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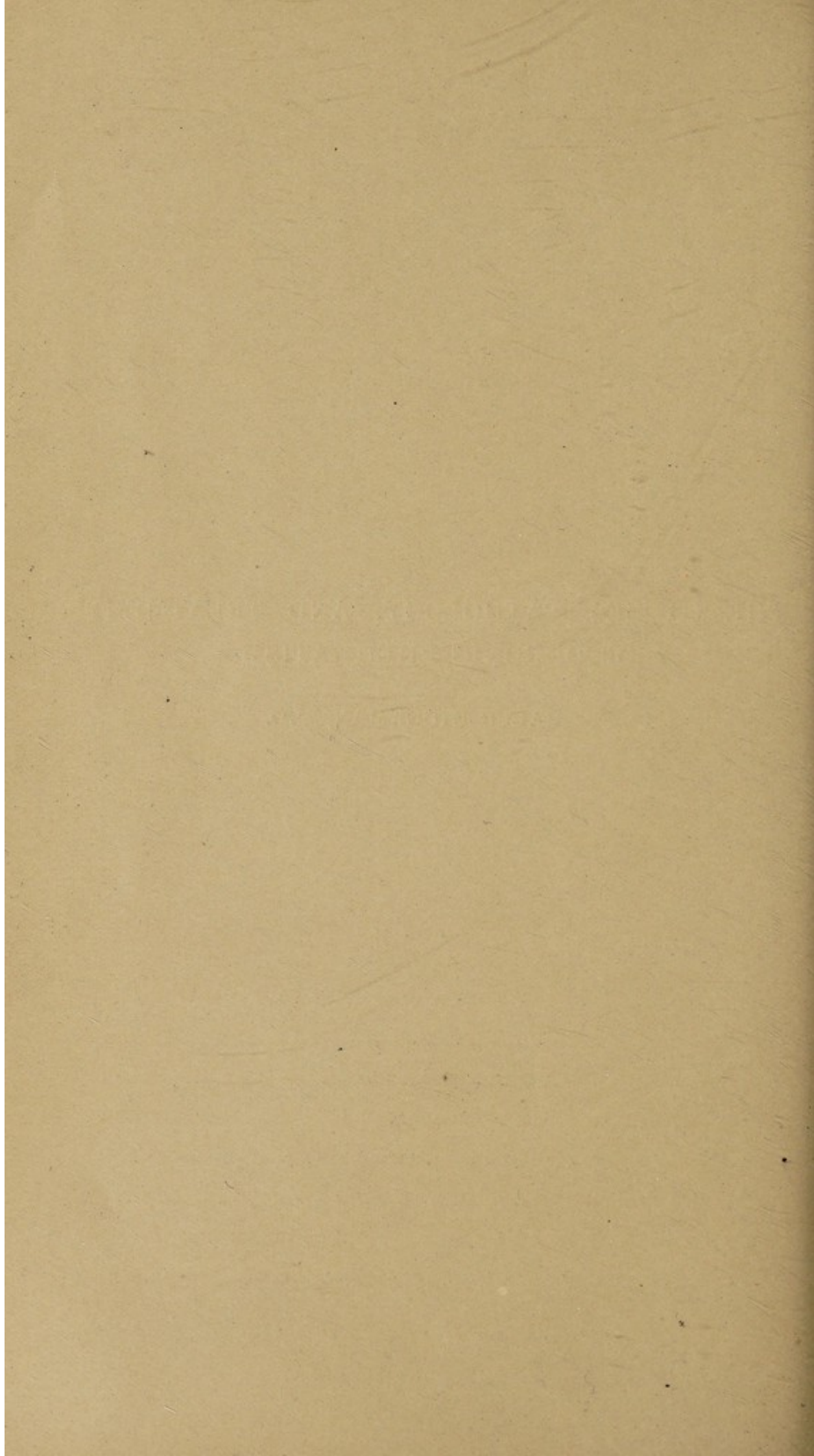
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THE CAUSES, PATHOLOGY, AND TREATMENT  
OF CHRONIC RHEUMATISM.

BY RALPH STOCKMAN, M.D.







## THE CAUSES, PATHOLOGY, AND TREATMENT OF CHRONIC RHEUMATISM.

By RALPH STOCKMAN, M.D., *Professor of Materia Medica and  
Therapeutics in the University of Glasgow; Physician to the  
Western Infirmary of Glasgow.*

(PLATES I. AND II.)

**Introduction.**—Acute rheumatism (rheumatic fever) is an acute microbic infection running a course of variable duration when untreated, and usually presenting certain well-defined symptoms, which render its diagnosis a comparatively easy matter. One attack predisposes to others. Those cases we are accustomed to call “subacute rheumatism” are really milder cases of the same disease, and no hard-and-fast line of distinction can be drawn. A case of acute rheumatism may be unusually prolonged, but never becomes chronic in the true sense of the term. That is to say, it never becomes chronic any more than enteric fever or diphtheria becomes chronic. These diseases may leave sequelæ in the form of bowel lesions or peripheral neuritis respectively, but such sequelæ are not designated as chronic typhoid fever or chronic diphtheria. In the same way, acute rheumatism may cause inflammation, followed by fibrous thickening, of the valves of the heart, or of the aponeuroses, fasciæ, ligaments, and nerve sheaths, but these are sequelæ or effects of the original disease, and not an indefinite continuation of it. These thickenings of the fibrous tissue give rise to



symptoms of pain referred to the muscles, joints, and nerves; but such symptoms or the lesions causing them cannot be properly designated as "chronic rheumatism" in the strict sense, more especially as acute rheumatism is not the only condition which precedes them and is responsible for their presence. Nevertheless, the name "chronic rheumatism" has been so long and so universally applied to chronic painful conditions of the muscles and joints that its retention is now a matter of convenience. In the popular mind, and also to some extent in the medical mind, the name has been long associated, specially and almost exclusively, with affections of the joints, and formerly when so many separate and quite distinct articular lesions were classed together as "rheumatic" this idea was to a large extent justified. Gradually, however, the meaning of the term has become much narrowed by more accurate diagnosis, and we now distinguish rheumatoid arthritis, morbus coxæ senilis, coxa vara, pulmonary osteo-arthritis, Haygarth's nodosities, septic and gonorrhœal arthritis, and other diseases and affections implicating the joints, as things quite distinct from each other and from chronic rheumatism. It is also very generally recognised that the articular structures proper—bone, synovial membrane and cartilage—are not primarily affected in chronic rheumatism, but that the parts implicated are the fibrous ligaments of the joints, and more especially the aponeuroses and fibrous insertions of the muscles, fasciæ, the periosteum, and the fibrous tissue generally of the muscles, bones, and joints. Any widespread or localised pain or stiffness occurring in these structures, and especially if it recur from time to time, is generally classed as "rheumatic," provided no other definite cause can be assigned. In our systematic treatises the condition is described under the headings "Chronic Rheumatism," "Muscular Rheumatism," "Mus-



cular and Tendinous Rheumatism," "Myalgia," and "Rheumatic Myositis," pain being assigned the most prominent place as a symptom, and damp cold as a cause. Regarding its pathology and essential cause, widely different opinions are expressed, but for the most part without any reasoned criticism or argument. By some authors it is regarded as an attenuated form of acute rheumatism (Pidoux, Bristowe, MacLagan), by others as a neuralgia (Senator, Osler), or a special infection (Strümpell), or a diathesis (Durand-Fardel), or pain from imperfect nutrition (Inman, Anstie). Others regard it as closely connected with gout (Garrod, Hutchinson), and it is often explicitly explained that it occurs quite independently of acute or subacute rheumatism. It is variously stated to have no pathology, to be merely a neuralgia, to depend on active hyperæmia of muscles, or slight inflammatory changes in their fibrous elements, or hyperæmia of the nerve sheaths. A very few authors refer to the presence of definite fibrous thickenings. Its treatment is mentioned in more or less general and vague terms, which are practically identical in all our current text-books, and not much hope of recovery is held out.

Our knowledge of the nature of chronic rheumatism, its causation, and its treatment can scarcely, therefore, be regarded as in anything but a chaotic and unsatisfactory condition. I trust the following systematic summary of many cases which have been treated under the observation of my clinical class in the Western Infirmary and in private practice may help to put matters on a more satisfactory basis.

**Pathology.**—The essential pathological changes in chronic rheumatism are confined to white fibrous tissue, and as this forms so large a part of the locomotory apparatus of the body, we find accordingly that rheumatism affects specially the aponeuroses,



tendons, the sheaths of muscles and nerves, periosteum, fascia, and the fibrous ligamentous structures of the joints. The lesion consists in inflammatory hyperplasia of the connective tissue in patches, most probably the result of the action of microbes or toxins conveyed by the blood vessels, and it may be widely spread over the body, or confined to certain areas. The irritant gives rise to proliferation of the fibrous tissue with serous exudation into the inflamed circumscribed parts, which are tender, painful on pressure, and, if large, can be easily felt or seen in the muscles and fasciæ, and on the sternum or other thinly covered bones. At first they may resolve readily enough, leaving no apparent traces behind, but they tend to return on slight provocation, and if much new fibrous tissue forms in the affected area they become permanent, and often increase to a considerable size, or spread out over a large area. The older and more fibrous they become the less tendency they have to disappear spontaneously or on treatment. These indurations assume various forms. Sometimes, especially in the lumbar region or in the fascia lata, large portions of the aponeurosis or subcutaneous fibrous tissue become more or less uniformly thickened, with perhaps more prominent indurations at certain points. In severe cases this gives the skin a hard, inelastic, and brawny feel. More commonly the fibrous indurations are more defined and circumscribed, varying in size from a small-shot or split-pea to an almond, or even half a walnut. The larger ones may be rounded or flattened, the smaller ones often feel like beaded chains along the fibrous edge of a muscle or aponeurosis. Very frequently the thickening takes the form of a strand or cord running through the fascia or subcutaneous fat. Sometimes they are deeply placed in the inter-muscular septa, sometimes quite superficially in the subcutaneous



tissue, in which case they may adhere to and often slightly pucker the skin. They can often be felt also as small tender projections on the surface of the ribs and other thinly covered bones. When pressed upon they give rise to pain, and if they are vigorously rubbed they swell up in a few hours and become much more painful on pressure. In the same way the fibrous hyperplasia which often results from a sprain, rupture of a muscle, dislocation, or other injury may form a purely local lesion of the same kind, which may give rise to "rheumatic" symptoms. Under the action of certain irritants (cold, damp, meteorological changes, muscular exertion, indigestion, and unknown toxins) these indurations are apt to swell and become tenser, and then they give rise to stiffness, aching, or acute pain. The local tension probably exerts pressure on the filaments of sensory nerves; hence these symptoms. Sudden movement of muscles, by increasing the tension or by exerting pressure on the swollen tissue, often greatly aggravates the pain or causes it to shoot excruciatingly. A branch of a nerve may be pressed upon by a nodule, or may even pass through it, hence the pain often radiates over a wide area, perhaps far from the nodule. If muscular movement of the part be kept up, or gentle friction be exercised over the induration, the exudation is temporarily got rid of, the tension is lessened, and the pain and aching generally pass off, usually to return again in two or three hours. One such fibrous nodule in the lumbar region is enough to cause very obstinate and painful lumbago.

Nerve sheaths are probably affected in the same way. I have never been able to obtain a portion of an affected nerve for histological examination, but clinically it may readily be determined that a superficial nerve, such as the temporal, is very painful on pressure over a limited area during an attack of



"rheumatic" neuralgia, while numbness, prickling, and tingling (the results of slight compression) are frequent and recognised manifestations of chronic rheumatism.

The histology of these indurations was studied from a number of them which were excised by my surgical colleague, Dr. J. Crawford Renton, and which were either too acutely painful to be effectively massaged or had not disappeared under prolonged treatment. They include specimens from muscle, from the subcutaneous tissue, and from periosteum. The photographs (Plate I. Figs. 1 and 2) were taken from sections of a small nodular swelling in the buttock. The patient, a man *æt.* 45, had been subject to muscular rheumatism with occipital and sciatic neuralgia at frequent intervals for ten years, sometimes suffering very severely from exacerbations. The present attack had been brought on by exposure to cold while perspiring freely, and had lasted for three months. He never had any pains in his joints. On examination, a considerable number of small nodules and fibrous thickenings were found in the neck, loins, and buttocks. Many of these were very tender and painful on pressure. The nodule in the right buttock could be very distinctly felt through the skin, and gave the impression of being the size and shape of a small almond. It was very painful, and from it the sciatic pain seemed to dart down the leg. After carefully fixing its position, Dr. Renton cut down upon it, and when exposed it was seen to consist of a swollen and slightly projecting portion of the perimysium of the gluteus medius muscle extending for about half an inch. The swelling with the adjoining portion of muscle was removed, hardened in formol-alcohol, and vertical transverse sections made from it. These show that it is a portion of the fibrous tissue sheath of the muscle, greatly hypertrophied and œdematous, and consisting of white fibrous



tissue and an amorphous sero-fibrinous matrix. At some places the fibrous tissue has penetrated inwards between certain of the muscle fibres, and a few of these have partially degenerated—more likely from the action of a toxin than from pressure. Fibro-blasts are not numerous, and there is no congregation of leucocytes in the neighbourhood of the inflamed area. The small blood vessels show very distinct periarteritis and endarteritis with marked connective tissue proliferation, indicating that they also have suffered from the action of an irritant. The swelling is therefore a chronic, but still comparatively recent, localised inflammation of the perimysium. After its removal the sciatic pain and the aching completely disappeared.

Some of the fibrous nodules lie immediately under the skin, with which they are continuous and to which they may give a puckered appearance. A photograph taken from a section of one of these is shown in Plate I. Fig. 3, the true skin and the dense fibrous tissue of the nodule being continuous with each other. Others lie in the subcutaneous fatty tissue, forming irregularly shaped often branching masses of fibrous tissue, or mere thin strands (Plate I. Fig. 4). They increase in size by the fibro-blasts spreading along the connective tissue of the fat cells (Plate II. Fig. 5).

After being massaged for some time, the serous exudation disappears, the tissue becomes denser and harder, and on being excised the little swelling has the feel and appearance of a piece of hard fibrous tissue, or a thin strand of the same. Plate II. Fig. 6 shows a section of such a nodule; the fibrous tissue is closely packed, the interstices have mostly disappeared, and there is an extraordinary degree of periarteritis and endarteritis, with numerous blood vessels (Plate II. Fig. 7). These hard nodules are



sometimes very painful, and if they involve a nerve may cause aching and shooting pains over a wide area. Their excision gives complete relief.

A quite recent example was obtained from a periosteal swelling on the sternum which had all the characters of rheumatic periostitis. It was about half an inch in diameter, slightly raising the surface of the skin, doughy on palpation, and very tender on even slight pressure. It was incised and a small portion removed. The incision relieved the tension and lessened the pain. The patient, a man *æt.* 35, had been ill for about eight weeks with severe muscular pains and slight arthritis. The swelling on the sternum had been there for three weeks or less, and many tender painful nodules were found in the loins and elsewhere. Microscopical examination showed that the swelling consisted of proliferating fibrous tissue, *œdematous*, and containing a good many fibro-blasts, numerous blood vessels, and many newly formed or forming capillaries. At some parts the fibrous tissue was older and denser than at others. There was an entire absence of any local leucocytic reaction, and the connective tissue in the walls of the blood vessels was greatly increased in amount. I was unable to detect any micro-organisms in the tissue, but the staining methods may not have been suitable. The irritation must be due either to a toxin, or to a small local invasion of microbes.

**Note.**—It has long been recognised (Balfour, Scudamore, Fuller, Durand-Fardel) that chronic rheumatism is not an arthritis, but an affection of the great fibrous tissue structures of the muscles, bones, and joints. Changes do not occur in the articular cartilages, nor in the bones, except secondarily. Virchow and others have described the condition as it affects the fibrous tissue of muscles, but they mostly examined muscles in which the fibrous



changes were much more advanced than in ordinary clinical cases. So far as I am aware, the presence of definite fibrous thickenings in chronic rheumatism was first mentioned by Dr. William Balfour (1816). He wrote a book on the subject, in which he describes several of his patients as having a large number of nodular tumours and thickenings which were painful to the touch, and from which pains shot to neighbouring parts. In one case he observes that "the fascia of the muscles and sheaths of the tendons were thickened, knotty, and puffy," and that the origins and insertions of many muscles were painful. He recognised the importance of these fibrous tissue growths as the cause of chronic rheumatism, and his whole treatment was directed to getting rid of them. His work has been practically forgotten. Scudamore (1827) was also well aware of the fibrous tissue changes in chronic rheumatism. He describes them as follows:—"Bursæ enlarged, thickened, and hardened, tendinous sheaths distended and thickened, and the tendons knotty at their insertions and often contracted, the aponeuroses thickened, and muscles which seem like a mass of ligament." In a case reported on page 406 of his book he describes numerous small tumours as being present in the fascia lata of each thigh, and he often mentions periosteal nodes. Later, Froriep (1843) laid great stress on these indurations (which he called *rheumatische Schwielen*), and described them in detail as occurring in the connective tissue of the skin, aponeuroses, and periosteum. He says that out of one hundred and fifty cases of chronic rheumatism he failed only twice to find them. Since his time Berghman, Helleday, Ewer, Hackenbruch, and Strauss have specially drawn attention to the importance of these fibrous tissue swellings as the cause of chronic rheumatic pain. Judging from the almost entire absence of recent writings on the subject in this



country, their importance and frequency have not been widely recognised. Cases of the occurrence of "rheumatic nodules" in adults have been reported by Mahomed, Duckworth, Fowler, and Middleton, but more as curiosities than as a matter of very wide and general interest.

**Etiology.**—In discussing the etiology of chronic rheumatism it is necessary to differentiate between—(1) The original causes of the local fibrous thickenings and nodules, and (2) the causes of the subsequent rheumatic attacks, when the fibrous indurations have become fully established, and the individual is subject to frequent and recurrent "muscular rheumatism" (chronic rheumatism), or to persistent "rheumatic" neuralgia.

I. ORIGINAL CAUSES.—Of these acute rheumatism is certainly one. The ephemeral nodules seen in children are well known since Barlow and Warner described them in 1881, but both in children and in adults permanent fibrous indurations often remain as the result of acute rheumatism. These fibrous changes may be slight and widespread, not capable of being felt by palpation, and giving rise merely to slight stiffness in the muscles and joints, or they may be felt as small tender thickenings on the aponeuroses, tendons, and ligaments, which are often persistently aching and painful. They ache with changes of weather, and often persist for months or permanently. Peripheral neuritis, with pain, numbness, paralysis, paresis, and wasting of muscles, may also occur after acute rheumatism, and, as previously observed, is probably a result of thickening of the fibrous nerve sheath. These are affections or sequelæ resulting from acute rheumatism; they are probably due to the action of toxins on the fibrous tissue, or may possibly be the result of damage produced by the actual presence of the causal micro-organisms, and they differ entirely from the original disease



in their nature and in the treatment required to cure them. Scudamore says: "The acute rheumatism very commonly produces a troublesome sequence of stiffness, debility, and aching of the limbs, most felt in the morning and at night, for which exercise and frictions should be used." Fuller also lays stress on this: "After the acute or subacute symptoms have passed, tenderness and aching remain in ligaments, tendons, fasciæ, and aponeurotic sheaths. They are thickened, stiff, and inapt for motion."

I have often observed the formation of these indurations in adults during acute rheumatism, the following case being a fairly typical example. During an attack of acute rheumatism, and when the temperature and pulse had returned to normal conditions, the patient, a young man, æt. 24, still complained of severe pain and aching in various parts of his body on exposure to draughts, or during damp weather, or without any apparent cause. There was great tenderness at the sternal part of the first and second intercostal spaces, on the outer condyle of one humerus, on the ligamentum patellæ, over the instep, and elsewhere. No distinct indurations could be felt in these places, but they were slightly doughy and very painful to touch, and ached as above described. There was pain over the upper sternum on respiration. Several very painful nodules were present in both calves and on certain of the ribs. There was grating in the palm of the hand from tendo-synovitis. His back muscles were very stiff, but no distinct indurations could be made out. On some days he was nearly free from pain, on others he suffered severely, and improvement under treatment was very tedious.

Slight febrile attacks with pain and aching in the muscles and bones, often described as an "influenza cold" or a "rheumatic cold," also cause these fibrous thickenings. Leube thinks it is a



specific infection, and possibly an attenuated form of the rheumatic virus. Dr. Newton, in reporting an epidemic of forty-three cases of "acute muscular rheumatism" which occurred in his practice, expresses the opinion that it is identical with acute articular rheumatism. Repeated attacks of these "muscular colds," whatever their true nature may be, bring on chronic rheumatism in time.

True influenza is often followed by these fibrous thickenings, and sometimes in a very severe and widespread form. They are probably sequelæ of the changes causing the aches and pains in the bones and muscles, which are prominent symptoms in certain cases of influenza, and which are almost certainly due to local irritation of fibrous tissue by the toxin or microbe of the disease,

Pitt states that fibrous nodules occur also with osteo-arthritis. They are said to come on after scarlatinal rheumatism, but I cannot confirm this from my own observation. I have, however, seen them after gonorrhœal inflammation of joints and of the plantar and lumbar fasciæ.

Persons who are subject to repeated attacks of sore throat often suffer from chronic muscular rheumatism, and in this case the irritating agent may be absorbed from the tonsil or pharynx.

It is true, however, that persons who say they have never suffered from acute rheumatism, muscular colds, influenza, or sore throat, are sometimes martyrs to chronic rheumatism, and have fibrous indurations. These come on insidiously, and are only noticed when they begin to give trouble. In some patients no other cause can be assigned than a history of frequent exposure to cold and wet, or to extremes of heat and cold, accompanied often by hard muscular work. Such a person complains that he is



gradually getting stiffer than he used to be, and in time chronic rheumatism develops. Possibly in some cases irritating toxins absorbed from the bowel may act as the cause. I do not think, however, that muscular rheumatism has any relationship to gout, or that it can be brought on by any particular errors of diet.

Symptoms closely resembling rheumatism occur in lead poisoning (apart from gout), and here there is increase of the connective tissue of the muscles and nerve sheaths, which probably accounts for the cramp-like and neuralgic pains.

Local injuries, as previously explained, may result in fibrous hyperplasia, and in the case of a joint, or an important aponeurosis or tendon, this may give rise to severe local rheumatism and varying degrees of disablement. Frequent slight traumata from over-exertion (as in athletes, gymnasts, labourers) may have the same effect. At least these people tend to suffer from chronic rheumatism, and I have been often unable to find any other cause for it than their occupations.

With regard to the part which age plays in the etiology, chronic rheumatism is said to be a disease of maturer years; but this is hardly correct. A slight degree of it constitutes the "stiffness of age," but it is not a necessary concomitant of advancing years. It is very common in adolescents and in early middle life.

Chronic rheumatism therefore is not a diathesis. It is a local affection of the fibrous tissues, and results from several preceding causes.

II. THE CAUSES OF PAIN AND ACHING AFTER THE FIBROUS INDURATIONS HAVE BECOME FULLY ESTABLISHED.—In discussing the pathology of chronic rheumatism, it has been already explained that the immediate cause of the pain and aching is swelling and tension of the fibrous indurations. The exciting causes are very



evident, and are well known to all sufferers from the affection.

*Weather conditions: Cold, damp.*—Various meteorological conditions, damp or cold weather, lying or sitting on damp ground or on a cold seat, exposure to draughts, wet clothes, usually bring on an acute exacerbation, which may be repeated before the previous one has quite passed off, and in this way the patient may be seldom free from aching pains. The greater part of the body may be affected, or only the part which may have been specially exposed (lumbago, pleurodynia, stiff-neck, and so on). If the person is in vigorous health, in the open air, and indulging in active exercise, frequently no evil effects follow a wetting, but one can never count on this. The rheumatic pains are most apt to ensue when leading a sedentary town life, and often on very slight exposure. The approach of rain, sudden changes in the weather, and east winds, also cause aching and pain. It is very difficult to explain the action of these different meteorological conditions. Longstreth says that the painful symptoms do not correspond to rain, but rather to a lowering of barometric pressure. A rapidly rising barometer is also, he says, accompanied by pain. Patients have often told me that when rain actually commences, their pains lessen, and that they can tell its approach even when in bed, so that it is not a question of exposure. It is a matter of popular knowledge that old injuries, wounds, and corns ache with changes of weather; and Weir Mitchell has found, from careful inquiries in fifty cases of old amputations, that more than half of them could foretell a change from dry to wet, or from wet to dry, or a change of wind, from the painful sensations in their stumps. Possibly the atmospheric changes may increase or lessen the lymph pressure in the body, and so increase or lessen the tension



in the new fibrous tissues. I am unable to suggest any more definite explanation, but we may remember that many plants and many domestic and wild animals show plainly by their behaviour that they are conscious of impending weather changes long before these actually occur, and in the case of plants at least this must be due to some influence exerted on the cell contents, and not to the memory of previous experiences.

*Unusual or violent muscular exertion.*—Chronic rheumatics are often very unwilling to take moderately violent exercise, owing to the prolonged stiffness and aching which usually follow it. A single severe wrench sometimes starts aching in a nodule or strand, and this may go on for weeks. It is apparently due to local causes, for riding brings on aching in the thighs, bicycling in the lower extremities, golfing in the arms and back, leaving in each case the other parts comparatively free. The pain can often be located in a particular induration or in more than one, to which it may return again and again; sometimes, however, it is more diffuse, and radiates.

*Disordered primæ viæ.*—An acute indigestion brought on by a big dinner with mixed wines often starts more or less prolonged aching in certain of the fibrous tissues (lumbago, joints, etc.). The champagne and port are often specially blamed, and the aching is attributed by doctor and patient alike to gout. The real cause is probably intestinal fermentation with absorption of an irritating toxin which specially affects the fibrous indurations. It results from over-indulgence in rich food and a consequent indigestion, rather than from any special article, and this is shown by the fact that if such a dinner is well digested and agrees well, no aching follows on it.

Chronic intestinal indigestion has a similar effect. The tongue



may be clean and the appetite good, but there is flatulence, a constant tendency to slight or severe headache, and very often temporal neuralgia. As long as these symptoms last, the fibrous indurations tend to ache. Scudamore drew special attention to disordered bowel as a cause of rheumatic pain, and treated such patients with mercurial purges.

*Pharyngitis, etc.*—An attack of pharyngitis, or an “influenza cold,” also cause all the indurations throughout the body to ache, and are common causes of acute exacerbations.

These are, in my experience, the most frequent and obvious causes of pain and aching in chronic rheumatics, but no doubt there are others.

**Symptomatology.**—In considering the etiology of chronic rheumatism, I mentioned feverish attacks accompanied by muscular pains as one of the causes. In text-books this is often called “acute muscular rheumatism,” and in practice “influenza.” As it is probably a frequent, if not the most frequent, cause of inflammation of the muscle connective tissues, a short description of its symptomatology may not be out of place here. Nothing is known regarding its bacteriology, but as it is so constantly accompanied by sore throat, the idea inevitably suggests itself that the original infection is situated in the throat. This, however, is only a hypothesis. It may be due, as Leube has suggested, to an attenuated form of the microbe which is the cause of acute articular rheumatism.

**ACUTE MUSCULAR RHEUMATISM.**—After exposure to damp cold and a preliminary feeling of malaise and chilliness, pain and aching are felt in the muscles and bones, and often slightly in the joints. The pain may be so severe as to prevent the patient



moving, or there may be merely a feeling of tiredness and stiffness sufficient to make any exertion unpleasant. Neuralgia may be present in one or more nerves, and may cause severe suffering. Often there is no rise of temperature, or it may be very slight, there is some disturbance of appetite and digestion, and usually some deposit of urates in the urine. There is often intense sleepiness, or a heavy dull feeling, and a sense of vague cardiac discomfort which sometimes amounts to slight faintness. Pharyngitis or tonsillitis are very often present, but not invariably. The symptoms usually begin about eight to twelve hours after exposure to cold and wet, and they pass off in a few days. During the acute stage the fibrous tissues of the muscles, bones, and joints are distinctly painful to touch or pressure at certain places, and at these places slight doughiness or marked oedematous swelling can be made out. It presents all the characters of a specific fever of short duration, but whether of truly rheumatic, influenzal, or unknown origin, it is impossible to determine definitely. It certainly bears a close resemblance to acute articular rheumatism, but the duration is shorter, and it is not controlled by salicylates with the same decisiveness and rapidity.

CHRONIC RHEUMATISM.—When numerous fibrous indurations have been developed throughout the body, the exciting causes previously described, especially damp and over-exertion, bring on severe attacks of muscular pain and aching, which may also involve various joints and fasciæ, but, instead of passing off in a few days, each attack may continue for weeks, the more acute symptoms of an exacerbation being followed by almost continual aching and stiffness. In severe cases the patient is thus never quite free from stiffness, aching, and pain, and is always liable to



an increase of them on any exposure. Their severity and extent depend on the degree to which fibrous strands, thickenings, and nodules have become developed in the affected tissues. In certain patients it may recur again and again in the same part, as in the muscles of the back (lumbago), neck (stiff-neck), shoulder, legs, etc. Very often only the particular part suffers which has been specially exposed to a draught or to severe exertion, or it may be much more general, or rarely, the periosteal tissues may be chiefly affected.

The chief symptoms are pain, aching, stiffness, a readiness to feel muscular fatigue, interference with free muscular movement, and very often a want of energy and vigour.

The pain may be dull and continuous, or sharp and shooting, or a mixture of both. It is often very severe on any sudden movement which compresses the swollen indurations, as happens frequently in the lumbar region or in the deltoid, especially after the parts have been at rest. More often, perhaps, it is a dull continuous aching or feeling of stiffness and weight, usually worst when warm in bed, or on awakening in the morning, or after resting a part for a time in one position, or after sleeping during the day. There is a dragging feeling of fatigue, and a disinclination for muscular exertion. The aching wears off on active exertion or on vigorously rubbing the parts. All these symptoms tend to be more marked in damp weather. The patient often has difficulty in locating the exact spot of the pain or aching, as these may radiate over a wide area, but on palpation it can be readily made out that certain places are swollen, tender, and often very painful on pressure.

The joints are not infrequently affected at the same time as the muscles, but never seriously as in acute rheumatism. One or



two joints may be very slightly swollen, but usually they are merely stiff and perhaps a little painful.

Interference with the working and staying powers of the voluntary muscles is often a very marked feature.

The sudden pain often felt on movement of the muscles of the back or shoulder may be crippling in its intensity, but apart from this, the muscles are easily tired. The constant aching, stiffness, and tired feeling form a bar to active or continued exertion. The intolerable and prolonged stiffness and aching, which often ensue after athletic exercises and games, usually cause a disinclination for any exertion of the kind, and the person gradually tends to become more and more sedentary in his habits.

During an exacerbation the digestion is often out of order. The tongue may be clean and the appetite fair, but there is often flatulence and a dull headache with temporal neuralgia. There is often almost continual slight sore throat along with these exacerbations.

If a nodule press on or implicate a nerve, severe neuralgic pain, radiating widely and often far away from the nodule, may be present. Occipital neuralgia is often due to a nodule in the neck, brachial neuralgia to nodules in the upper arm and sometimes to an induration close to the spinal border of the scapula, sciatica is often caused by nodules in the buttock, while temporal neuralgia is frequently present and is apparently due to swelling of the nerve sheath. Numbness, prickling, and a sense of weakness are other symptoms of implication of nerves.

Weakness of the back, aching in the fascia lata, and the symptoms which have been called "spinal irritation" are often due to these fibrous indurations. When there are many indurations, the suffering may become practically constant, with exacerbations



on exposure to wet, draughts, fatigue, and indigestion. The general health and nutrition may then be mediocre, there is a loss of energy, frequently depression of spirits, and a tired look in the face. In a case of moderate severity the patient looks quite well, is well nourished, and often works hard.

In severe cases, and especially if there be much neuralgia, digestion and nutrition are very poor, and there may be a good deal of emaciation and neurasthenia, sometimes so much that the patient is a complete invalid. In many women who are regarded by their friends as martyrs to neuralgia, and as hopeless neurasthenics, and who have all the concomitant symptoms of these conditions, the original cause of all their ill-health is found to depend on a widespread development of these fibrous thickenings throughout the body. In men also I have seen a considerable degree of neurasthenia induced, but not to the same extent as in women. The heart and arteries do not become secondarily affected in any way, so far as I have been able to judge.

**Physical Examination.**—During an acute attack the muscles are tender on pressure and feel doughy or swollen at the affected parts, but no indurations can be made out, unless they have been there previously.

On examining a chronic case, the indurations may sometimes be felt quite plainly and are painful on pressure, but for a satisfactory examination it is better to thoroughly smear the skin with liquid paraffin, vaseline, or some fat. The muscles of the part should be relaxed as far as possible. The thumb or tips of the fingers are then passed over the skin with firm, gentle pressure, and the more superficial nodules and indurations can be readily felt. Some of the indurations are soft and ill-defined, giving the impression that they consist largely of serous exudation ;



others are more fibrous and hard. Some are scarcely palpable fibrous cords, often very tender along their whole extent. Occasionally they are like a chain of small-shot or beads running along the side of a muscle or aponeurosis or under the skin. They can often be very easily felt on the periosteum of the ribs. They are tender on pressure, especially those situated just under the skin. It is difficult at first to locate them all, often deep pressure is required, but after a few days of massage they swell and become more painful on pressure, and are then much more easily detected. In very chronic cases, involving a large area of subcutaneous tissue (as in the loins or shoulder), the induration may be general, and, being situated just under the skin, gives the latter a resistant, brawny, and inelastic feeling. When the subcutaneous tissue is thickened in this way, the ordinary tactile sensibility of the skin is dulled, and even a strong faradic current can sometimes be scarcely felt.

The commonest situations for these indurations are in the lumbar aponeurosis, the calves, fascia lata and tendinous expansions of the thigh muscles, the trapezius just above the supraspinous region, the insertion of the deltoid, the inner border of the biceps and its long head, the intercostal and pectoral muscles, the glutei, and the soles of the feet.

The fibrous tissues round the neck of the bladder, of the pharynx and œsophagus, behind the sternum, all along the spinal column, and of the joints, may also be affected, giving rise to dull or acute pain in these situations. The anterior abdominal muscles are very seldom affected, those of the forearm, hand, and anterior aspect of the leg infrequently, except at the origin of the supinator longus muscle.

The symptoms arising from implication of the fibrous tissues about the bladder and thorax often cause much mental anxiety to



patients. In the case of the bladder the symptoms consist in dull pain and increased frequency of micturition, but they usually pass off in a week or thereabouts. When the intercostal muscles and the fibrous tissues of the ribs and sternum are affected, each respiration may cause pain or discomfort, and if the respiration be deepened or accelerated by ascending a hill or a stair, the pain may become acute, and darting or stabbing in character.

When the fibrous tissue behind the pharynx is affected, the symptoms are chiefly subjective. The patient feels as if the parts were slightly swollen, stiff, and uncomfortable, but little or nothing can be made out on inspection.

**Treatment.**—ACUTE MUSCULAR RHEUMATISM.—As previously stated, it is not known whether the pains in the muscles and bones are due solely to a true rheumatic infection, or whether they occur with several febrile conditions. The general treatment is that of a slight feverish attack, and recovery takes place in a few days. If the pains are widely spread over the body, rest in bed, light diet, saline purgation, mild diaphoretics (liquor ammonii acetatis, spiritus ætheris nitrosi, Dover's powder), or mild alkaline diuretics, hasten recovery and give ease to the patient. Sodium salicylate, alone, or with phenazone or phenacetin, greatly relieves the pain and aching; or, best of all, methyl salicylate may be well rubbed in locally. The salicylates, however, do not exercise the same immediate specific action which they show in acute articular rheumatism. A hot bath, followed by a copious perspiration, or a Turkish bath, with well applied massage, if taken in time, may abort the attack.

Very often in such an attack the chief site of the pain is localised to the lumbar region, to the shoulders, neck, chest wall, or lower extremities, and in these places the actual painful area is



often comparatively small and results from serous exudation. This is best treated by massage, followed by passive and active movements. One thorough application of massage may result in cure, or several may be required. The parts are very tender, and the manipulations must be begun very gently by stroking so as to get rid of the exudation and relieve tension; gradually, more severe pressure can be borne, first with the palm of the hand, and then with the fist or knuckles. This is followed by passive and then by active movements appropriate for each part. The local inunction of methyl salicylate, alone, or mixed with an equal part of liquid paraffin, often relieves the pain, or a 10 per cent. solution of menthol in liquid paraffin may be used. Mustard leaves and other local irritants are also beneficial.

CHRONIC RHEUMATISM.—Where fibrous indurations and nodules are present, satisfactory treatment is much more difficult and prolonged. During an acute exacerbation, when the indurations swell up and cause pain and aching, these may be relieved by the measures just described. But the relief thus afforded is only temporary, and in a few hours, or as soon as treatment is stopped, the pains return, to continue for days, weeks, or indefinitely. Besides, the patient remains liable to attacks on every exposure to cold, wet, or fatigue. To obtain permanent cure and complete relief from the recurrent attacks, the fibrous indurations must be completely dispersed, and in all but quite recent cases this is always a more or less tedious and troublesome procedure. The only means which I have found of special value are massage and exercises, the faradic current, and the injection of solution of chromic acid into any of the fibrous nodules which are sufficiently defined to allow of this being done. Of the three, massage is the most important and the most efficacious.



*Massage.*—General massage is of no use. Treatment must be specially directed to any nodules and indurations which can be felt, and to parts which are painful. In many cases, especially in the lumbar region and in the fascia lata, although pain and aching are present, no special thickenings can at first be made out, but after being rubbed for a few days, certain places become swollen and painful, and the exact seat of the lesions can thus be located. Sometimes, however, in these aponeuroses and elsewhere, the thickening is slight and widespread, it cannot be located for special treatment, and then it is more difficult to get rid of. Frequently, too, the thickenings are deeply situated in the intermuscular septa, or in the capsules of the joints, or in the periosteum, and are not easily reached. In carrying out massage, the muscles of the part should be relaxed, the skin should be smeared with liquid paraffin, or some oleaginous substance, and, if necessary, the hairs shaved off. At first the massage should not be too severe, as it is thus apt to irritate the indurations and to cause too much pain and subsequent stiffness. After a few days of treatment, the fibrous thickenings become more painful and defined, and in old-standing cases many of them are only then detected. Once their number and situations are known, treatment may be directed to them more particularly. For the first week or ten days, or even a good deal longer, they are very painful when manipulated (the subcutaneous ones often exquisitely so), and hence the treatment has to be carried out judiciously; but after a time they begin to shrink in size, and become more fibrous and callous. Much more pressure can then be exerted on them, the fist or the knuckles being used, and in process of time they become quite small and hard, and ultimately disappear entirely. The massage should be carried out daily, ten



or fifteen minutes or more being devoted to each region affected; at the beginning and end about two minutes of gentle effleurage should be given, as it soothes the parts and removes serous engorgement. When the nodules are large, well-defined, and few in number, treatment can be carried out on the dry skin or through thin underclothing; but if the induration is widespread, or the nodules small and numerous, the whole part must be rubbed on the bare skin and with some lubricating material. The rubbing should not be too severe, especially at first, as the indurations become thereby very sensitive to pain, and time is lost rather than gained.

To obtain satisfactory cure, the dispersion of the indurations must be complete, otherwise relapses occur, and these are a source of much disappointment. The length of time required to effect this varies very much. Recent soft thickenings can be dispersed in from one to three weeks. A very common time is six to eight weeks; but some cases, and these are not infrequent, require treatment for six to twelve months. In such old-standing cases some of the indurations are got rid of much earlier than others, and if these have been a source of aching and pain, considerable relief is afforded even by a partial cure. Some nodules become very hard and fibrous, and fail to be dispersed by the most persistent and severe rubbing. The rapidity of dispersion depends on other circumstances also. If the nodule can be forcibly compressed against a bony part (as in the upper arm), more effective pressure can be exerted, and it is much sooner got rid of than if it lies deeply buried among fleshy muscles, or alongside the spinal column where it is difficult to reach. This is illustrated by many cases of sciatic neuralgia. If the sciatica be due to a nodule in the buttock, cure is not so difficult; but if the



thickening is in the sheath or in the bed of the carefully protected nerve, it is difficult to reach, and can scarcely be cured by massage. Deeply placed nodules in the sole of the foot, in the tendo Achillis, and at the side of the spinal column, are often impossible to disperse. It is best to have an experienced rubber for some weeks at least, or until the painful stage is past and the indurations have been located. After that, treatment may be carried on by an intelligent person who is strong enough, or by the patient himself for some parts of the body. In many cases the treatment required is so prolonged, and small indurations are so often overlooked and left untreated by the masseur, that it is necessary to instruct the patient himself how to treat them when they begin to ache and give trouble. The treatment of fibrous indurations connected with the joints is conducted on the same principles—hard massage with passive and active movements.

*Exercises.*—The movements should be such as are best calculated to exercise and stretch the muscles and aponeuroses involved. They can be easily devised without apparatus, or better with the aid of a stick, dumb-bells, Indian clubs, and Sandow's exerciser, and should be carried out for half an hour or more daily.

**Historical Note.**—These methods are by no means new. Without going further back than last century, similar treatment was described in detail by Dr. William Balfour (1816). His method was by "friction, percussion, and compression" (bandaging), and he applied it with great success to the treatment of rheumatism of joints, sprains, and muscular pains. He held that the frictions and hard pressure remove the tension in the aponeuroses which is the cause of the pain, and he also emphasised the value of percussion. "If to a tumour recently formed, the

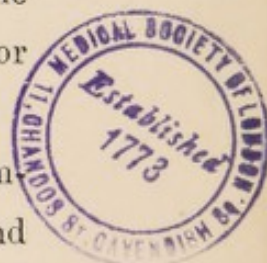


consequences of either a violent sprain or of rheumatism, compression either by friction or bandages, or both, is applied, the swelling immediately subsides, and the motion of the parts becomes free." "Bandages and friction produce their beneficial effects by promoting circulation in the capillaries, and absorption of effused humour." He reports a number of cases to illustrate his methods of treatment, some of them very severe and of long duration, but with which he was remarkably successful. He says, "I venture to assert that in the great majority of cases lameness arising from rheumatism in parts susceptible of compression must be attributed, not to the irremediable nature of the disease, but to those concerned in the treatment—the patient or the practitioner."

Scudamore says it is often impossible to effect cure or improvement in chronic rheumatism without the aid of friction and shampooing. "It tends to excite a better circulation, especially in the veins, to give more tone to the muscular fibre, to overcome rigidity of parts, to stimulate the absorption of synovial secretion or of effusion." He does not, however, show the same practical grasp of the method, nor the knowledge of details, which Balfour does.

In more recent years, Berghman, Helleday, Ewer, Hackenbruch, Strauss, and others have insisted on the value of systematic massage in dispersing these fibrous indurations.

*Faradism.*—The faradic current should be applied over each affected region for five to ten minutes daily, and should be as strong as can reasonably be borne. It is a useful adjunct to massage treatment, but is not so powerful. Its action can be best studied in the circumscribed indurations which lie under the skin. Probably it scarcely reaches some of the others. At first the





current renders them more painful on pressure, but this passes off, and their sensitiveness is finally lessened. Presumably, therefore, it causes the serous exudation to disappear and the indurations to shrink, just as massage does. Froriep used almost exclusively the electro-magnetic current, which gradually removed the indurations in a majority of his cases, but he also employed vapour baths, dry heat, iodine ointment, and liniments as adjuvants. For pain in the soles of the feet he used galvano-puncture. In the treatment of stiff joints, Hoffmann recommends faradism and galvanism as superior to massage, but this is contrary to my own experience.

*Injection of chromic acid.*—This method is only possible where the nodule is sharply defined, and can be accurately penetrated by a hypodermic needle. Strands and diffuse thickenings cannot be so treated, as the needle passes through them, and the fluid only irritates the neighbouring tissues without doing any good. A 1 per cent. solution of chromic acid in water is used, and about 5 to 8 minims are injected. The procedure usually gives rise to some aching, and occasionally to pretty sharp pain, lasting for an hour or two. The previous injection of a 1 per cent. solution of cocaine hydrochloride lessens this, but extreme care must be taken that it is sterile.

The chromic acid causes the nodule to shrink, and often greatly relieves muscular or nerve pain. The nodule is not dispersed, however, and may give rise in the future to pain and aching. The injection can be repeated, if necessary, but the relief is often permanent, and occurs very rapidly. Care should be taken to inject deeply, and not throw the solution into the tissue immediately under the skin, as it may give rise there to pain and phlegmonous induration. The inflamed portion of fibrous tissue is so small



that it is very easily missed, and if this occurs no relief is obtained. To obtain good results, the chromic acid must actually penetrate the inflamed tissue, and this is not always easy of accomplishment.

*Drugs.*—Where intestinal indigestion is present, and this is especially recognised in lumbago, a course of mild purging is advisable—2 or 3 grs. grey powder or blue pill, or compound rhubarb powder, in the evening, followed by a saline before breakfast. As regards specific remedies, it cannot be said that any are known which cause absorption of the fibrous indurations. In quite early cases I have seen potassium iodide give relief, and Graves speaks very highly of its value in lumbago as tested in his own case, but in regularly chronic cases any benefit is not very apparent. Fuller says it is of no value in muscular rheumatism, but in joint rheumatism has some effect, and is very valuable in periosteal cases. Iodine ointment I have used extensively, but I question if it ever reached most of the indurations, or does much good apart from the necessary rubbing in.

Salicyl compounds (salicylates of sodium, methyl, quinine, and aspirin, salicin, etc.) given internally lessen pain during the exacerbations, and often give great relief. Methyl salicylate, applied locally, is absorbed and relieves pain locally, and in distant parts also. Their action is not curative, however, as they cannot be expected to remove fibrous tissue. The same is true of phenacetin, phenazone, quinine, and all similar compounds. Alkalies, ammonium chloride (Fuller), colchicum, arsenic (Scudamore, Hoffmann), cod-liver oil, guaiacum, actaea racemosa, I have found useless, and "Chelsea pensioner" is ameliorative in some cases, probably only through its mild purgative effect.

Counter-irritants sometimes do good, but very often have no



effect. Probably many of the indurations are outside the range of their action. Where the joints, tissues, or periosteum are affected superficially, blistering or painting with iodine liniments lessens pain, and causes more or less absorption of the swelling.

*Spa treatment.*—Recent cases, where the fibrous thickenings are in the early stage and still plastic, may be cured by a course of hydrotherapy, but inveterate cases only obtain temporary relief from their sufferings, which usually return in full force on the first exposure to wet and cold after their return home. The drinking, bathing, and mild general massage, suffice very efficiently to empty the bowel freely every morning, and to promote absorption of the serous exudation in the fibrous indurations. This is sufficient to cure quite recent cases, and usually gives complete relief for a time to the aching, stiffness, and pain of chronic cases, so that the patient feels much more happy and energetic. The indurations remain, however, and on the first provocation they swell and become tender and painful again. The regular purgation (obtained at Harrogate for instance by the action of the sulphur water), and the consequent improvement of intestinal digestion, do great good in certain cases, probably by preventing the absorption of irritating substances from the bowel. The indurated fibrous tissue can, however, only be removed by local and well-directed manipulations, and this is undoubtedly aided by previous hot baths (water, peat, vapour, etc.), as the parts are relaxed and rubbing is much less painful. A spa has this further advantage, that patients are content to give the necessary time for massage and electrical treatment, and have the accessory advantages of elaborate bathing appliances, and of drinking a mineral water. They can also get such exercises as may be thought necessary.



*Hardening treatment.*—Persons who suffer from chronic rheumatism are often excessively sensitive to cold and damp, and develop an exaggerated fear of draughts. They sit in overheated, unventilated rooms, and often overclothe themselves. They also avoid sharp exercise, owing to the prolonged aching and stiffness from which they suffer after it, and they are apt, if they have the opportunity, to indulge unduly in hot baths, as these temporarily relieve the aching by relaxing the tissues. All this tends to soften them, and makes them very liable to chills, and so to acquire more rheumatic thickenings. With the disappearance of the indurations under treatment, all this should be changed, and an active muscular life and hardening régime substituted, but in a common-sense way, and having regard to the patient's age and occupation. Balfour says in his previously mentioned treatise: "For if percussion and compression are beneficial in proportion only as they facilitate motion, it must be admitted that indulgence and rest are the very food of rheumatism."

*Diet.*—Dietetic treatment is of no special value. The broad rule is to avoid gastro-intestinal fermentation, and this is best accomplished by a simple, ordinary mixed diet, avoiding such substances as cause indigestion or flatulence in any particular individual. A heavy dinner with numerous wines often starts a prolonged attack, but this is due, not so much to the wines directly, as to the indigestion which they may have caused. Total abstainers and women suffer from chronic rheumatism equally with the ordinary imbiber. In the same way, sugar and flesh meat are often forbidden to chronic rheumatics, but these are hurtful merely in so far as they cause intestinal fermentation and indigestion, which they do only in a small proportion of people.



*Climate.*—During residence in a dry, stimulating climate, the indurations may entirely disappear, and the individual ceases to suffer from his rheumatic pains. A short sojourn gives relief, but not cure. Some absorption probably takes place, and this, combined with the freedom from continual exacerbations, seems ultimately to lead to their disappearance. On the other hand, a seaside climate and a damp atmosphere increase the symptoms, and favour the conditions which give rise to chronic rheumatism. They often keep the parts aching more or less constantly, so that the patient hardly knows any other existence.

*Surgical treatment.*—It was mentioned previously that certain nodules, after prolonged massage, still remain very hard and fibrous, and cannot be dispersed. If a nerve passes through one of these, or is pressed upon by it, this may give rise to severe pain or continual aching. In such a case the nodule can be removed surgically. The operation is not always an easy one, as the small masses of fibrous tissue may lie pretty deep, and are then difficult to find. Before operation is attempted, they should, as a rule, be well massaged, till they become hard and defined. When they lie in the subcutaneous tissue, or attached to the skin, their removal is a very simple matter, and if their position can be accurately fixed, there is also no great difficulty in excising them from the perimysium. Their removal gives complete relief from the symptoms. Such treatment is only possible for large and well-defined nodules, or where a particular one is causing extreme pain, as in most cases the thickenings are too numerous and widely spread to permit of any idea of surgical interference.

*Prognosis.*—Some cases, mostly in young people, gradually recover without any special treatment, but the usual tendency is to get worse, and for the indurated tissue to become more fibrous



and more widely spread. In cases of ordinary severity, even when the indurations are fairly numerous and widely scattered, recovery is assured if the treatment be persevered in. It requires, however, considerable resolution and determination on the part of the patient, as relapses are common, and he is apt to get discouraged. Many patients tire of the treatment, and give it up as soon as a decided improvement has occurred, but freedom from pain and aching can be counted on only if the fibrous indurations have been quite dispersed. This often requires three to twelve months of practically continuous treatment, but encouragement to go on is derived from the fact that many of them disappear much earlier than others. Soft recent nodules can often be got rid of in ten days, or disappear spontaneously. In very severe cases, where there is great induration and the patient is very stiff and crippled, recovery is hopeless, but by stretching, massage, and manipulations, more freedom of movement may be obtained. When the subcutaneous tissue is much thickened and brawny, as occurs most frequently in the lumbar region, or sometimes in the neck or fascia lata, any very substantial or permanent improvement is rare. In the joints, if the fibrous tissue changes are extensive, or if the bones and cartilages have been affected by prolonged malposition or disuse, or if the muscles are greatly atrophied, the results of even prolonged treatment are disappointing. With single indurations after injury, sprains, etc., the prognosis is good. A continued exposure to unfavourable climatic or industrial conditions may lead to the formation of fresh fibrous inflammations, but these are generally dispersed in a very short time if treated at once.

**Prophylaxis.**—Persons subject to chronic rheumatism should avoid exposure to damp, and especially sitting in a draught in wet



clothes. After acute rheumatism, if any painful or aching spots remain about the fibrous tissues of the joints, periosteum, or aponeuroses, these should be thoroughly massaged until they disappear. The same course should be followed after influenza, scarlatinal rheumatism, "muscular" chills, violent muscular exertion, and stiffness from any cause.

After dislocations, sprains, fractures, rupture of muscles, and similar injuries, local massage and faradism should be employed until the exudation has been completely absorbed. Properly devised passive and active movements are also of great value in such cases.

Chronic follicular pharyngitis and chronic or acute tonsillitis should always be thoroughly treated, as muscular rheumatism seems very often to be associated with infection of the pharynx and tonsils. Digestion, and especially intestinal digestion, should be attended to, and all excesses, such as large dinners with a mixture of wines, carefully avoided.

In a person who has once been cured, any return of the symptoms may be speedily overcome by a course of spa treatment, or a short course of massage. A yearly visit to a spa, or a long holiday, with plenty of outdoor exercise, is advisable, as it gets the digestion into good order and gives a feeling of fitness. When the gastro-intestinal tract is acting well, the pharynx is much less liable to infection. Regular outdoor exercise and indoor gymnastic exercises are of great value, for, as Balfour says, "indulgence and rest are the very food of rheumatism."



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## DESCRIPTION OF PLATES I. AND II.

FIG. 1.—Section of inflamed perimysium forming a painful swelling on the muscle ( $\times 140$ ). It consists of proliferated and oedematous fibrous tissue with an amorphous matrix, and at places this penetrated between the muscle fibres. In the section it is detached from the underlying muscle fibres.

FIG. 2.—Portion of same ( $\times 550$ ).

FIG. 3.—Section of fibrous nodule lying immediately under the skin and continuous with it ( $\times 75$ ). It had been massaged for some time.

FIG. 4.—A strand of fibrous tissue lying in the subcutaneous fat, and spreading into it ( $\times 75$ ). This was painful on pressure.

FIG. 5.—Section of dense subcutaneous nodule spreading into the fatty tissue ( $\times 75$ ).

FIG. 6.—Section of a nodule which lay in the fascia ( $\times 140$ ). It had been massaged, but instead of dispersing became very hard and fibrous.

FIG. 7.—Section of portion of a nodule showing periarteritis and endarteritis and numerous blood vessels ( $\times 75$ ). The nodule had been massaged for some time.

FIG. 8.—Section of recent periosteal nodule ( $\times 140$ ). It shows the increased and oedematous fibrous tissue.





FIG. 1.

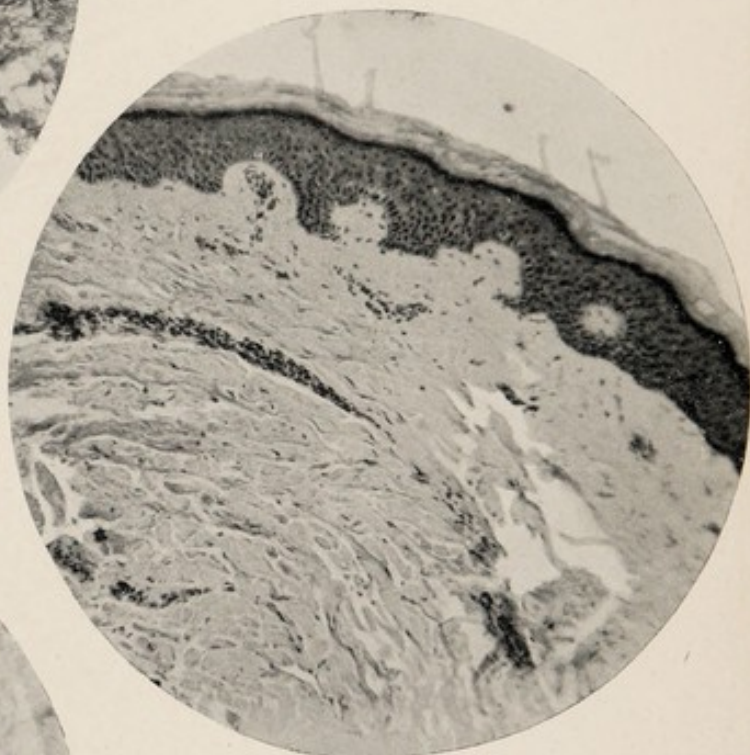


FIG. 3.



FIG. 2.

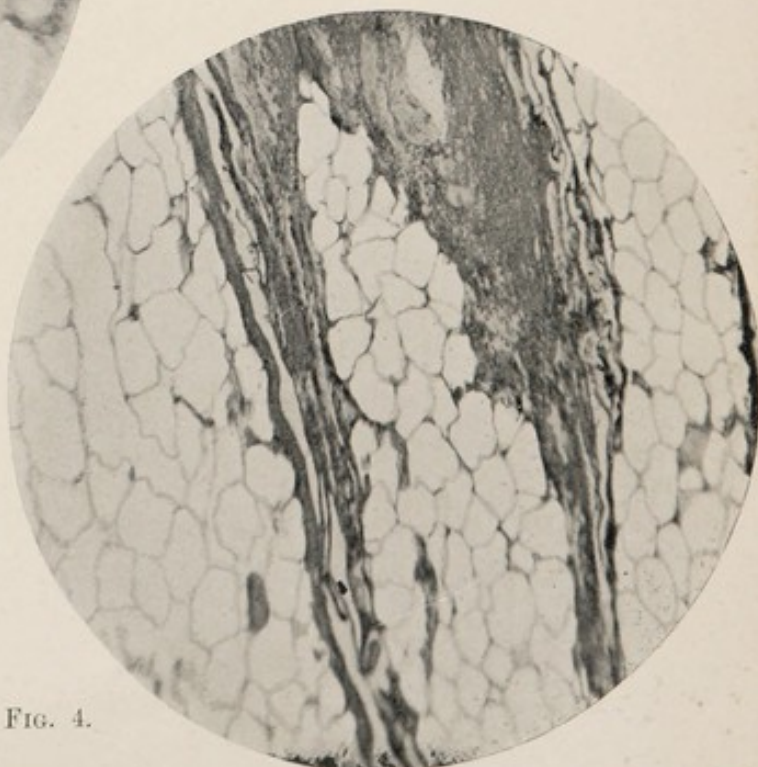
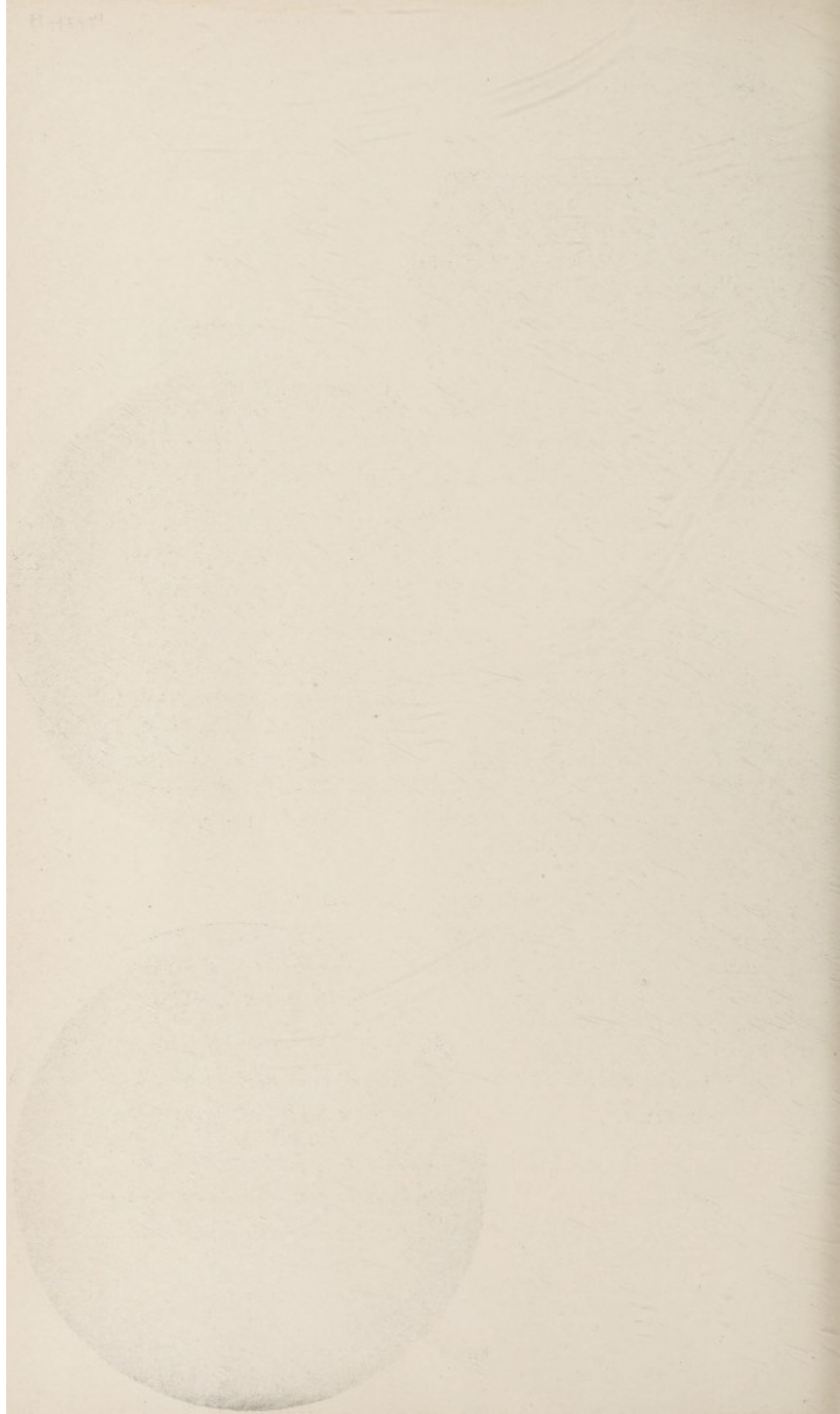


FIG. 4.







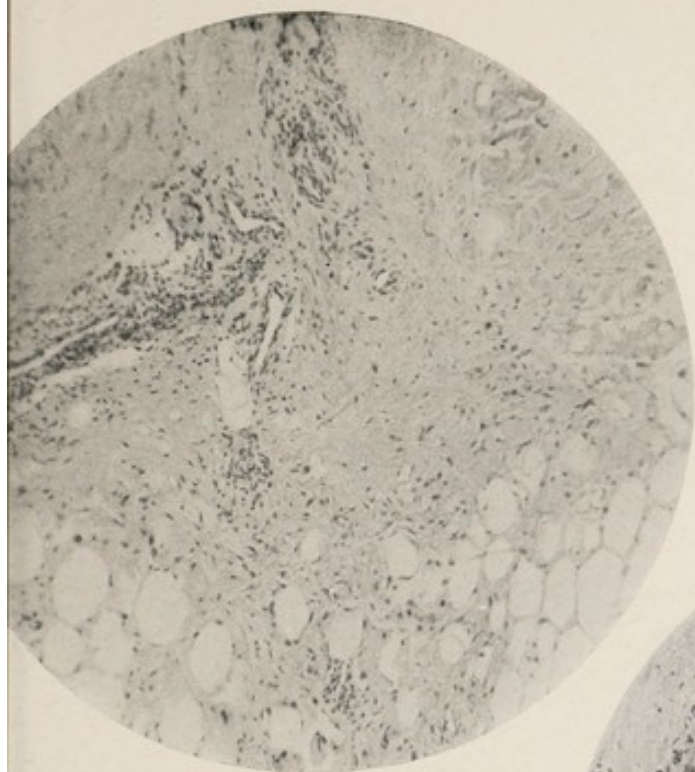


FIG. 5.

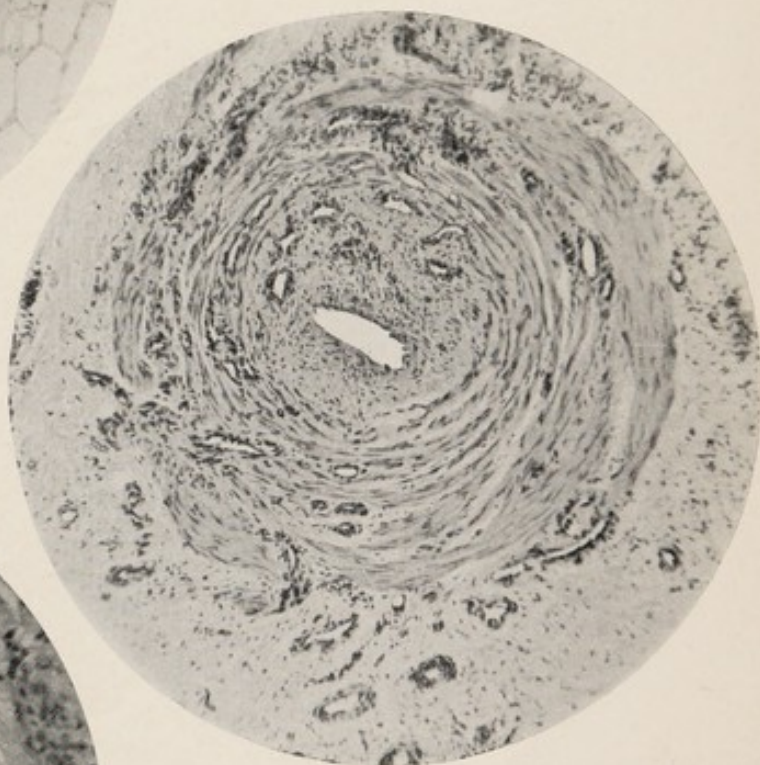


FIG. 7.

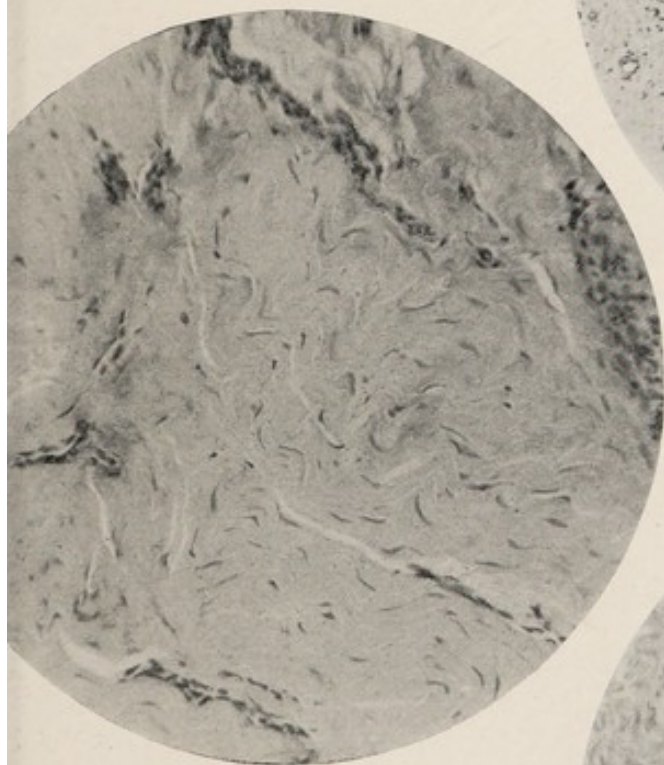


FIG. 6.

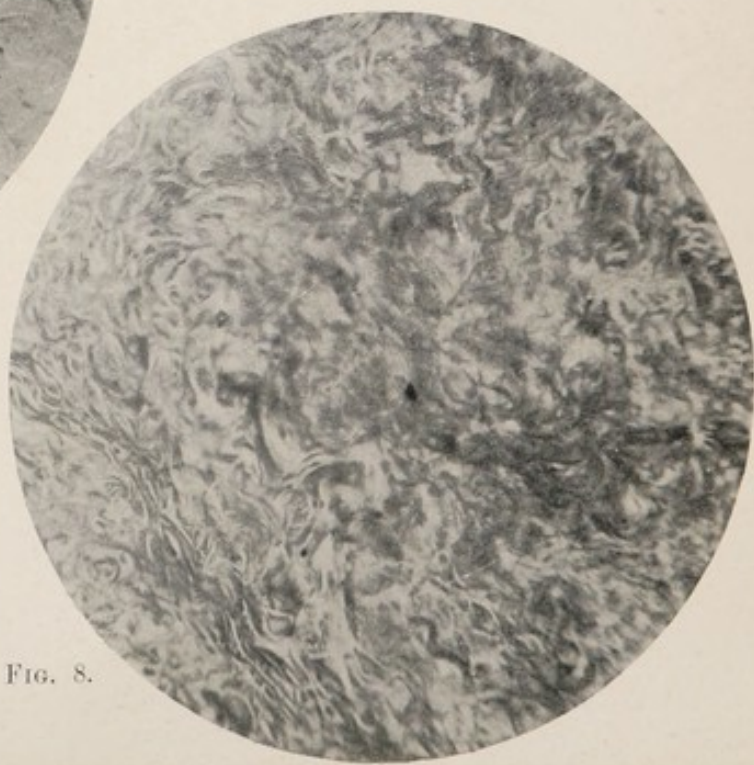


FIG. 8.



