the spleen, in all three of my cases, I have found the most prominent histological change in thickening of the walls of the central artery of malpighian body, this thickening being of the nature of a hyaline degeneration. The capsule and trabeculae are also more or less thickened, and there is dilatation of the sinuses of the pulp, with some thickening of walls. This is usually described as chronic venous congestion of the organ.

In the liver, Case A. shows no important change except of fatty infiltration in the portal zone. Case B. shows an increased amount of connective tissue in the portal tract, with thickening of the walls of the ducts and of the vessels. Case C. shows a more marked degree of fibrosis of the organ, strands passing in from a thickened capsule and involving portal tracts with ducts and vessels. All these show greatly thickened walls.

The principal changes in the kidney are apparently primarily arterial, and the new tissue has undergone hyaline degeneration. In some part in all three cases the glomerulus is markedly hyaline. Waxy change was excluded by suitable staining methods. Bowman's capsule frequently showed fibrous thicken-

ing, and throughout the organ, particularly along the vessels, were localised patches of fibrous connective tissue.

In the pancreas, the pathological changes are even more marked, increase of connective tissue throughout the organ being very extensive in cases A. and C. There is degeneration of the parenchyma, hyaline thickening of vessels and ducts, with a proliferation of the lining epithelium of the latter. Both cases show thrombosed vessels and case A. shows also a haemorrhage into the substance of the organ.

Case C. shows also a collection of mucous like glands, opening into the main duct, the significance of which is not apparent.

Case B. shows a fairly normal parenchyma, but very marked thickening, fibrous and hyaline, of the ducts, great and small, and to a less extent of the vessels.

In the skin sections, all three uniformly show atrophy of epithelium, glands, and hair follicles, flattening of the papillae of the corium, increase of fibrous tissue in the cutis vera, with hyaline degeneration in the deeper layers.

The ovary of Case A., being of a woman of 57, shows little abnormality, except in the greatly

thickened vessels, the coats of which are markedly hyaline.

The ovary of case B., a girl of 24, is pathological in its almost total absence of germinal epithelium and follicles, in its extensive fibrosis, and in the thickened hyaline vessels.

The hollow organs, stomach and bladder, were to the naked eye markedly thickened, this change being principally in the muscular coat.

Amongst these pathological changes, perhaps the most remarkable are those described in connection with the skin changes which are evidently widespread. It is difficult to account for these otherwise than on the ground of an apparent specific neurotrophic origin, and probably in addition they may partly result directly from the arterial changes. These arterial changes being so widespread throughout the body, can only be explained by the circulation of some chronic irritant in the blood stream, which, in its course, involves joints as well as organs. I am therefore of opinion that the joint changes are merely symptomatic, and that they are only part of a general chronic toxaemia.

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