versely thyroidectomy in the rabbit causes hypertrophy of the pituitary. The pituitary-thyroid mechanism controls growth and general metabolism. It is not possible to separate these functions for they fail independently. Clinically, although hyperthyroidism has been described in conjunction with gigantism, the more usual condition of acromegaly shows a shift towards myxoedema. Acromegaly develops slowly, and I have seen a patient of this type from whom a diffuse nodular goitre had been removed. At the age of three she developed infantile paralysis resulting in paralysis of the whole of the left arm, but the interesting feature is that in spite of nervous decontrol the overgrowth of the fingers and hand have not been impaired.

In Cushing's Syndrome due to basophil adenoma of the pituitary there are marked secondary symptoms in metabolism, especially that of fat. In appearance these patients accord more to the hypo than the hyperthyroid type, but in the later stages, or if molested by operation, they are apt to develop a rapid pulse and become anxious. A similar condition obtains after unilateral adrenalectomy in the more advanced cases of virilism. Both these conditions respond well to Lugol's solution. In those rare children who develop isosexual precocity there seems to be a gross upset of this pituitary-thyroid mechanism, which results in lack of growth associated with marked maturity. The paradox is that this condition may be caused either by hypothalamic tumour or adrenal carcinoma. In the latter hyaline changes are found in the cells of the pituitary.

With regard to the gonads, the thyroid may enlarge during the times of stress in the development of the reproductive system. Both the active and deficient functions of the thyroid are associated with depression of sex functions. Experimentally, castration in the dog, rabbit and rat leads to slow involution of the thyroid. Clinically, this was suggestive in a patient who presented himself several years after castration performed abroad.

Patients suffering from hypogonadism have a tendency to be tall, and their epiphyses close late. One of my early intersex patients is growing up with a strong tendency towards acromegaly.

It is doubtful if the thymus gland exerts any endocrine effect, but it is of importance in thyroid surgery. In hyperthyroidism the thymus may be enlarged, and the cause of sudden respiratory failure at operation. After thyroidectomy it undergoes involution. If tadpoles are fed on thymus their metamorphosis is slowed and they develop into giant tadpoles.

Experimental evidence on the thyro-pancreatic relationship are indefinite.

With regard to thyro-adrenal effects the evidence is conflicting. Experimental results indicate that the adrenal cortex inhibits thyroid activity, and where there is an insufficiency of cortex hyperthyroidism ensues. When thyroid is given in the hypocortical state adrenal failure follows. My own experience confirms that unilateral adrenalectomy in marked virilism induces a hyperthyroid like condition, which is controlled by Lugol's solution.

With regard to the adrenal medulla it is generally agreed that thyroid administration increases the sensitivity to adrenaline, and this effect is most marked on the sympathetic. It is probable that the exophthalmos and other signs of hyperthyroidism are due to this cause.

There are those who consider that hyperthyroidism is due to lack of adrenal cortex, and those who consider overfunctioning of the adrenal medulla plays an important part in the genesis of Graves' Disease. This problem is one of practical importance because it forms the basis of the Goetsch test, for studying the effect of the injection of adrenaline into the hyperthyroid patient.

Adrenaline tumours of the medulla, although they produce an anxious and apprehensive outlook during their hypertensive attacks, do not cause the widespread sympathetic release of hyperthyroidism, but exert their constrictive effects more locally on the blood vessels. These tumours may produce mild degrees of cortical activity, and when this is present it is of considerable help in the diagnosis.

THE CHRONIC RHEUMATIC DISEASES (Part II)

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Clinical Points in Joint Examination

1. Pain
2. Swelling
3. Tenderness
4. Stiffness
5. Limitation of movement
6. Crepitus
7. Muscle wasting
8. Deformity
9. Oedema
10. Involvement of surrounding structures.

In this section the two types infective arthritis and osteoarthritis will not be considered separately, but the various points will be brought out in the discussion of the symptom or physical sign.

RHEUMATISM

FIG. 1

FIG. 3

FIG. 2

FIG. 4

FIG. 5

FIG. 6

FIG. 7

FIG. 8

FIG. 9A

FIG. 9B

FIG. 10

1. *Pain.*

Pain is such a constant and outstanding symptom in the rheumatic diseases that it was felt that as much knowledge as possible should be acquired as to its characteristics.

Sir Thomas Lewis and his associates have persistently attacked this problem, and their work has recently been gathered together into book form (Lewis, 1942). The first paper that came to my notice was published in 1933: full references will be found in Lewis's book. The following important points helped in the study of rheumatism.

He tried stimulating the skin in various ways—with a heated wire, a needle prick, pulling a hair, and pinching it with forceps—and he found that if the patient could not see what was being done he was not able to say what method of stimulation had been employed, because the type of pain produced was unvarying. In addition, stimulation of a small cutaneous nerve produced the same type of pain. The description of the pain depended on its duration—if short, it was called "pricking," if prolonged "burning." This single pattern of skin pain is interesting and important, for it enables one to distinguish pain due to involvement

of the skin from that found in other structures. I tested it with bee stings (used in the course of treatment) and nettle stings. The latter seemed to vary to some degree, but mostly because they had a character superadded to their basic quality.

Lewis next investigated muscle by injecting it with hypertonic saline or buffered acid solutions. He injected the solution into a muscle on one side, and on the other worked the symmetrical muscle under ischaemic conditions. He found the two pains to be indistinguishable. He was unable to describe the pain, but was able to say that it was different from skin pain. It partakes more of an aching character, and is familiar to anyone who has used unaccustomed muscles the previous day. Perhaps it is felt best in the thigh adductors after a long day's hunting. The character of the pain is unvarying.

Similar conclusions were reached with regard to the pain produced by injury to web, tendon, periosteum, joints and deep fascia.

In trying to apply this valuable research to the problem in hand, I was able to separate skin pain from muscle pain quite easily. Unfortunately, the pains from tendon and muscle, though different from each other, have qualities which elude

CAPTIONS

- FIG. 1.—Standard Hand. It is usual in cases of diagnostic difficulty to take a standard picture of the hand. Fig. 1 represents a normal hand taken under these conditions.
- FIG. 2.—Here is a typical picture of Heberden's Nodes. It will be noticed, however, that the midphalangeal joint on the index finger of the right hand is becoming affected. This is one of the common forms in which osteoarthritis of the hands appears, the other being an affection of the carpo-metacarpal joint of the thumb.
- FIG. 3.—This picture shows a right hand affected with focal infective arthritis with a normal left hand. This shows clearly the difference between the two.
- FIG. 4.—This picture shows infective arthritis of the knees with decalcification and loss of joint space.
- FIG. 5.—This is a picture of osteoarthritis of the knees affecting especially the left, although there is lengthening of the tibial spine on the right side as well. It will be noticed that there is no decalcification and there is no loss of joint space although the condition is considerably advanced.
- FIG. 6.—This is a picture of infective arthritis of the shoulder ankylosis. This is the most unusual form of infective arthritis.
- FIG. 7.—This picture shows infective arthritis of the hip, showing loss of joint space.
- FIG. 8.—This is osteoarthritis of the hip joints showing the way the femur rises in the acetabula, but only at the point of greatest contact. There is no loss of joint space in the remainder of the joint.
- FIG. 9.—A case of osteoarthritis of the hands showing the appearance of the hands themselves.
- FIG. 10.—A radiograph showing how these appearances are found on the X-ray.

description. It is true that muscle "aches" and tendon "hurts," but every patient has a different way of describing his pain, and only those with a fair vocabulary can go about the description with a chance of being understood.

With regard to the pain in joints, it seems likely again that this is characteristic. Presumably all joint pain arises in synovial membrane, as articular cartilage is relatively insensitive. Patients are able to localise their pain fairly accurately. With the eyes shut, they can tell which side of a joint is being hurt, but the pain is described as a rule as "sharp." The pain of arthritis is "deep and boring," and does not closely resemble the pain produced in a joint by a hypodermic needle. In the course of treatment a good many joints have been injected with lipiodol which causes some pain for about forty-eight hours. This is the "same" pain as the arthritic condition itself caused, and it is "different" from skin and muscle pain. From personal experience, I can recognise skin and muscle pain and generally tendon pain, but I have had no experience as yet of joint pain.

In studying this question of pain I have been most puzzled by the degree of joint change which is necessary to produce pain. For instance, two patients may have a degree of joint change which by clinical and ancillary examination appears to be comparable. One suffers the most intense pain, and the other has none. Or even more remarkably, the same patient may have a degree of arthritis in both knees: one knee appears by X-ray to be in a more advanced condition than the other, yet pain is felt in the better knee and none in the other.

It has occurred to me that many of the X-ray changes produced by non-specific arthritis could be due to changes in the vascular supply to joints. Lewis and Pochin (1937) showed that when asphyxia of the upper arm was produced by compression with a cuff, and the fingers became anaesthetised, the intensity of pain response increased and became diffuse. In addition, however, there was an increase in the pain responses from deeper lying tissues. They think this was due to temporary local damage to the nerves at the point of compression, but it is possible to conceive long-continued poor vascular supply to a joint producing damage of such a character as either to bring pain into consciousness at an early date or to make pain, which would be felt in any case, more severe. I have tried to investigate this question by oscillometric readings, but the results are anomalous and dubious.

Recently Guttman (1940) devised a thermoregulatory sweating test. By placing the patient in a radiant heat bath and covering the skin with

a dye, he has been able to compare the sweating in different parts of the body. Possibly this might be a method of approach, but I have had no experience so far, and this line of thought might be worth following.

The study of pain is certainly a part of the study of rheumatism, but has its principal use in the evidence it gives that a joint, and not its surrounding structures, is involved. It plays little part in separating infective arthritis from osteoarthritis, as it is a leading symptom in both.

2. Swelling.

Although swelling is such a constant physical sign in chronic arthritis, it appears likely that there are only a few common types. It seems possible that all swellings can be grouped into fluid, synovial, and bony swellings. Perhaps one of the commonest traps is to regard a joint as swollen because the periarticular structures are wasted.

(a) Fluid swelling.

This may occur as a synovial effusion, or as an effusion into a bursa. I do not propose to enter here into the question of detecting fluid in joints or bursae, as the standard text-book methods of examination are adequate.

Fluid swellings, either bursal or articular, are very commonly met with in infective arthritis, and it is helpful to take samples of this fluid. The cell count and differential count I have found to be of some help—not only in establishing the diagnosis, but it is also probably a help to prognosis. So far, very few examinations of this kind have been recorded, but I have tried to indicate what may be expected in a small section later. A synovial effusion in infective arthritis indicates an active process within the joint, and generally suggests rest for a limited period.

In osteoarthritis effusions occur, but are rare, and it is still uncertain what their significance may be. On analogous lines, they probably indicate a worsening of the joint condition, but it is by no means certain.

It will be wise to mention here that a joint with synovial effusion needs very careful diagnosis, for the effusion of, say, intermittent hydrarthrosis, needs quite different treatment. The bilateral effusion into the knees in syphilis is painless and should not lead to difficulty.

(b) Synovial swelling.

This is a very common finding. It occurs principally as the result of an incompletely resolved synovial effusion in infective arthritis or, more rarely, in the rather later stages of osteoarthritis.

As an index to activity, it has value, but in infective arthritis it may become a permanent feature even after the disease has ceased to be active, although the swelling often gradually disappears as time goes on and the membrane shrinks down.

In osteoarthritis it is most commonly seen in cases during the temporary stage of inflammation, when the joints become hot and the skin over them becomes red, and a general "flare-up" occurs. It takes a considerable time before the joints recede to their former condition, and this stage of classical inflammation nearly always leads to advance in the condition, and is one of the strongest arguments in favour of an inflammatory or bacterial aetiology.

(c) *Bony swelling.*

This is especially noticeable at the end of the long bones in osteoarthritis, and I have been unable to find any clue to its nature. It may be quite an early feature, and it seems as if there is hypertrophy of the bone, for the ends of the bones, especially at the knee and ankle, are increased in girth, and this is the more readily noticeable if one side is affected and not the other. It seems almost incredible that there should be a local periosteal reaction with the laying-down of fresh bone. Diagnostic difficulties are also present, for in one case the swelling was due to a syphilitic periostitis, and in another to a sarcoma of a femoral condyle, but in most cases it appears concurrently with the osteoarthritis, and I can find no reference to it in the literature. I have never noticed these swellings in infective arthritis.

3. *Tenderness.*

If it is intended to place any reliance on this sign as an indication of joint disease, care will be needed to locate accurately the site of tenderness. To make this clear, it is only necessary to consider that any one of the following structures may give rise to tenderness: skin, fat, fascia, muscle, nerve, or synovial membrane.

In addition to its own inherent difficulties, the problem is also one of location in depth. Lewis's work on pain is of assistance in separating tenderness in skin and muscle, as the pain arising from these is characteristic. Further, skin tenderness is, of course, noticed with very superficial stimuli.

The question of tender fat is important. The fat may appear in the form of panniculitis, where the fat is laid down in the lobules in the superficial fascia, and strands of fibrous tissue may be attached round it to the epidermis. This may occur in any

patient who is putting on weight fast, but it is only dignified with the title "panniculitis" when tenderness is present, and, indeed, it is only then that it gives rise to symptoms.

Sometimes fat is laid down in extensive localised deposits round the joints, particularly on the medial aspect of the knee-joint, and gives rise to the condition known as "adiposis dolorosa juxta-articularis." This can be, and very often is, confused with a true arthritis, and may account for some of the diagnoses of menopausal arthritis. It may possibly be an atypical form of Dercum's disease, but it is unlikely to be due to lymphatic disturbance, and in my experience the swellings seldom become inflamed. Some hold the opinion that the condition is endocrine in origin.

Round most joints it is almost impossible to separate muscle pain from fascia pain. Tender nerves are fairly easy to diagnose as the nerves tend to become slightly thickened and "roll" under the finger. They also give rise to "pins and needles" in the area of their distribution when pressed fairly hard.

It is difficult to test the synovial membrane itself except in the case of the knee-joint, but in cases where it is hypertrophied (as round the ankle-joint and the wrist), it is sometimes possible to be sure that it is tender. Even then the pain produced is not the same as the patient complains of in cases of true arthritis.

Most physicians attach importance to the question of tenderness, and this has reason on its side. On the whole, however, I regard it as a deceptive sign and of little value in separating infective arthritis from osteoarthritis.

4. *Stiffness.*

This is one of the interesting symptoms of chronic arthritis. When discussing pain, mention was made of pain in muscles, and that this pain was characteristic and unvarying. In most cases muscle pain is associated with stiffness. In healthy subjects stiffness follows over-exercise and Lewis (1936) thinks, with good reason, that the pain and stiffness follow the accumulation of metabolites in the muscles. Pain of this sort and stiffness follows muscle work under ischaemic conditions, but disappear very quickly when the blood supply is restored. Unfortunately this is, not at all the story in arthritis. The stiffness is greatest after rest, and is most noticeable in the morning. As the muscles are exercised, the stiffness wears off. The same remark applies to the stiffness which follows the use of unaccustomed muscles. A man performing hard muscular work may use from eight to ten times as much oxygen as he would at rest. This represents an enormous increase, but it has been shown (Verzar, 1912)

that brief tetanus imposed on a single denervated muscle leads to a maximal blood flow five times that at rest. This was attributed to the action of metabolites. Since this work was carried out, the physiology of muscular exercise has been carried further and is now so complex that it is not suitable for discussion in a clinical paper.

It may perhaps be permissible to say that the vascular changes which occur in chronic arthritis, and which one is tempted provisionally to incriminate, do not seem to provide a likely answer here, unless the suggestion be made that the arteries at rest are not capable of removing metabolites, but still have the power of responding to exercise.

There is, I think, little doubt that the degree of stiffness is a fair indicator of the activity of the process.

5. *Limitation of movement.*

This may be due either to pain, stiffness, or mechanical causes. Apart from mechanical causes, it is a good indicator of past and present activity, but it must be considered in relation to its cause. Mechanical causes are, of course, fibrous and bony ankylosis in infective arthritis, and capsular contraction in osteoarthritis. Other rare causes exist.

6. *Crepitus.*

I have noticed only three types of crepitus. It may be of a rather leathery, crackling type, which seems to originate in the synovial membrane, or it may originate in a tendon. This latter is difficult to describe, but easy to recognise.

Bony crepitus may be heard in any joint, but is generally best appreciated in the spine or pelvis. I generally regard it as evidence of old activity—though without proof—and notice it most frequently in the pelvis or lumbar spine in burnt-out ankylosing spondylitis.

7. *Muscle wasting.*

Muscle wasting appears in a very marked degree in infective arthritis. Generally it is explained as being due to interference with trophic fibres which pass in, or near, joints. The modern view is apparently against this. Disuse, again, is not in favour as an explanation, but it seems likely that it takes some part.

Recently a clinical method for measuring electrical potentials in muscle has been brought forward. Weddell *et al.* (1943) constructed an apparatus consisting of a high-gain amplifier and a cathode ray oscillograph, and, with the help of needle electrodes stuck into muscle, they produced what they think to be normal muscle tracings and abnormal tracings, or fibrillation

potentials, in denervated muscle. So far it is too early to say, but this may be a method of promise.

The muscle wasting seen clinically persists after the arthritic process is at an end, and so it ranks with

8. *Deformity* as an aftermath of chronic arthritis. It has, however, additional significance, for the rate of muscle wasting is a good indicator of the activity of the disease, and is some help in separating the two types of arthritis clinically, for osteoarthritis (except of the hips) never shows it to such a marked degree.

9. *Oedema.*

Oedema is a good negative point, for it rarely occurs in chronic arthritis, and, if present, is an indication to look for a possible alternative diagnosis. It occurs with greater frequency in cases of specific arthritis.

10. *Involvement of surrounding structures.*

The diagnosis of arthralgia depends partly on exclusion. Tenosynovitis and painful and tender nerves have to be carefully looked for. The question of painful fat has already been mentioned under the heading of "Tenderness."

Clinical Examination as a Whole

Having described the methods of examination, and the details obtained in the examination of joints, certain points arise in the course of each clinical examination which must be mentioned.

1. *Sweating.*

Sweating is a constant occurrence in infective arthritis, but seldom seen in osteoarthritis. It is presumably associated with the katabolic nature of the disease, and certainly leads to loss of weight in many cases. The odour, both in rheumatic fever and in infective arthritis is characteristic.

2. *Obesity.*

This has already been discussed—see also Heberden Lecture, pp. 10-22 and 27-32.

3. *Loss of weight.*

Loss of weight may be very marked, but by no means always. It is a good indication of the activity of the process.

4. *Blood pressure.*

The blood pressure in infective arthritis is, on the whole, low, and in osteoarthritis there is a tendency for it to be raised. The following table shows the relative incidence of hypertension in the three main types of chronic rheumatism.

TABLE VII.

Hypertension in Chronic Rheumatism.

Type of rheumatism	Males			Females		
	Total number of cases	Hypertension present	Rate per cent	Total number of cases	Hypertension present	Rate per cent
I.A.	48	4	8.3	206	39	18.9
Ankylosing spondylitis	22	1	4.5	31	4	12.9
O.A. (A-N)	39	14	35.9	184	79	42.9

The standards used were fully described in 1939, and the question of hypertension was very fully discussed.

Radiology

In most diseases of bones radiology is an essential part of the examination, and it seemed to be of interest to ascertain in what percentage of cases it has been helpful in arriving at a diagnosis.

Taking the 1,000 cases as a whole, Dr. Lewis-Faning computes that in 92.9 per cent of males and 95.2 per cent of females, the X-ray was helpful in diagnosis. Gout stands out as being the disease in which the X-ray was of least assistance, only being helpful in 60 per cent of cases as against an average percentage for all other types of 95.9.

The following criteria were used to separate the two types of chronic arthritis. Originally I divided the cases of infective arthritis into two radiological grades, but I have now discontinued doing so as its value was problematical. My present view is that the radiological appearances in infective arthritis and osteoarthritis are so different as to constitute a check, even on clinical conclusions.

Radiological Criteria.

Infective Type.

1. Generalised decalcification.
2. Mixed opaque and translucent areas in the line of the cartilage with infiltration of bone beneath it.
3. Loss of joint space.

Osteoarthritic Type.

1. No decalcification.
2. If cartilage is altered, the change tends towards dense thickening, generally localised in the form of a band.
3. No loss of joint space.
4. Osteoarthritic outgrowths at junction of cartilage and synovial membrane. In the knee-joint "lengthening" of the tibial spines.
5. Loose bodies.

Blood sedimentation rate.

It has frequently been said that the sedimentation rate is of use in separating out infective arthritis, as it is raised in this condition and not in osteoarthritis. This is undoubtedly true, but the rate is occasionally raised in osteoarthritis, and I tried originally to make separate groups, using the raised rate as the criterion. I found this was unsatisfactory as there appeared to be no significant differences in these cases, apart from the raised rate.

As the rate is said to vary in the two sexes, and as such extraneous circumstances as a hot day, or a tilted tube, may raise the rate, it seemed better to take 15 mms. at the hour (Westergren tube) as the top limit of normality.

In addition, it seemed unfair not to remove those cases in which other reasons existed which could account for the rise.

The following conditions were noted which could have done so.

Cases in which Alternative Reasons existed for a Raised Sedimentation Rate.

In Infective Arthritis.

Pulmonary tuberculosis and other tuberculous conditions.
 Psoriasis.
 Pleurisy.
 Septic tonsils.
 Asthma.
 ?Cushing's syndrome.
 Carcinoma of liver.
 Syphilis.
 Pneumonia.
 Valvular heart disease.

In Osteoarthritis.

Chronic nephritis.
 Pulmonary tuberculosis.
 Positive Wassermann reaction with a mediastinal effusion.
 Psoriasis.
 Old haemoptysis.

Paget's disease.
 Tabes.
 Asthma.
 Discharge from left ear.

The value of the B.S.R. as an indication of prognosis and an index of progress in treatment.

In addition to the above analysis of the value of the sedimentation rate at the commencement of treatment, two other problems are statistically treated in some detail in part II. It will be sufficient here to quote the conclusions reached, (a) the initial height of the sedimentation rate is no guide to prognosis for any type of rheumatism, and (b) a significant difference occurs between the proportion of successful treatments according to whether, within specified limits, the B.S.R. improved, worsened, or remained stationary. Dealing only with infective arthritis, ankylosing spondylitis and gout, it was found that when the B.S.R. "improved," 77 per cent of cases were successfully treated, but when it became worse only 49 per cent of success was obtained.

This factor has been worked out for the other types of rheumatism, and in no case is the initial height of the sedimentation rate any guide to prognosis (the table is not reproduced).

Conclusion

I conclude that with careful clinical examination, as set out, and with the free use of radiological and pathological assistance, it is possible to separate infective arthritis from osteoarthritis in the great majority of cases.

The points of clinical difference have been fully set out on pages 11 *et seq*, and consists of differences in type and physical make-up of the patients, with the difference in clinical findings on general and special examination. Involvement of the small joints is far more common in infective arthritis, but is not confined to that condition. In particular the carpo-metacarpal joint of the thumb is frequently the initial site of pain, tenderness and deformity in osteoarthritis.

The principal radiological criteria are set out on page 59, and the frequency distribution of the blood sedimentation rate is set out by one of us (L.F.) in Part III.

The combination of these three types of observation enables two conclusions to be reached. That there are only two common types of bone and joint reaction in chronic non-specific arthritis, and that these two can be separated in the vast majority of cases.

The unclassified group was set up for two reasons. Firstly, to take cases which were insufficient in number to justify a special group, and secondly, in case it should be found that cases

of chronic arthritis could not be satisfactorily separated. At the end of the work the group consisted of the following 41 cases:—

UNCLASSIFIED GROUP.

	Cases
Gonococcal arthritis	3
Protrusio acetabuli	1
Bursitis	5
Erythema nodosum	3
Still's disease	1
Typhoid arthritis	1
Adiposis dolorosa juxta-articularis	6
Synovitis	5
Old pyoarthritis	1
Spasmodic torticollis	1
Calcified nucleus pulposus	1
Spinal arthritis	2
Intermittent hydrarthrosis	2
Herpes zoster	1
Focal arthritis	2
Swelling of third left costo-sternal joint	1
Sub-thyroid panniculitis	1
Not diagnosed	4
	41

This left five cases in this series which could not be diagnosed by any method.

Strangeways (quoted by Glover) found that in any series of cases involving chronic joint changes, it is impossible to fit in a proportion, usually about 15 per cent, owing to the mixed nature of the conditions found. For this reason, Glover's committee formed a category of "unclassified joint change diseases." Of the 2,510 cases of rheumatic disease recorded, 50 males and 20 females fell into this category. The whole material comprised 1,771 males and 739 females, and there were 400 cases (232 males and 168 females) of chronic non-specific arthritis. It is uncertain to what figure to relate the unclassifiable group, but if the cases of gout are added (the only other chronic disease involving joints), the total figure for chronic arthritis becomes 553 (382 males and 171 females). So that 13 per cent of male joint cases and 11.7 per cent of female joint cases were not capable of diagnosis by the means the practitioners had at their disposal. This is not very different from the figure Strangeways suggested.

In the present series conditions were quite different, and with the most favourable hospital conditions the unclassifiable cases were naturally fewer. Five cases could not be diagnosed by any method, and of these, two were men and three women. Correlating them in the same way as before, 1.2 per cent of males and 0.6 per cent of females could not be diagnosed. Some of the reasons for this will be discussed in the Summary.

Possible aetiological factors.

It was mentioned earlier that the disease index

TABLE VIII.
Sub-acute Rheumatism.

Associated factors	Cases
Rheumatic fever	14
Chorea	1
Erythema nodosum	1
Mitral stenosis	1
Pleurisy	1
Pregnancy	2

TABLE IX.
Sciatic Pain.

Associated factors	Cases
Diabetes mellitus	5
Paget's disease	1
Herpes zoster	1
Tuberculous kidney	1
Osteoarthritis of the hips	3
Osteochondritis	3
Infective arthritis	3
Osteoarthritis of the knee	1
Pneumonia	1
Synovitis	1

TABLE X.
Paget's Disease.

Appeared as	Cases
Osteoarthritis of the knees	5
Osteoarthritis of the hips	2
Sciatica	1
Myalgia	1

TABLE XI.
Diabetes Mellitus.

Appeared as	Cases
Osteoarthritis	7
Interstitial neuritis	5
Ankylosing spondylitis	2
Osteoarthritis of the hips	2

SUMMARY OF ANALYSIS.

TABLE XII.

Associated factors	I.A.	O.A. (A-K)	O.A. spine	O.A. hips	S.A.	Fibrositis	Int. neuritis
Total cases	254	253	40	44	53	114	56
Rh. F.	4	4	—	1	—	1	—
Chorea	2	—	—	—	—	—	—
Erythema nodosum	1	—	—	—	—	1	—
Valv. heart dis.	4	1	—	—	1	—	—
Diabetes mel.	—	7	—	2	2	—	5
Scarlet fever	4	—	—	—	—	—	—
Psoriasis	8	2	—	1	—	2	—
Pul. tub.	11	4	—	—	3	3	—
Other tub.	3	1	—	—	1	—	—
Menopause*	20	36	4	—	4	5	—
Pregnancy	5	3	1	—	—	1	—
Graves' disease	3	1	—	—	—	—	—
Myxoedema	—	3	—	—	—	—	—
Paget's disease	—	5	—	2	—	1	—
Syphilis	1	—	1	—	—	—	—
Gastric ulcer	—	1	1	—	—	—	—
Injury, or history of	3	22	6	3	—	4	—

* At or about the time of the menopause.

had been prepared entirely on the basis of rheumatic patterns, and that associated factors, even though they might be aetiological, were not mentioned. These data were subsequently analysed and some of the results are shown in tabular form (see

Tables VIII and IX). Since the number of associated factors in relation to each type of rheumatism may be none or many for each patient, the totals of these tables do not, of course, agree with those of earlier tables.

Infective arthritis.

Out of a total of 254 cases, infective arthritis was associated with rheumatic fever four times, chorea twice, valvular heart disease four times, and erythema nodosum once.

Glover (1924), dealing with 180 cases of I.A., found a history of previous attacks of acute rheumatism in 18 per cent of cases. Adding all the possibilities together, the figure is 4.3 per cent. Diff. = 13.7 ± 2.9 per cent.

Glover found 7 per cent of cases of chronic chest disease: my figure is 5.5 per cent.

He recorded four cases of scarlet fever (to some extent it was considered to be outside the orbit of his investigation): it only occurred four times in this series.

Glover only records psoriasis twice. It may be remembered that some think there is a form of psoriatic arthropathy. In this series it has been found eight times in infective arthritis, twice in osteoarthritis, once in osteoarthritis of the hips, and twice with fibrositis. This is of some interest for although psoriasis is a common disease, the incidence is high. Apart from erythema nodosum and the rashes of allergic and toxic origin, it is the only skin disease commonly seen. My own clinical impression was that it was only associated with the infective type, but apparently this is not always so.

Osteoarthritis (A-K).

The factors here are much the same as those mentioned in infective arthritis, but the incidence differs. Glover's figure of 14 per cent can be compared with our four cases from A-K together with one case from hips = 1.7 per cent.

Pulmonary tuberculosis has dropped from 11 cases to 4.

There were 3 cases of frank myxoedema.

Two things are different: for the first time Paget's disease comes into the picture (5 cases). This disease always associates itself with osteoarthritis, never with infective arthritis.

In Table X is seen how the 9 cases of Paget's disease appeared: five times as osteoarthritis of the knee, twice as osteoarthritis of the hips, once as a persistent case of sciatica (with sarcomatous degeneration of the bone and death), and once as repeated myalgic attacks. The other difference refers to the question of injury, for injury was an associated factor twenty-two times. This feature was noticed at an early stage, and a special group was made to include cases due to injury and occupational trauma. It is a curious thing that injury nearly always produces this type of arthritis, although it must be borne in mind that the age incidence for osteoarthritis is higher than that for infective arthritis.

Pregnancy and menopause.

It sometimes appears clinically that cases of rheumatism start either during pregnancy or immediately afterwards. In this series, however, infective arthritis started at the time of pregnancy only five times, and osteoarthritis three times, which is probably no more than might happen by chance. However this may be, the menopause certainly has greater claims to consideration.

Perhaps I may refer here to pages 39-43 in the Heberden Lecture. Although this was written in 1939, there is little new to add to-day. Of the 103 cases of osteoarthritis mentioned there, 15 cases fell into the group occurring at the time of the menopause (14.5 per cent). In the present larger group of 200 female cases, 36 occurred at the time of the menopause (18 per cent), which is a close approximation.

In view of the age incidence of osteoarthritis, it would be natural to find a proportion of the cases at the time of the menopause. The relative age incidence in different types of rheumatism has been worked out, and it seemed to be of interest to see whether the menopause occurred more frequently in the older types, and so whether age by itself was a factor.

TABLE XIII.
Incidence of the Menopause.

Type of rheumatism	Case incidence	Percentage	Mean age
			years
Osteoarthritis (A.N.) ..	36/200	18.0	57.34
Osteoarthritis of spine ..	4/27	15.0	57.11
Ankylosing spondylitis ..	4/31	12.9	42.65
Infective arthritis ..	20/206	9.7	47.75
Fibrositis ..	5/66	7.5	43.52

Table XIII shows the different types in order of descending frequency of the menopause. With the exception of ankylosing spondylitis the age descends with the frequency. Too much attention must not, of course, be paid to an observation which may have so many false values, but it suggests that age by itself may be a factor of some magnitude, and this, coupled with the uncertain pathology underlying menopausal arthritis, makes one doubtful as to what view should be taken of this condition.

Analysis of the result of treatment in chronic arthritis in relation to the duration of the disease.

Having reached the conclusion that it is possible to separate the two great types of chronic non-specific arthritis, it seemed a reasonable step to try and find out what the results of treatment might be in the two conditions.

Taking the view that clinical impressions of the results of treatment are deceptive and unreliable, it seemed better simply to record at the end of treatment whether the patient had improved, was symptom-free, or showed no improvement. These facts were recorded partly, of course, from the patients' statements and partly from physical signs. In most cases the two agreed. Three groups were therefore formed:—

Not improved
Improved
Symptom-free.

TABLE XIV.
Infective Arthritis.

Number of cases	Group	Duration of disease (mean in months)
90	Not improved	38.71 ± 5.15
104	Improved	31.95 ± 3.75
59	Symptom-free	21.25 ± 4.24

TABLE XV.
Osteoarthritis.

Number of cases	Group	Duration of disease (mean in months)
101	Not improved	33.42 ± 3.77
113	Improved	21.63 ± 2.42
78	Symptom-free	17.0 ± 2.64

TABLE XVI

Differences (in months)	I.A.	O.A.
between NI and I	$+6.76 \pm 6.4$	$+11.79 \pm 4.5^*$
„ NI and S.F.	$+17.46 \pm 6.7^*$	$+16.42 \pm 4.6^*$
„ I and S.F.	$+10.70 \pm 5.7$	$+4.63 \pm 3.6$

* Indicates significant difference.

So far as the duration of the disease was concerned, little difference was noted in infective arthritis between the improved and not improved groups, but the symptom-free group showed a considerably shorter duration.

In osteoarthritis the improved and symptom-free groups both showed a much shorter duration than the not improved group.

It can be inferred from this that the duration of symptoms in infective arthritis and osteoarthritis

has a bearing on the likelihood of treatment being successful. Although this seems a reasonable conclusion, I do not think it has been proved statistically before.

The chance of successful treatment in the various types of rheumatism irrespective of the duration of the disease or the length of treatment.*

Purely as a matter of interest, it was thought to be worth while to work this out. It is evident that no great importance must be attached to the result, as in some of the groups the figures are too small to be of any value, and in any case the figures only relate to my own cases. Unfortunately I cannot find in the literature any parallel figures with which to compare this table (Table XVII). The only points of interest are the high percentage of success obtained in fibrositis and in interstitial neuritis.

Perhaps some faint importance attaches to the figure obtained in osteoarthritis of the hips (34.9 per cent). As is well known to all physicians engaged in this field, the condition for all practical purposes is refractory, and therefore any "success" obtained is due to the natural tendency of all the rheumatic diseases to have remissions and eventually to come to a balanced non-symptomatic state.

If, therefore, the figure obtained in osteoarthritis of the hips is compared with the figures obtained in most of the other conditions (except, perhaps, gout and ankylosing spondylitis), a glimpse will be obtained of what treatment can really do to improve the conditions and render the patients symptom-free. These remarks will not apply, of course, to the ability of treatment to ameliorate symptoms which is very high, but merely to its ability to "cure" these rheumatic conditions. It is for this reason that no claim is made in this paper to "cure" any of these conditions.

TABLE XVII.

Percentage of Success in Treatment without Regard to the Duration of the Disease or the Method of Treatment.

Type of rheumatism	Percentage of success	Type of rheumatism	Percentage of success
I.A.	64.4	Gout	52.5
S.A.	55.8	Fibrositis ..	94.7
O.A. (A and Spine)	66.7	Int. neur. ..	85.4
O.A. (B-K)	64.5	Miscell. ..	73.4
O.A. (Hips)	34.9		

* "Success" here includes the groups "Improved" and "Symptom-free."