ARTHritis deformans
(Osteo-arthritis).

By

Percy W. Hampton,

M.B., Ch.B., Edin., 1899.
Arthritis Deformans.

**History and Nature.**

Although this disease has probably existed as long as any other form of disease with which the human race is afflicted, it is only within the last century that it has been recognised and described as a disease per se.

Evidence of its great antiquity is derived from the finding of bones amongst ancient remains which unquestionably show the characteristic changes produced by this disease. The oldest bones showing these changes have been found in Egypt. In the Museum of the Royal College of Surgeons of England are several bones, presented by Mr. Petrie, which had been
found in the tombs at Gurob. These tombs were made about 1300 B.C. The bones were exhibited before the Pathological Society of London by Mr. Eve 1 who demonstrated well marked osteophytic changes at their articular ends. These changes have also been seen by Chiaje 2 in bones unearthed at Pompeii; by Dr. Norman Moore 3 in a skeleton found in a Roman sarcophagus in Smithfield; by Virchow 4 in skeletons from the graveyard of the Convent of Marienblon in Pomerania; and by Lebert 5 in bones from the catacombs of Paris.

That Arthritis deformans was

2. Chiaje - Arthritis deformans from Pompeii, ii, 565.
not recognised as a malady distinct from Rheumatism and Gout until a comparatively recent date is not to be wondered at when we consider that previous to the seventeenth century these diseases, together with all other affections of the joints were included under the general term "Arthritis".

The clinical features of Gout have been known to, and well described by, the earliest medical writers, and it is probable that Arthritis Deformans was not unknown, the multiple form of this disease evidently being alluded to by Paulus Aegineta' in the following passage which occurs in his description of Arthritis;—

"when the cause is diffused over all the joints of the

'Adams' Translation vol i. sect. cxviii, p. 657.
"body, we commonly call it 'arthritus', in which the vertebral, "papulae, jaws, and every other joint are attacked with the "disease."

According to Scudamore, articular rheumatism was first treated of as a separated disease from Gout by Ballonius in a treatise "De Rheumatismo et Pleuritide dorsali" published at Paris in 1642. Previous to that the word 'rheumatism' had been used as a synonym for catarh. In 1683 the essential differences between Rheumatism and Gout were again clearly drawn by Sydenham, who treated of Arthritis Deformans as a sequela of Rheumatism. Following Sydenham the main features of Arthritis Deformans

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2 Sydenham. Opera, Sec. vi, Cap. v.
were mentioned by several authors, but were regarded as gouty or rheumatic manifestations. It was not until the end of the eighteenth and beginning of the nineteenth centuries that this disease was differentiated from Gout and Rheumatism.

Garrod assigns the honour of having first drawn this distinction to Landré Beauvais in a thesis read on the third of August, 1800.

In this country the disease described was first as a separate malady by Heberden, in 1804, who drew a distinction between it and Rheumatism. He was also the first to draw attention to those modes on the terminal phalanges of the fingers which now bear his name.

In the following year the

2 Heberden - ch. xxviii. Digit Foram Nodi.
clinical features of this disease were independently described by Haygarth, a distinguished physician of Bath, under the name of "Arthrosis of the Joints." He distinguished it from Gout, by its being almost peculiar to women, by the absence of fever, by the swollen joints presenting bony enlargement, by the comparative freedom of the integuments from inflammation, and by the muscles seemingly not being affected.

The condition is mentioned by Scudamore in his treatise on Gout and Rheumatism who recognizes the distinction of this complaint from Gout on the following grounds:—the bone-like hardness of the affected parts, the general state of

1 Clinical History of the Arthrosis of the Joints, p. 150.

2 Loc.Cit. 3rd edit. p. 343.
freedom from pain at no time severely felt, together with the absence of sympathetic disturbance of the digestive organs.

Todd, in the Croonian lectures for 1843, states his belief that this disease is a rheumatic affection and, further, suggests the term "Chronic Rheumatism of the Joints" as being less liable to objection than "Chronic Rheumatic Arthritis" proposed by Mr. Adams, as he did not consider the mobius process to be of an ordinary chronic inflammatory nature, because "as Dr. Colles has well remarked," two very opposite processes are to be found going on at the same time, viz. absorption of the old bone and its cartilage of incrustation, with deposition of new bony matter; whilst in the ordinary chronic inflammation there would be a gradual enlargement of the bone."
A short account of this affection is given by Brodie in his "Observations on the diseases of the Joints". He called it Rheumatic Gout, the name by which it was generally known at that time. He regarded it as having a somewhat similar etiology to Gout. This view is contrary to that generally held, probably on account of the class of practice in which he was engaged.

An excellent description of this disease was given by Adams' in his monograph on the subject, with which is associated an Atlas of Drawings, illustrating its Morbid anatomy. He was one of the first in this country to pay special attention to the anatomical characters of the disease, having had many

1 Adams on Rheumatic Gout.
opportunities of doing so in his workhouse practice. He proposed to designate the disease "Chronic Rheumatic Arthritis", as, like chronic rheumatism its symptoms are slow in their progress and subject to atmospheric influence.

Sirs A. B. Garrod proposed the term Rheumatoid Arthritis as being more suitable than Rheumatic Gout, as the name Rheumatic Gout implies a necessary relation to Gout and Rheumatism. On the other hand, Fuller, although regarding the disease as essentially distinct from both Rheumatism and Gout, maintained the suitability of the title Rheumatic Gout on the ground that it pointed to the class of diseases with which it was allied.

1 Garrod (Sirs A. B.), Gout and Rheumatic Gout.
2 Fuller, Rheumatism, Rheumatic Gout and Sciatica.
and has the great advantage of being already recognised and extensively used. The same author was the first to describe the disease in its acute form, and gave an excellent account of the symptoms, pointing out the diagnosis from acute rheumatism.

In recent years much interest has been taken in this disease, and something added to our knowledge of it.

A valuable monograph on the Early symptoms of the disease has been contributed by Kent Shender, of Bath, who has endeavoured to point out the symptoms whereby the disease may be identified "in its very cradle", in order that it may be treated at a

1 Fuller. Rheumatism etc. III Edit. 1860, p. 335.
2 Shender. Early Symptoms and treatment of Os Peo-Arthritis, 1889.
time where treatment may be serviceable. He truly says that "the diagnosis of an incurable disease has little glory about it, and still less utility."

The question has recently been raised as to whether, under the name Arthritis Deformans (Rheumatoid Arthritis), we are dealing with a single disease, or grouping together a number of cases belonging to two or more separate forms of articular disease, which somewhat resemble one another in their clinical features and morbid anatomy but differ essentially in their etiology. In this relation it must be remembered that identity of clinical symptoms and nearly identical pathological lesions do not necessarily prove identity in etiology.

Some light has been thrown on this subject by the discovery
of a micro-organism in the fluid and tissues of affected joints, by Drs. Bannatyne and Wohltman of Bath, who believe it to be the exciting cause of the disease, or rather of the more rapid form. Bannatyne, in his treatise, expresses the belief "that there are at least two separate forms of disease at present classed under the term "Rheumatoid Arthritis"—the one acute and undoubtedly microbic in character, the other chronic and probably degenerative. In a recent paper\(^2\) he further emphasises this view. Garrod\(^3\) goes further and would separate the different cases collectively known as "Rheumatoid Arthritis" into as many as four

\(^1\) Bannatyne. \textit{Rheumatoid Arthritis. Preface to II edit.}
\(^3\) \textit{Lancet.} vol. I. 1901 p. 774.
different diseases, and draws attention to the fact that our knowledge of the morbid anatomy of some of them is slight, and that further investigation is required in this direction." The classical description of the change in the joint characteristic of rheumatoid arthritis... is mainly based upon the examination of cases of the senile class, and it is permissible to doubt whether it applies equally to all varieties.

**Nomenclature.**

We have already seen that this disease has received a number of designations. It was, until recently, best known as "Rheumatic Gout" and "Chronic Rheumatic Arthritis." These terms are objectionable, as they are not sufficiently distinctive, and have consequently been very
loosely used. At the present time it is generally known in this country by the names "Rheumatoid Arthritis" and "Osteo-arthritic", the latter term having been adopted into the nomenclature of the Royal College of Physicians. Little objection can be taken to the name Rheumatoid Arthritis, as clinically the disease, in some of its forms, bears a superficial resemblance to Rheumatism. The name Osteo-arthritic, however, is open to the objection that in the rapidly progressive form of the disease there are no osseous changes, the disease seemingly being confined to the synovial membrane and ligamentous structures.

It was called Arthritis Deformans by Virchow in 1869 and this is the name in general use in Germany.

\[1\] Virchow - "Archiv" xlvii, 1869.
The clinical history and appearances of the different forms of this disease vary so widely, it is desirable to use a common term that will include them all. As more or less deformity of the joints is characteristic of all forms of, and is indeed the chief means of recognising, the disease, the designation Arthritis Deformans, is, perhaps, the most suitable, and is, accordingly, the one I have adopted.

A few years ago a rather good name for this disease, namely "pneumococcal arthritis" was suggested by Dr. Brabazon of Bath.

Arthritis Deformans has been defined as "a chronic disease of the joints, characterised by changes in the cartilages and synovial membranes, with periarticular formation of bone and great deformity." The above definition is based upon what is the universally accepted description of the morbid anatomy of Arthritis Deformans. This description has been chiefly derived from the examination of cases of the penile variety, and is so far correct, but it does not include all the cases which at present are known as arthritis deformans, as there are some in which there is no evidence of periarticular bony

"Osler, Prin. & Pract. of Medicine. 1895. p. 305."
formation.

The question of there being more than one artistic disease included under the name arthritis deformans has already been touched on. As clinical grounds for this belief Parrod describes four kinds of cases, which, briefly, are as follows:—

1. A rapidly progressing form, usually occurring in young women, commencing with fusiform swelling of the interphalangeal joints — this swelling being due to thickening of the joint capsule and effusion into the synovial sac, there being no osteophytic formation. There is a similar involvement of other joints. The course of the disease is marked by more or less pyrexia. There is

1 p. 11.
considerable muscular atrophy, and anaemia is usually marked. Pain is a variable symptom.

2. A slowly progressing form occurring in older women, somewhat similar in its distribution to the above, but in which there is osteophytic formation at the articular ends of the bones, together with fibrillation and erosion of the cartilages.

3. A form occurring in young people in which there is but little enlargement of the affected joints, but considerable deformity from muscular contracture.

4. A form in which only one or two joints are involved, as, for example, in the hip-joint affection of elderly people.

In addition to these that interesting condition, characterised by enlargement of the tubercles
at the ends of the phalanges in relation to the distal interphalangeal joints and known as Heberden's nodes is usually classified as a variety of Arthritis Deformans.

In the above forms the disease is essentially one of the extremities, the joints of the vertebral column being but slightly, if at all, affected, but there is a form in which the disease is almost, if not entirely, limited to the vertebral column, producing the condition known as Spondylitis Deformans.

In this connection it may be noted that the disease presents this striking peculiarity, namely, that when it primarily attacks the limbs it leaves the vertebral column for the most part alone, and conversely, when the vertebral column is primarily involved there is as a
rule but little extension to the limbs, only the more central joints being attacked, the smaller peripheral joints escaping entirely. In this respect it bears a close resemblance to the localised form of the disease, and is, perhaps, of the same nature.

Our knowledge of the pathology and morbid anatomy of these different forms is not sufficient as yet to justify us in considering them as separate diseases, and in the following pages I purpose describing them, as manifestations of one disease, under the following heads:

A. Generalised Arthritis Deformans
   a. Acute
   b. Chronic

B. Localised Arthritis Deformans

C. Heberden's Nodes

D. Arthritis Deformans of the Vertebral Column.
A. Generalised Arthritis Deformans.

Etiology. It is generally found that, in persons suffering from generalised or polyarticular arthritis deformans, there has been, immediately preceding its onset, a condition of lowered vitality, brought about by various influences. As in other diseases there appear to be certain conditions which predispose an individual to an attack of this disease.

There is no doubt that heredity plays some part in the etiology of this disease, but not so important a part, I think, as some would have us believe. One can sometimes, but not often, elicit a family history of arthritis deformans, but a family history of gout or rheumatism can be much more frequently obtained. This can
best be explained on the ground that there is an arthritic "diathesis, or peculiar condition of tissue—health, involving tendency to inflammation of joints and fibrous structures; and that upon this as a foundation may be built up, under the influence of special causes, a tendency to gout, rheumatism, or any one of their various modifications and combinations."

If this diathetic predisposition exist, and it seems reasonable to suppose that it does—gout and rheumatism being the commoner diseases—it is only natural to expect a more frequent family history of these diseases than of arthritic deformity. Although there is no relation between this disease and tuberculosis, many persons suffering...
from arthritic deformans present the appearances familiarly known as the strumous deaethis. This is especially noticeable where children are the sufferers. Fuller and others attach much importance to a family history of Phthisis as an etiological factor. A combined history of Gout and Phthisis is also regarded as predisposing to arthritic deformans. It must be remembered, however, that Phthisis is a very common affection, and is probably hardly more frequent among the relatives of those suffering from arthritic deformans than it is among the general community. If it has any influence it probably lies in the fact that the children of Phthisical parents.

1 Rh. Rh. Gout & Sciatica. iii edit. p. 334.
2 Osteo. Arthritis by Russell Forebode. 1893. p. 16.
are usually not very robust and are more liable to the attack of any disease than the generality of people.

Neither age nor sex is shared by this disease. In the first decade of life it is rarely met with and both sexes are about equally affected. With the onset of puberty the frequency is greatly increased chiefly owing to the peculiar liability of women to be attacked. This disease is regarded by many as one of middle and advanced life, but this is by no means the case, as in its more rapid and severe forms it is usually seen in early life. A. E. Garrod shows that the number of female cases increases almost steadily with each five-year period until that between forty-five and
"fifty is reached, and that after
this the numbers rapidly decline.
Osler states that "it most commonly
sets in between the ages of twenty
and thirty, but it may begin as
"late as fifty." As regards female
cases, my own experience coincides
with this. In men, I find, it
usually commences at a later
age, namely, between forty
and fifty. After the fiftieth
year the male sex is the
most liable.

The following chart is taken from
an analysis of the 662 cases of
generalised arthritis deformans treated
at the Deconshire Hospital, Buxton,
during the year 1900:

<table>
<thead>
<tr>
<th>Disease first contracted between the ages of,</th>
</tr>
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<tbody>
<tr>
<td>Both sexes</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>16-20</td>
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<tr>
<td>21-30</td>
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<td>31-40</td>
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<tr>
<td>41-50</td>
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<td>51-60</td>
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<td>61-70</td>
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\[\text{Ref}: \text{Prin.} \& \text{Prac. of Medicine, 1895, p. 306.}\]
of these cases 31.3% occurred in men, and 68.7% in women. I am inclined to think that this is rather above the usual proportion of men.

The special liability of women to be attacked during the period of sexual activity has naturally directed attention to the female generative organs as a possible channel by which the specific poison enters the system. It is found to occur in girls at the age of puberty where the menses have never started; in older girls where menstruation is scanty or irregular; the onset may be after marriage; after labour, especially if it be prolonged and difficult; after a miscarriage; after such debilitating influences as prolonged lactation and rapid child-bearing. It attacks women suffering from endometritis or other uterine disease, and it frequently
sets in at the time of the menopause.

The commencement of the disease is sometimes associated with grief, worry, or anxiety, and this is one of the reasons advanced as to the likelihood of the disease having a nervous origin. Such a transient condition as a sudden shock seems an improbable cause of this disease, yet cases have been recorded in which this was apparently the case.

Patients frequently attribute the disease to exposure to cold and damp. This, however, is often more fancied than real as they regard the disease as rheumatism and think this the usual manner in which it is contracted. But one sometimes gets a reliable history of getting
wet through and neglecting to change the clothing, or of sleeping in a damp bed and getting a chill. I know the case of a bricklayers' labourer who was quite healthy until he went to work in a damp tunnel; he then gradually got into bad health and contracted this disease in an acute form.

Injury is said to be the cause in some instances. This is, however, rare in the generalised form of the disease. I have seen one case in which the disease was apparently lighted up by an injury to the ankle; it was localized to this joint for a time, and then spread to the other joints, at first slowly and then rapidly.

Sometimes the disease starts in joints whose resistance has been weakened by some former disease, such as rheumatism.
gonorrhoeal rheumatism, or gout. With regard to the last named, Sir Dyce Duckworth maintains that "gouty arthrititis will produce lips on the ends of the bones, crackling, chronic synovitis, and other features commonly—but erroneously, as I believe—supposed to be alone significant of rheumatic disease." This is no doubt true, but one sometimes gets remarkably symmetrical deformities in gouty subjects which present all the external appearances of arthritis deformans; as is well known there is no special asymmetry in gouty deformities, and I see no reason why the one disease should not complicate the other.

We have little knowledge at our disposal as to the influence of climate, but it is
said to be most frequently met with in low lying damp countries, such as Holland and Ireland.

**Early symptoms.** In a disease like arthritis deformans, where so much may be effected if treated in an early stage and so little in an advanced stage it is a matter of great importance to study the symptoms whereby the disease may be recognised in its beginnings. It is as a rule not recognised until the characteristic appearances of the joints manifest themselves, the slight pain, stiffness and swelling which is usually the earliest indication of the disease being regarded as 'rheumatic' arthritis.

It is essentially a disease of the joints but there are certain constitutional symptoms which appear along with or even before the actual onset of the joint trouble. I do not here refer to symptoms due to the condition of lowered vitality which usually proceeds and predisposes to the disease, but to definite and fairly constant symptoms which appear to be due to the invasion of the organism by some toxin, or dependant upon a disorder of the nervous system whichever view of its pathology may be taken. Little heed was paid to these "lightning beginnings" by authors until Dr. Kent 'Sheney' of Bath directed attention to them, but abnormal sensations such as numbness
and tingling of the extremities have been alluded to by Drs. Howard and Homolle as early symptoms.

Shender regards a quickening of the pulse rate as an important early manifestation, the pulse going up to 80 or 90 and gradually rising until the disease is fairly established, when a pulse rate of 110, 115, or 120 is commonly met with, and this may go on for years. "It is as if the heart were running along without check, as if the inhibitory power of the pneumogastric nerves were partially withdrawn, or partially neutralised by a cerebral influence which cannot at present be defined."

Pigmentary changes in the skin are fairly common, which may take the ordinary form of freckles or may resemble the

'Rh. & Rheumatism' Author's, p. 245.
chloasma of pregnancy. More frequent than either of these is a dusty palloriness of the complexion.

Vaso-motor disturbances such as sweating, local or general, or coldness of the extremities are frequently met with. In one case sent to the Buxton Hospital coldness and numbness of the fingers was so marked that it was sent with a diagnosis of Raynaud's disease and rheumatism. In this case the fingers were sometimes blanched, but more usually were of a purplish colour. There was in this case early Arthritis deformans of the interphalangeal joints.

Among the sensory symptoms Spencer regards a neuralgic pain in the ball of the thumb as "the earliest prophetic note of the coming storm", he
considers of equal importance "a sharp pang on the inner "ridge of the wrist." And further, he is of opinion that "any case "in which they occur as almost determined beyond debate. My own experience endorses pain in the ball of the thumb as a fairly common symptom, not only in an early stage of the disease but for a considerable time after. In one case which I was fortunate enough to see previous to an acute attack of this disease the patient complained of occasional paroxysms of pain in the ball of the thumb, and she stated that when an attack was on a red mark appeared over the seat of the pain — the spot indicated being just in front of the carpometacarpal joint of the thumb. In all the
cases I have seen the pain seems to be due to the disease fixing on this joint, as there is tenderness on pressure over the line of the joint, and the pain is increased on movement. Perhaps the disease selects this joint just an attack of gout usually occurs in the metacarpophalangeal joint of the big toe. Moreover, this joint would be more liable than the other carpo-metacarpal joints on account of its much greater range of movement.

Transient stiffness of the lower joint and of the neck may be an early symptom. Later on in the course of the disease this stiffness may become permanent owing to osteophytic enlargement of the condyle of the joint and around the articulation of the cervical vertebrae.
Acute Arthritis Deformans.

There is no doubt of the occurrence of this disease, more especially in the young, in an acute form, although some authors do not recognise such a form, regarding the acute disease as true Rheumatic Fever and its sequelae as rheumatoidal changes following upon the rheumatic attack.

This form may occur at any period of life, but is most common and is seen in its most severe form in the young. It usually attacks young female adults, but it has been observed by many authors at a much earlier period of life. Barnatyn states that he has seen it in a boy aged 4', a boy aged 7', and a
girl aged 8. Cases have also been recorded by Lloyd Davies, Sri A. Garrod and others.

It generally occurs where there is a condition of ill health either constitutional, or induced by overwork, worry, anxiety, or unhygienic conditions of life.

The attack may come on suddenly, or may be preceded by a short period of suffering from 'rheumatic' pains and the other prodromata noted in our consideration of the early symptoms.

The attack proper begins with pain and swelling of, usually, some of the larger joints, accompanied by a rise of temperature as in Rheumatic Fever, and it is generally mistaken for this disease. It, however, differs from an acute rheumatic attack in there being less heat and

\[\text{Page 30 et seq.}\]
redness of the skin over the joints, "less furring of the tongue, less bounding of the pulse, in short, less active febrile disturbance," and later by the involvement of the smaller joints and the failure of salicylates to reduce either the temperature or the joint swelling.

The joint swelling has this striking peculiarity - it is strictly limited to the synovial cavity, there being no effusion into the periaricular structures. The joints present an ovoid or fusiform appearance which is especially well seen in the hands. On palpation this swelling feels hard and elastic and in the larger joints fluctuation can easily be made out. Later on, when the fluid in the joint cavity

1 Fuller. Rheumatism etc. III ed. 1860.
is more or less absorbed the joints may present to the touch a soft doughy feeling as if they had undergone maceration or they may present the hard nodose appearance so typical of the chronic variety.

There is nothing remarkable about the temperature chart except the persistence of the pyrexia. The temperature is never very high seldom rising above 102° F., but it may persist for weeks or even months, and even after it has been normal for a time it usually rises again with every fresh outburst of pain.

The patient is confined to bed for the most part while the attack is on, and lies with all her joints in a semi-flexed position, this being
the attitude in which she obtains most relief from the pain.

There is marked muscular atrophy accompanying the joint lesions and unless the patient is carefully nursed there is great danger of contraction of the joints which cripples the patient for a considerable time and may be for life.

The anaemia which usually accompanies this disease becomes more marked and the skin takes on a sallow colour.

During the fever the urine is loaded with urates and has an offensive odour. This disease is unaccompanied by the heart-disease so common in rheumatic attacks, but a systolic murmur may appear at the apex, which,
however, clears up as the patient recovers and regains her strength.

Complete recovery never takes place as in acute Rheumatism, as there is always some disorganisation of the articulations and thickening of the structures round about. Thus, a certain amount of deformity, stiffness, and weakness, of the joints always persists. In the more severe forms contraction of the joints occurs from keeping them so long in the flexed position, and from muscular atrophy and shortening. Such cases are more or less complete cripples. Under appropriate treatment they may recover the use of their limbs to a considerable extent, but fresh exacerbations often undo all that treatment has done and
the unfortunate sufferer becomes a life long cripple.

fig. 1.

Acute Arthritis Deformans showing fusiform swelling of the proximal interphalangeal joints.
fig 3. Radiograph of normal hand.
Note on fig. 283. Fig. 2 is a radiograph of the hand of the patient shown on page 142. If it be compared with the radiograph of a normal hand shown in fig. 3 it will be seen that there is an apparent absorption of the articular cartilages of the affected joints. This appearance is probably partly due to the joints being slightly flexed. This radiograph was taken directly after an acute attack to see if there was any periarticular formation of new bone but is useless for this purpose as it is well known that new bone is transparent to the X-rays for a considerable time after it is formed.
fig. 4. Acute Arthritis Deformans showing swelling and flexion of the joints. This and fig. 1 also show the marked symmetry of the affected joints.

Subacute Arthritis Deformans. This is a less severe form of the acute variety. It is chiefly met with in the young, yet it is not infrequent.
in middle life. It is much more common than the acute variety.

In this form there is rapid involvement of many joints usually beginning in the hands and wrists. The attack may not confine the patient to bed, and there is generally less crippling than in the more acute form.

In some cases the patient is threatened with a general attack, when the disease becomes suddenly arrested after attacking a few joints.

3. Chronic Generalised Arthritis Deformans.

The chronic variety of this disease, which (from the incurability of the acute and subacute forms) is the one most commonly seen, is usually
regarded as a slowly progressive disorder taking many years to cripple its victims. This, in my experience is by no means the case; the malignancy of the disease depending largely upon the age at which it is contracted, the general rule being, the younger the patient the more rapidly progressive the disease; indeed, in some cases it can hardly be said to be progressive at all, it being general from the first. It may also be noted here that the rapidly progressive forms are not so much marked by osteophytic changes, although these changes may occur in a later stage of the disease.

One can usually tell from the character of the deformities what the mode of onset has been; the rapid forms being characterised by ovoid swelling
of the joints which is due to effusion into the synovial cavities. On palpation the swelling may be soft and doughy so that the finger may be sunk between the bones into the joint, or it may be hard and elastic, the former condition being due to softening and relaxation of the ligaments, the latter to periosteal thickening.

Another form with rapid onset is marked by considerable deformity from muscular contracture with little obvious enlargement of the joints.

In the slow form osteophytic enlargement of the ends of the bones is a leading feature of the disease and it is to this variety that the term "Osteo-Arthritis" proposed by Spender is most applicable.

The mode of onset has already been considered, but,
as a rule, in practice, the disease is not suspected until the patient presents some enlargement, with pain and stiffness, of one or more of the articulations, usually in the hands. The frequency with which it starts in the hands is said to be accounted for by the fingers being the joints most used.

Next to the hands, the knees are the commonest seat of the disease, after the knees the joints are attacked in, more or less, centrifugal order.

The cervical vertebrae and the joints of the mandible are often attacked, Sir A. Garrod considering the latter an important diagnostic sign.

The following table taken from the works of Bannatyne and A.E. Garrod show the centrifugal order of this affection:
<table>
<thead>
<tr>
<th></th>
<th>Bannatyne</th>
<th>Garrod, A. E.</th>
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</thead>
<tbody>
<tr>
<td>Hands</td>
<td>97.4</td>
<td>86.0</td>
</tr>
<tr>
<td>Wrists</td>
<td>84.6</td>
<td>26.6</td>
</tr>
<tr>
<td>Elbows</td>
<td>61.9</td>
<td>25.0</td>
</tr>
<tr>
<td>Shoulders</td>
<td>82.0</td>
<td>25.0</td>
</tr>
<tr>
<td>Sternal-clavicular</td>
<td>2.5</td>
<td>—</td>
</tr>
<tr>
<td>Cervical</td>
<td>34.4</td>
<td>—</td>
</tr>
<tr>
<td>Feet</td>
<td>67.9</td>
<td>27.4</td>
</tr>
<tr>
<td>Ankles</td>
<td>73.0</td>
<td>60.6</td>
</tr>
<tr>
<td>Knees</td>
<td>12.5</td>
<td>14.6</td>
</tr>
<tr>
<td>Hips</td>
<td>67.9</td>
<td>—</td>
</tr>
</tbody>
</table>

In extreme cases when contracture takes place the following is the usual attitude:

There is flexion of the elbows and knees, this flexion seldom being greater than a right angle. Movement of these joints is greatly limited and any forcible attempts at movement cause great pain. This limitation

1 Bannatyne, A. B. Arthritis, p. 107, Garrod, A. E. Rheumatism, p. 249
of movement is due to shortening of the ligaments and muscles, but fibrous ankylosis may take place and in some cases osseous ankylosis has occurred, in a few cases the joint has been locked by the new bone thrown out around it.

The forearm is pronated, supination being impossible.

There is frequently extension and inversion of the foot (talipes equino-varus).

The hand may be fixed in the straight position or may be flexed.

Various distortions of the fingers and toes take place.

The shoulders are usually stiff and may be fixed against the side of the chest. The hips are not so often fixed, if they are it is usually in the flexed position.
fig. 5. Arthritis Deformans. Showing attitude.

It will therefore be seen that the general attitude is one of flexion, except in the foot where extension occurs from
the extensors of the ankle being the stronger group of muscles in the leg, and also, I think, from the action of gravity, the toes tending to drop whatever the position of the patient. In this connection it may be noted that extension at the ankle is analogous to flexion at the wrist.

We will now deal more particularly with the deformities as seen in the different joints. These deformities are so diverse a character that in order to properly describe them all it is necessary to adopt some classification. They fall, naturally, into two main classes; one in which the deformity is chiefly due to changes in and around the joints, and the other where the deformity is mainly due to muscular atrophy and
shortening. The first class may be again divided into cases characterised by fusiform swelling of the joints, the result of an acute attack, and slowly progressive cases marked by osteophytic changes at the articular ends of the bones. The hands, in which these differences are most noticeable, now claim our consideration.

The disease in the hands.

Type I. This is often the result of an acute attack, and the characteristic avoid appearance of the joints has already been described. We will now suppose that a middle-aged patient presents herself, having had
an acute attack in early life. On looking at her hands it will be found that one of two changes have taken place in the affected joints, viz.: condensation of the inflammatory exudation may have taken place the enlarged joints feeling hard, and it is difficult to say by palpation or radiography if there is any osteophytic outgrowth; or, softening of the ligaments may have taken place and the joints present a doughy feeling, and in many cases a partial luxation of some of the joints may have occurred, especially a deflection of the fingers towards the ulnar border of the hand. This is not a simple inclination towards the ulnar side such as can be produced
in a normal hand but is an actual slipping of the first phalanges from off the heads of the metacarpal bones. Owing to this slipping the head of the first metacarpal is very prominent and apparently enlarged but on the index finger being restored to its normal position (which is easily done) this prominence entirely disappears.

When there is fluid in the synovial cavity there is sometimes a protrusion of the synovial membrane beyond the capsule of the joint. It is seen in the proximal interphalangeal joints. This protrusion always takes place at the weakest part of the joint, namely, between the extensor tendon and the strong lateral
ligament, on one or both sides. These protrusions take the form of tense fluctuating globular swellings; on pressure, most, if not all of the fluid can be returned to the joint.

In this type of the disease both hands are more or less symmetrically affected. The joints attacked are the metacarpophalangeal and proximal interphalangeal, the terminal joints usually escaping.

Fig. 6 Arthritis Deformans. Typhel, early case.
Type 2. Here we have the well known Osteo-arthritis disease of elderly people in which the knuckles become enlarged and nodular. In a typical case the fingers lean towards the ulnar border of the hand and are often flexed and somewhat overlapping. In some cases muscular contractions cause various irregular forms of distortion of the fingers but not the remarkably symmetrical deformities seen in our next type.

In its distribution this type conforms to the preceding one, viz. the terminal joints are as a rule spared.
fig 7. Arthritis Deformans Type 2. Typical Case. (from a photo)

fig 8. Arthritis Deformans Type 2. (from a photo)
Fig. 10: Arthritis Deformans. Type 2: Advanced case.

Type 3. Under this variety we have a condition where the deformities are due to muscular contraction, rather than to changes in and around the joint structures. Closely following the classification of Charcot, these deformities might be arranged into two classes, viz.: one where flexion of the fingers is the most marked feature.
and the other characterised by extension of the fingers, taking flexion or extension of the middle phalanges as the basis of our classification.

The type of flexion is marked by (A) flexion of the middle with extension of the other two phalanges, or (B) flexion of the first and second with extension of the third, or (C) all the phalanges are flexed so that in extreme cases the nails dig into the palms of the hands.

On the other hand in the type of extension (A) the middle phalanges are extended with flexion of the others, or (B) the finger is extended with the exception of the terminal phalanges which are flexed, or (C) the whole finger is extended.

Ulnar deviation does not as a rule occur in these cases.
Indeed, I have seen a case in which there was well-marked inclination of the fingers to the radial side of the hand.

<table>
<thead>
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<th>Type of Flexion</th>
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B. B. B. B.

C. C. C. C.

Fig. 11.
Fig. 12. Arthritis Deformans. Type of Extension.

Fig. 13. Arthritis Deformans. Type of Extension. Radial deviation of fingers of Right hand.
The disease in the wrists.

The wrist, intercarpal, carpo-metacarpal, and inferior radio-ulnar joints are usually all involved together. In early cases conforming to our first type the wrist is swollen there being marked convexity of the dorsum movement is limited to slight flexion. Some rotation may be possible at first but later this movement is lost the hand being fixed in the prone position or midway between pronation and supination. When absorption and ligamentous softening occurs the wrist feels pulpy and synovial protrusions are sometimes met with. In a later stage there is sometimes a certain amount of displacement of the hand from the forearm (vide Fig.14). In the "Osteo-arthritic" form the wrist is enlarged and frequently
almost fixed, the forearm and hand usually being in line.

Fig. 14. Arthritis deformans. Deformity of wrist.

The disease is the elbows.

In the more acute cases there is effusion into the synovial cavity giving the elbow an ovoid form and concealing the bony "landmarks". The elbow is flexed and the forearm pronated this being the position of ease. Eventually the joint becomes fixed in this position, due to shortening of the muscles and condensation of the ligamentous structures. Associated
with the disease in the elbow there is often effusion into the olecranon bursa. A number of foreign bodies are generally easily felt in the bursa.

A description of the disease in the shoulder joint will be found under the 'Localised form.'

The disease in the Sterno-clavicular joint.

The disease occasionally attacks one or both of these joints, but is apt to be overlooked unless specially sought for. Bannatyne found that this joint was affected in 2.5% of cases examined by him. There is usually some enlargement of the end of the clavicle and the patient experiences some pain on

'Bannatyne. AR. Arthritis. II edit. p. 107.'
moving the joint. There is sometimes tenderness on palpation of the joint and if the joint be moved soft crepitus can be felt. As in other joints there may be stiffness or abnormal mobility. Rigidity is demonstrated by asking the patient to shrug the shoulders; if it be present this movement is limited, and in one case that I have seen it was altogether impossible on one side, the movement on the other being but slightly limited. If there be abnormal mobility the end of the clavicle can be moved about within the capsule owing to softening and relaxation of the ligaments. I have seen one case in which there was forward dislocation of the clavicle, which was easily reduced and as readily appeared again, as in
dislocation from injury.

The acromio-clavicular joint is often implicated along with the sterno-clavicular, the chief manifestation being enlargement of the acromial end of the clavicle. When the shoulder joint is the seat of the disease, this joint is involved along with it.

The sterno-costal joints, as would be expected from their possessing synovial membranes, sometimes present some sign of this disease; but more noticeable is an enlargement, not unlike that seen in the "pimply rosary", sometimes met with at the junction of a rib with its cartilage. This swelling is tender on pressure and the skin over it may be slightly reddened. The enlargement is confined to one or two ribs, the ribs affected being the
second and third. This is only seen in the rapidly progressive forms and is always associated with the sterno-clavicular joint.

The disease in the Temporomaxillary joint.

In most cases where this joint is affected nothing is noticed beyond some stiffness of the jaw so that the patient cannot open his mouth to the full extent. Pain at the seat of the joint and a crackling noise in the ear when movements of the jaw are made may be complained of. Crepitations can sometimes be felt and even heard by the observer. In advanced cases one or both condyles may be enlarged.

In association with the disease in the joints of the mandible, the vertebral of the first and second cervical
vertebrae are often affected. The symptoms of this condition will be noticed under that affection of the vertebral column described as "Spondylitis deformans."

The disease in the feet and ankles.

Great deformity and stiffness of the feet and ankles is often produced by this disease, frequently rendering locomotion difficult; if contracture of the knee joints is associated with it, it then becomes an impossibility. In the more acute form of the disease there is swelling of the ankles and the proximal row of interphalangeal joints as seen in the hands. Muscular contracture is often rapidly produced giving rise to an acquired Talipes Equinovarus (fig. 5). In that form of the disease in which muscular contracture is the most marked
feature, the resulting deformity is usually extension of the ankle so that the heel cannot be brought to the ground and a contraction of the toes analogous to that seen in the fingers in our leading "type of flexion" (diagram A, p. 64), i.e. extension of the first and terminal phalanges with flexion of the middle. In the more chronic slowly progressive form we usually get deformities analogous to those familiar conditions known as flat-foot, Hallux valgus and Bunion, and hammer-toe.

Fig. 15. The feet in a case of Chronic Generalised Arthritis Deformans
The disease as it affects the hip and knees joints will be discussed under the Localized Variety.

In common with most joint affections Arthritis Deformans is accompanied by a certain degree of muscular atrophy. This atrophy varies greatly in degree in different cases. In some patients who are naturally stout and in whom the disease follows a more or less benign course muscular wasting is not very apparent, but in most cases it is a well marked symptom. It affects most the muscles in relation to the diseased joints, but there is also a general wasting, not alone of the muscles, but also of the subcutaneous fat so that the patient is 'all angles', and of the skin which looks thin, dry, and glazed.
The degree of muscular atrophy is not correlative with the amount of destruction in the joints, but rather with the type and activity of the disease. Indeed, there is a type which we have already several times animadverted to (type 3 p. 62) in which the joint trouble appears to be quite secondary to that of the muscles.

Usually certain groups of muscles are more affected than others. In the hands the wasting is general. In the forearms the extensors including the Supinator Longus are generally most affected; in this it differs from the atrophy of lead poisoning in which the Supinator usually escapes. In the thigh the extensors of the knee are the most affected (vide page 160). If the shoulder joint be affected there is marked atrophy of the
Deltoid and scapular muscles. The electrical irritability of the atrophied muscles may be normal but is often slightly lowered. There is generally an increase of myotatic irritability.

The atrophy in Arthritis deformans is similar to that in other articular inflammations. That it is not alone due to disuse is seen by the trifling and slowly produced atrophy entailed by disuse of the joints, whereas in all varieties of Arthritis, traumatic or infective, the rapidity and degree of the atrophy is dependent upon the severity of the joint affection. It cannot be due to a secondary extension of inflammation to the nerve from the joint as this would manifestly not

explain the involvement of the whole of a muscle. And that it is not due to a Peripheral Neuritis is shown by the absence of the "reaction of degeneration" and of other signs of peripheral Neuritis. Bannatyne appears to think that in the case of Arthritis Deformans the atrophy is caused by a toxin circulating in the blood and affecting the ganglion cells of the anterior cornua of the spinal cord. This would explain a generalised muscular atrophy but I fail to see how a toxic agent circulating in the blood could possibly have any selective action on those cells which govern the nutrition of the muscles in relation to the diseased joints.

I think that, muscular atrophy being such a constant accompaniment of all joint inflammations, there must be some common factor that causes it in every case. The most popular view is that of a reflex influence on the muscles, and it appears to me quite feasible that the irritation of the sensory nerves supplying the joint would have such an influence on the cells of the anterior cornea as to inhibit their trophic functions.

Fig. 16. Diagram explaining reflex influence.
At this point it will be opportune to consider how the deformities met with in Arthritis Deformans are produced. These deformities are of two kinds, viz.:—those primarily due to changes in the joints themselves, and those secondarily induced by changes in the muscles. Under the first class we would include deformities produced by effusion, ligamentous thickening, and bony outgrowths. It is not our intention to deal with them here but rather to discuss the cause of the second class of deformities. In the larger joints such as the knee or elbow, when muscular contracture takes place one set of muscles overcomes the antagonistic set and the joint is drawn into one of its normal attitudes and is fixed there by permanent shortening of the muscles.
In the small joints of the hands certain deformities are seen which will require a more elaborate explanation. It has been noticed that inclination of the fingers towards the ulnar border of the hand is a very common deformity and it may be remarked that ulnar deviation is only met with in articular disease, it never being seen in deformities due to nerve lesions. Obviously, therefore, to produce this deformity there must first be disease of the joints. This causes softening of the ligaments, then atrophy and shortening of the interosseus, taking place the fingers are drawn over to the ulnar side which is "the path of least resistance", because they metacarpo-
-phalangeal joints slopes towards the ulnar side, and further, it is found that the fingers are more easily pushed over to the ulnar side in a normal hand. There is often hyperextension at the first interphalangeal joint owing to the action of the interossei and lumbrical muscles which are inserted into the dorsal expansions of the extensor tendons.

Fig. 17. Showing slope of metacarpophalangeal joints to ulnar side.
In the vast majority of cases of generalised Arthritis Deformans articular pain is an almost constant accompaniment. In some, however, the pain only comes on at intervals; changes in the weather or the warmth of the bed bringing it on. Some patients, more especially those whose joints are fixed or less fixed experience no pain whatever except when an attempt is made to move the joints.

The pain is usually of a dull aching character, worst when the patient gets warm in bed, so that he often spends restless nights and gets worn out for want of sleep. If erosion of the cartilages is in active progress starting pains are felt in the joints when the patient is dropping off to sleep.
The pain is also variously described as gnawing or rheumatic, "toothachey" or neuralgic, boring, and burning, the latter being felt in the skin over the joint.

Besides the articular pain, there is often cramp-like pain in the muscles of the limbs: a "drawing" of the muscles is frequently experienced, this being especially noticeable in the hamstring tendons when the knee joints are the seat of the disease. Ordinary rheumatism-like pain is often felt in the muscles, a frequent seat of the pain being along the upper border of the trapezius, or across the back in a line between the shoulders.

Tingling and hyperaesthesia of the fingers is sometimes complained of, so that the
patient cannot handle anything with comfort. More frequent than this is tingling accompanied by a feeling of numbness, varying in degree in different cases and in the same case from time to time. One sufferer told me that this tingling was so intolerable at times that she had to hold her hands up in the air to get relief, these attacks lasting about an hour at a time. Another stated that the tingling increased with inspiration to such a degree that she could not draw a long breath with comfort. Many complain that the tingling is made worse by putting the hands into warm water. Thus, it would appear that the hyperaesthesia and tingling is due to a
congestive condition of the end organs of the sensory nerves.

It is stated by Bannatyne that purpura haemorrhages sometimes occur in this disease. He has also seen haematemesis several times and haemoptysis once. He has also seen haemorrhage under the nails of both hands and feet. I have seen haemorrhage under the nails in one case but on enquiry it proved to be accidental, if, however, persisted a considerable time. The spontaneous haemorrhages spoken of by Bannatyne I have never seen, and I think must be very rare, so rare, indeed, that it is highly probable that their association with Arthritis Deformans is only

\[\text{Rheumatoid Arthritis}, \text{edit. p. 122.}\]
a coincidence. According to Bannatyne these haemorrhages are almost undoubtedly due to the rheumatoidal toxic poison inducing anaemia with dilatation of the blood vessels and extravasation of their contents."

Subcutaneous Fibrous nodules are occasionally seen in association with this disease. They are most common along the subcutaneous border of the ulna in connection with the disease in the elbow joint and olecranon bursa.

Psoriasis, Pityriasis versicolor, and other skin diseases are sometimes met with, the atrophic condition of the skin probably rendering the patient more vulnerable to the invasion of these diseases.

Insomnia due to the pain, gastric disturbances, amenorrhoea in the female, impotence in the
male (in rapidly progressive cases) due to the debilitating influence of the disease are often met with. Tachycardia is also common, it probably being due to the action of the toxin on the cardiac nervous mechanism.


The diagnosis of this disease in advanced cases as a rule presents no difficulty, easily being recognised by the characteristic appearance of the joints and by its symmetrical distribution. But in many cases, notably where the disease is slowly progressive beginning in a wrist or knee, mistakes are apt to be made.

As a general rule, in these
cases there is effusion with softening of the ligaments and the condition is apt to be mistaken for tubercular disease, especially for hydrophs articular or for white swelling. In white swelling there is considerable thickening of the synovial membrane and the swelling feels solid and gelatinous. From tubercular synovitis or hydrophs articular the diagnosis is not so easy, and if there is any doubt, it is best to treat the disease expectantly. If it is Arthritis Deformans the involvement of other joints will soon show its true character.

One sometimes meets with cases in which there is considerable stiffness and sometimes contracture of a few of the joints without any bony lipping and not symmetrical
in its distribution. I believe these to be cases of infective arthritis in which the inflammation has not gone on to suppuration but has stopped at the "plastic" stage with the formation of fibrous tissue in the periarticular structures or even in the joint itself. In support of this it will be found on inquiring into the history of a case that the joint trouble has frequently followed one of the specific infectious diseases and failing such a history I believe the organism gets in by such channels as the teeth and throat. Some cases follow an injury, the injury probably being predisposing, the germ circulating in the blood and lodging in the injured joint.
The following interesting case of infective arthritis came under my own notice. I was called to see a man suffering from a large "gum-boil". On examination I found a large abscess in connection with two of the lower teeth which were carious. The glands in the submaxillary triangle were enlarged and tender. Temperature 102°F.

The abscess was opened and the patient advised to go and have the teeth out. He felt so much relief that he neglected to do so. Two days after I was sent for and was informed that he had been suddenly "struck" with a pain in the right wrist the night before; the pain got rapidly worse and "flew up the arm", rendering the
limb quite helpless. On examination the wrist was found to be swollen and tender but about the natural colour. He could not bear the slightest movement of the joint. Temp. 99.2. Infective arthritis was diagnosed and hot carbolic fomentations applied. The two carious teeth were removed to stop the supply of the poison. The wrist slowly got better but was very stiff. Some improvement was effected by soaking in hot water, passive movements and rubbing, so that after a number of weeks he was able to return to his work. I believe that this was of the nature of a Pyaemic Infection, but that the Staphylococci were not sufficiently virulent to cause
supphuration. Further, I have no doubt that a polyarthritis of this nature is frequently diagnosed as Chronic Rheumatic Arthritis or Chronic Arthritis Deformans. In some of these cases the toxic agent of Arthritis Deformans seems to become superadded to the primary infection, sometimes a member of years after. Possibly such patients having their joints already damaged are more vulnerable to the attack of the Arthritis Deformans poison than others.

A multiple arthritis causing permanent stiffness of the joints is often the result of gonorrhoea. This would be classified under the infective arthritides but there are some peculiarities which it is well to notice.
It may attack the temporo-
maxillary, intervertebral, and
sterno-clavicular joints, in
this resembling Arthritis Deformans.
Chronic Hydrarthrosis is sometimes
the result of gonorrhoea, but
it usually affects only one joint.
Gonorrhoeal Arthritis is more
common in men than in
women. The arthritis is not
marked by a symmetrical
distribution, there is never
limping of the articular
ends of the bones. There is a
history of urethritis. Pain in,
and tenderness of, the fascia
of the foot especially under
the heel is common in gonorr-
rhoecal arthritis. The patient
feels as if a sharp nail
were going into the heel
whenever it is brought to the
ground.

Arthritis Deformans may
be secondary to gonorrhoeal
arthritis. I once met with a young man who had a severe attack of Polyarthritis following gonorrhoea. Most of the joints of the limbs, including the small joints of the hands were affected. The interphalangeal joints presented the typical ovoid appearance of acute Arthritis Deformans. Some might regard the joint lesions in this case as solely due to the gonococcus. If a pure culture of the gonococcus were to be obtained from the joints in such a case it would of course settle the question.

The deformities typical of Arthritis Deformans may be seen in persons suffering from gout. Sir D. Duckworth states that bony lipping may be the result of gout, but in some cases I am
Inclined to think that if Arthritis Deformans has been superadded to the original disease, I have seen a man by occupation a glazer in the potteries, who had gouty tophi in the ears, and signs of chronic lead poisoning, but his hands had all the appearance of Arthritis Deformans and there was stiffness of the spine in the cervical region. Also, an old cab driver who had suffered for years from gout, with tophi in the ears and teeth ground down, but a deformity of both hands had come on a year or so before I saw him, which prevented him following his occupation. In this case again the deformity had all the superficial appearance of Arthritis Gouty deformities.
are as a rule due to deposits of biurate of soda around the joints and elsewhere. **The deformities on the above two cases, I consider as due to Arthritis Deformans secondary to Gout.**

**Fig. 8.** A gross case of gout showing deformities produced by the deposit of biurate of soda.

From nerve arthropathies such as Charcot's joint disease Arthritis Deformans is diagnosed by the presence of
the nerve symptoms in the former disease. From the deformities produced by muscular atrophy such as the claw hand of progressive muscular atrophy or of ulnar paralysis it must also be diagnosed. The paralysis of hemiplegia and of peripheral neuritis sometimes produces
but the following points may be mentioned here. In acute Arthritis Deformans the joints are more symmetrically involved, the small joints of the hands are more liable to be attacked, the temperature is not so high and the constitutional disturbance not so great in proportion to the number of joints involved, and salicylates fail to reduce either the pyrexia or the joint swelling.

__Morbid Anatomy of Arthritis Deformans__

Our knowledge of the morbid processes of this disease is very incomplete, partly because the disease is not fatal in itself so that there is a lack of material for studying the disease in its earlier and more active condition,
and partly because observers make no attempt to differentiate the different forms. Now that the disease is being separated into types, clinically, we may expect a corresponding anatomical differentiation, and probably later some of these types will be shown by bacteriological and other methods of research to be really different diseases. At present there is little more to go on than the classical description of which Adams was the chief exponent and which chiefly applies to the osteo-arthritis form of the disease. Authorities differ as to whether the changes begin in the cartilage or synovial membrane. Garrod A. E. believes the cartilage is primarily affected, while Adams\(^2\) and following him Bannatyne\(^3\) believe

the synovial membrane to be the first affected. If the disease is of an infective nature, as I believe it is, the latter are probably right, as organisms circulating in the blood could hardly find their way into a non-vascular tissue like hyaline cartilage. The disease, then, probably begins as a synovitis although the cartilage is in many cases early involved especially over the central part of the articulation where it is devoid of synovial membrane, which leads us to think that the disease beginning in the synovial membrane, an exudation containing the microorganisms and their toxins is thrown out, so that the cartilage is attacked from the joint cavity. Bannatyne thinks that the microorganisms gain "access to the joint cavity by"
"Setting up an endarteritis in one of the small vessels on the surface of the synovial membrane with a diffuse cell exudation, and this by extension and rupture breaking into the joint cavity, liberates them for further mischief."

The earliest change met with is effusion into the synovial sac with marked injection of the vessels of the membrane. The membrane becomes thickened, this thickening being at first soft and pulpy, and later hard and dense. The synovial fringes become hypertrophied, and these villous-like processes bud and give off secondary villi. These synovial buds generally become cartilagenous, the cartilage being formed from cartilage cells which normally exist in the synovial membrane. Sometimes a further development takes place true bone being formed. The movements
of the joint causes the pedicles attaching these buds to the synovial membrane to stretch. Sometimes a pedicle breaks, setting free its module of cartilage and so giving rise to a foreign body in the joint. In this manner a considerable number of loose bodies may be formed.

The microscopic appearance of the synovial membrane, according to Hennatiy, is as follows: "The synovial membrane is seen to be infiltrated with newly formed connective tissue cells, the blood vessels are dilated, and their walls thickened, and here and there are small collections of leucocytes surrounding them. On proper staining, microorganisms are discovered scattered throughout the membrane, but more especially wherever there are any collections of round cells."

"Hennatiy, Rheumatoid Arthritis ii edit. Page 62."
and it may be added that the borders of the articular cartilage are not subjected to friction.
In the cartilage two apparently opposite processes appear to be going on. At the centre of the articulation the cartilage becomes fibrillated giving an appearance of velvet pile and this eventually disappears leaving bare bone, while at the periphery there is an overgrowth of the cartilage giving rise to bipping round the joint. These two processes, according to Comiel and Ranvier, are in reality identical; "the difference results from the borders of the articular cartilage being covered by the synovial membrane, under which the proliferating elements accumulate instead of being discharged into the articular cavity; ")

The histological changes leading to fibrillation of the articular cartilages are as follows: -

2. Ibid., page 391, & Parrot & E. Buchsbaum, Rheumatism, page 275.
There is a proliferation of the cartilage cells in a direction at right angles to its free surface, producing vertical rows of cells, and presenting an appearance closely resembling that which precedes the development of bone. Owing to the rapid multiplication of the cells a number are found contained in the same capsule. These capsules open into one another, in a direction perpendicular to the surface of the cartilage, and the capsules on the surface burst into the joint, discharging their contents into the articular cavity. A further fibrillation takes place by a splitting up of the ground substance between the tubules produced by the discharge of the cartilage cells.

Intervertebral fibro-cartilages such as the menisci in the joint of the mandible, the semilunar cartilages in the knee,
the fibro-cartilages in the sternoclavicular and wrist joints, and between the bodies of the vertebrae, are frequently absorbed. Intervertebral ligaments like the ligamentum flavum in the hip, and fibro-cartilaginous bands surrounding the sockets of joints like the hip and shoulder, often share the same fate.

On removal of the cartilage at the centre of the articulation the bone is left bare. It presents an eburnated appearance owing to a layer of compact bone on the surface. This compact bone is probably produced by a local osteitis, set up by an extension of the inflammation from the joint. The surface of the bone is often finely grooved the grooves running in the direction in which the joint moves.

Sometimes the Haversian spaces are opened up by the grinding down process, or more correctly, by the process of absorption, giving a worm-eaten appearance to the bone.

At the edges of the articulation there is an outgrowth of bone, this new bone being produced by ossific changes in the overgrown articular cartilage. These osteophytes being always covered by cartilage there is no limit to their development. Sometimes these osteophytes become detached forming what Adams calls addimentary bones. New bone may be thrown out in such quantity that the osteophytic masses interlock and produce a false ankylosis. True bony ankylosis is never found in the joints between the long bones.

Adams, "Rheum. Pract. III ed. p. 38"
but sometimes occurs in the spinal column and in the carpus and metacarpus.

In some cases the ligaments become stretched by chronic effusion in the joint allowing abnormal mobility andluxation. In others the ligaments are preternaturally dense and thick, sometimes of the consistency of fibro-cartilage, causing great stiffness of the joint.

tendons in the neighbourhood of a joint may become detached; this is well seen in the shoulder joint where the tendons inserted into the tubercles of the humerus often lose their attachment. The long head of the biceps which is within the capsule of the shoulder joint is often absorbed.

Suppuration has been seen in a few cases, but it is no doubt due to an accidental inection
by pyogenic organisms and not to the primary infection?

Pathology.
Many views have been held as to the exciting cause of this remarkable disease, but as yet none of them have stood the test of unquestionable proof.
At present, the two most popular views held by authorities, at least in this country, are the dystrophic or neuro- trophic and the infective. Most are now agreed that Rheumatic Arthritis is due to a specific infection, and doubtless the same view will be held as regards most forms of Arthritis Deformans, especially those characterized by initial or periodic pyrexia.

Adams, R. Rheumatic Int. ii ed. p. 21.


The neurotrophic theory has been popular with the profession for so long that we will briefly review the chief arguments advanced in support of it.

It receives its chief support from the similarity of the lesions found in this disease and in Tabetic Arthritis (Charcot’s joint disease). Anatomically Tabetic Arthritis is said to resemble Arthritis Deformans; but, according to Bannatyne the lesions are not identical in the two diseases. In Tabetic Arthritis, as a rule, only the knees are affected and it shows no sign of progressing to other joints, with the exception that the small joints of the fingers have been known to suffer. In this it conforms to the Localised type of Arthritis Deformans. Further, Tabetic Arthritis is more rapid and more
destructive than Arthritis Deformans.
It might be argued that Tabetic Arthritis is possibly a secondary Arthritis Deformans, the joints in Locomotor Ataxy being especially vulnerable through having their trophic influences cut off, and that the disease is more rapid and destructive in these cases for the same reason.

Arthritis due to nerve lesions other than Locomotor Ataxy has been met with.

The muscular atrophy met with in this disease is often merely Arthritic, but is sometimes out of all proportion to the joint mischief. This lends support to its being of nervous origin. The trophic changes in the skin also point to nerve trouble. The association of the disease with grief, worry, or anxiety is also in favour of a nervous origin.

1 Farrod, A. E. Rheumatism et, 1902, p. 287.
Peripheral neuritis has been found in some cases where the atrophy is great, but as it is not a constant feature it cannot be advanced as a cause. It is rather, I believe, an effect, of the materies morbi of Arthritis Deformans acting on the nerves.

Its symmetrical distribution is advanced as being in favour of its having a nervous origin. But symmetrical lesions might be the result of disease, the cause of which is in the blood. Of joint diseases we might example Gout which is often symmetrically distributed in its chronic forms.

The neurotrophic theory gets support from the frequency with which it follows Uterine Disease. It is well known that the diseased uterus has a powerful influence on the nervous systems, often causing intense hyperaesthesia, and, it is said, reflex paraplegia; but I
think that now most authors regard paraplegia occurring in chronic visceral disease as an extension of the inflammation to the cord. In support of the infective theory of Arthritis Deformans it might be argued that the diseased uterus is the channel by which the infection enters the circulation.

The nervous theory is said to get support from the frequency with which Arthritis Deformans follows prolonged exposure to cold and damp, in this resembling the onset of Acute Nephritis. But cold and damp predisposes to other diseases, such as Acute Nephritis and Pneumonia.

Against the syphilitic theory we have the argument that it would not account for the inflammatory symptoms sometimes met with, such as prolonged pyrexia, and the local evidence of inflammation.
in the joints.

The infective theory which is now largely accepted and which, I venture to say, most satisfactorily accounts for the various phenomena which this disease presents, got its chief impulse from Dr. Bannatyne of Bath, although he was not the first to suggest it, by his discovery of a micro-organism which he believes to be the exciting cause of the disease. The organism discovered by Bannatyne is a non-motile bacillus exhibiting marked polar staining with an intervening unstained portion, giving it the appearance of a diplo-coccus. Its average size is 2.1 x 0.6μ. Pure cultures of this organism have been obtained, but as yet it has not satisfied Koch’s criteria, in as much as an inoculation of the pure culture has failed to reproduce the disease, but this might

\[1\] Bannatyne. Rheumatoid Arthritis. II. Edit. & appendix.
be because the animals experimented on were immune to the disease.

Bannatyne believes that the organism "has as its habitat the "joints, and while there gives rise "to soluble products which, when "absorbed, pass to the central "nervous system, giving rise to "the nerve symptoms so common "in this disease." The organism has been found in the blood, so that the disease is probably of the nature of a pepticaemia, thus accounting for the involvement of one joint after another.

The chief arguments Bannatyne advances in support of his theory are: - the frequent occurrence of this disease as a sequel to other infective diseases; its numerous nerve symptoms for which no adequate nerve lesion can be found; its polyarticular character and symmetrical distribution; the presence of enlarged glands proximal to
the affected joints; (enlargement of the spleen has also been found); the result of treatment by Guaiacol, Salophen, etc.;

We see evidence of inflammatory action, and consequently, in all probability of bacillary, in the prolonged fever of acute cases. Pyrexia from nerve disorder, of a non-toxic nature, one would expect to be comparatively transient in its duration.

We, further, see it in the local signs, the joints being swollen and hot in acute cases, and old-standing cases being frequently characterised by a chronic effusion, resembling that form of tubercular synovitis known as 'hydrops articularis'; a thickening of the synovial membrane comparable to 'gelatinous degeneration' is also frequently met with.

Again, the anatomical changes met with point to an inflammatory rather than to an atrophic process. We have the marked injection of the synovial membrane which many observers have drawn attention to, and the proliferation of the cartilage cells, ultimately leading to fibrillation at the centre, and growth of the cartilage and new bone formation at the periphery of the joint, which to my mind indicates the presence of some irritant, probably the toxins produced by some microorganism. That microorganisms can cause new growth we have abundant evidence in the inflammatory formation of new connective tissue, and the formation of new bone in periostitis and osteomyelitis.

Lastly, there is the possibility of it being infectious, although as yet we have little evidence
of this. But I know of one
sufferer who contracted the
disease during a long stay in
Buxton, doubtless occupying a
bed that many arthritic patients
had used. I know of another
who was a servant in the
house of a medical man in
Buxton, and who contracted
the disease in a very acute
form. Osler states that "Sequin"
has reported the occurrence of
three cases (of Arthritis Deformans)
in children of the same family.
This last might, of course, be
used as an argument in support
of the dystrophic theory, as we
see the same sort of thing in
Progressive Muscular Dystrophy.
There is one variety of Arthritis
Deformans which presents different
clinical features and probably
different morbid appearances to
the more ordinarily recognised
types of disease known as Arthritis
Deformans, and I think is of a
different nature. I refer to that
variety where the deformities are
apparently primarily due to
muscular atrophy and the
resulting muscular shortening (vide p. 62).

I am of opinion that this
variety is analogous to a
Progressive Muscular Atrophy, any
Arthritis present being due to
disease of the joints.

I base this opinion on:—the
marked muscular wasting quite
unaccounted for by any visible
joint trouble; the similarity of the
deformities to those resulting from
nerve trouble, such as Peripheral
neuritis, traumatic lesions, and
Progressive muscular atrophy; and
the symmetry of its distribution
which is more marked in this
than in Arthritis Deformans proper.

Negatively, we have the absence
of external signs of joint trouble. There is no effusion or erosions
in these cases. True, the joints are very stiff and the bones cannot
be replaced in their normal relations, but this is due to permanent
muscular and ligamentous
shortening and not to any evident
arthritis. Ulnar deviation of the
fingers so common in these Arthritis
Deformans is not seen here; on the
contrary, radial deviation, probably
from contraction of the Abductor Indicis
and other interosseous muscles, has
been seen (vide fig. 13 page 65).

The electrical reactions and
the myotatic irritability do not
help us much, except that in the
first place the absence of the
reaction of degeneration shows that
the condition is not due to Peripheral
neuritis, and that in the second
the irritability is usually
increased, as we find in most
cases of muscular atrophy whatever
the cause.

There is generally some vaso-motor disturbance in this variety, such as localized or generalized cold sweats, the patient's hands and face being sometimes covered with beads of perspiration although there is no rise of temperature; there is also often constriction of the peripheral arterioles, leaving the extremities cold and blanched or cyanosed. Joint pains are not experienced in this variety as in the others.

A rather ingenious, but somewhat fanciful, theory has been advanced by Russell Forsbrook. He believes the disease to be due to two factors: first, an hereditary instability of the vaso-motor centre (which centre acts either as a trophic centre itself, or has very intimately related to
it a distinct trophic centre which acts in conjunction with it, so that it is easily excited by a small deficiency of oxygen; second, that there is a condition of anaemia immediately preceding the onset of the arthritis and that this leads to a deficiency of oxygen in the blood.

Continued excitation of the vaso-motor centre by a deficiency of oxygen (or excess of carbon dioxide) causes constriction almost to obliteration of the minute vessels supplying the joints in this way cutting off their blood supply and consequently interfering with their nourishment. This is followed by exhaustion of the centre leading to dilatation of the vessels and giving rise to inflammatory changes. These two forces alternating again and again cause the degenerative and inflammatory lesions characteristic of Arthritis Deformans. The greater the hereditary instability
of the vaso-motor centre and the greater the deficiency of oxygen, the more acute is the attack of Arthritis Deformans.

We believe that Dr. Forsbrook is arguing from false premises as the anaemia in cases of Arthritis Deformans is a result of the disease. We admit that in the lowered condition of health often preceding the disease there may be a degree of anaemia, but this is not always the case.

**Treatment.**

In a disease so progressive and destructive one would expect little could be done to alleviate the patient's condition, but as a matter of fact, although a perfect cure is not be be looked for a great deal can be done towards arresting
the disease and when the disease is quiescent much can often be done towards overcoming stiffness and contractions. It must be confessed, however, that in some cases our best efforts are futile the disease steadily progressing in spite of all we do.

In acute cases the patient should be kept in bed during the pyramidal period. An endeavour should be made to keep the knees straight to prevent contraction of the hamstrings but this is often impossible on account of the pain, which may be so severe as to make the patient cry out if any attempt be made to move the joints or if anyone accidentally stumble against the bed. The joints should be wrapped in cotton wool and some anodyne application may be applied. The diet should be light but nourishing; it may
largely consist of milk, but the patient should not be restricted to a milk diet; or the question of diet the patient's wishes should be considered. Medicinally, I have not found any of the "remedies" recommended of any avail; perhaps a simple iron mixture, or inoside of iron and arsenic would answer best.

When the patient is convalescent, or when the fever is retrogressing if it has been prolonged, the patient may be allowed to spend some part of the day in a wheel chair with the leg pieces up as far as possible to prevent contraction of the knee joints.

In chronic cases attention should first be paid to the patient's clothing. He should be warmly clad wearing flannel or other woolen garments next the skin. It is a matter of great
importance that the joints should not be exposed to changes of temperature as this greatly aggravates the pain. Knitted woolen knee caps should be worn and in the winter the patient should wear mits when in the house, and, of course, it is needless to say warm gloves must be worn when out of doors. All unnecessary exposure to cold and wet must be avoided, and great attention must be paid to the clothing of the feet. The bedroom should be ‘airy’ and in cold weather should be warmed by means of a fire. The bed should be soft with a wire mattress and well ‘made’ as the patient is often all angles and any hardness or lumpiness is torture to him.

Every encouragement should be given the patient to take full advantage of the open air and sunshine. If the patient
is able to walk he must be encouraged to do so, but with the use of a crutch or stick, according to the severity of the case, in order to take his weight off the diseased joints as much as possible. If unable to walk, or if he walks badly he should be taken out in a bath chair or a carriage. Too much stress cannot be laid on the great use of fresh air and sunshine as a therapeutic agent in this disease. It oxygenates the blood, promotes metabolism and excretion and improves the appetite; and in this relation we must not forget the psychological advantages - the patient is taken out of himself, whereas if left in the house he would have leisure to brood over his ailments.

The long dark wet winters of this climate are exceedingly prejudicial to sufferers from this
disease and if their means allow it they should winter abroad. The dry air of plateau and steppe country is better than the humid and often enervating climate of the seaside. The Karroo of Cape Colony and many other parts of South Africa are ideal resorts for sufferers from this disease.

In this disease there is no need to restrict the diet; indeed, as in other chronic wasting diseases the patient should be allowed as nourishing a diet as he is capable of digesting. Owing to mistaken ideas as to its pathology, nitrogenous articles of diet, especially meats rich in extractive principles, are often cut off, but properly prepared meat usually agrees very well with the patient, many finding it more digestible than starchy and sweet foods. Fats are an
important adjunct to the diet; plenty of creamy milk and butter should be taken especially if the sufferer is unable to eat the fat of meat; milk may be enriched in fats by boiling a muslin bag of minced suet in it. Cod liver oil being readily absorbed and assimilated is a very useful fat food. Owing to its disagreeable taste many are unable to take the pure oil and with others it is liable to cause indigestion, nausea and sickness, and in large doses it may set up diarrhoea. It was first tried in this affection by Sir B. Brodie who administered the purified oil in a case of Arthritis Deformans and at the same time rubbed it in as a liniment on the affected joints. He states that 'the result

'Brodie, observations on the diseases of the joints', page 247.
was such, that to any other patient under the same combination of circumstances he would certainly be disposed to recommend a trial of the same remedy. If the pure oil disagrees one or other of the emulsions with or without malt may be given; before recommending any proprietary preparation it should be seen that there is a good proportion of cod liver oil in it.

As in other diseases for which no specific remedy has been found a host of drugs have been recommended; an old favourite was the celebrated "Chelsea Pensioner" which has the following composition, "Sulphur 3j, Potas. Bitartrat. 3j, Pub. Rhei 3s, "Sulphuric acid 3j, Honey 3 xj, S)i / 3j roots, maneque. Perhaps the most perceptible drugs in this disease are Arsenic and Iron, although a great deal is not to be expected from their use.
Iodine and the iodides have been recommended. It is useless, however, to paturate the patient with Potassium Iodide as it only lessens his recuperative powers. If it is desired to give an iodide it is best given as the Iodide of Iron, either in the form of the Syrup or in a pill.

Bannatyne, and following him others have attempted to combat the disease by the internal administration of antiseptics, chiefly Guaiacol Carbonate (Duotal), and it has been well spoken off. I have seen it administered in a number of cases with very doubtful benefit. In an acute case it failed either to reduce the temperature or modify the disease after prolonged administration. Creosotal and Salophen were equally unsuccessful.

1. Bannatyne. Rheumatism or Arthritis. 2nd ed. pgs 185 et seq.
in this case. In other cases where the disease has been in active progression it has equally failed to modify it. Some cases have improved during the administration but these have been poor working class people, and I regard their improvement to the rest and good diet while in hospital.

Barnatyn believes that Guacacol and other internal antiseptics, act, not by any direct action on the micro-organisms themselves, but by entering into combination with the toxic albumins and being excreted in this combined form by the kidneys, and possibly also by impairing the power of the organisms to grow and multiply. Barnatyn hopes that before long an antidote, having as powerful an effect for good as that of Diphtheria, will be found.

For the muscular cramps often experienced in this disease Hyoscyamus
has been found useful by A.E. Garrod, and Forsbrook recommends Antifurin for the same purpose.

Among the other drugs recommended for this disease are Actaea Racemosa, Fraxinis Excelsior, Colchicium, Salicylates, Resinose, and Ichthyol.

If the digestion is impaired this should be improved by the exhibition of suitable medicines. Attention should also be paid to the enunctories by occasional cleansing baths and if necessary, the administration of aperients.

For the relief of articular pains the following external applications have been recommended:

1. Equal parts of Guaiacol & Olive oil.
2. Guaiacol, one part, 1/2 Lodi, six parts.
3. Methyl Salicylate (pure).
4. Wintergreen oil.

1 A.E. Garrod, Rheumatism.
2 Forsbrook, Osteo-Arthritis, p. 108.
5. Methyl Salicylate and Olive oil, equal parts.
7. Hot Carbolic lotion, fomentations, 2½%.
8. Liquor Plumbi and 7% opium.
10. Evaporating lotions containing Ether, Alcohol, and some hygroscopic salt like ammonium chloride.

Of these such bodies as Quinaol and Phenol have a pedative action on the cutaneous nerve endings. Iodine is a counter irritant. Olive oil aids the absorption of the body dissolved in it. The lead & opium and Liquor Potassae & opium lotions probably have no action beyond keeping the part cool by their evaporation.

Other local methods of treatment are: the application of Scott's dressing, which consists of strips of lint on which Scott's ointment (Ungt. Hydraig. Compr.) is spread; the lint is covered by strapping, wool,
and bandage; it serves chiefly by immobilising the joint and so giving it rest; this dressing should not be left on long as the joint will soon get stiff under it; painting the joint with liniment or tincture of iodine, Shender recommends painting a ring of liniment of iodine above and below the affected joint; rubbing the joints with liniments, for the relief of pain the well known A.B.C. liniment may be tried; the application of a blister to act as a counter irritant; I have found the blister of most service when applied over the temporo-mandibular joint for the relief of stiffness; the application of hot air, hot sand or hot water; at home hot water can be applied locally by means of a large sponge.

The hot water treatment is
a line of treatment that is carried out very extensively at the various spas, and is of undoubted benefit, but from the attraction it has for patients is frequently overdone. It is also carried out at numerous hydro-
pathic establishments, and can be carried out to a limited extent in the patient's own home.

At the spas it is usual to take a bath every second or third day; while in the bath the patient rubs himself with his hand or a soft brush, and the various douches are applied by the attendant. If the patient's joints are too sensitive to bear the direct impact of the douche, the stream is directed at the joint under the water; this is known as the wet douche. Chronic sufferers in whom the disease has long been passive and who go to the
Spas chiefly for the relief of stiffness generally have the "dry" douching.

The hot water does good in the first place by cleansing the skin and exciting the sweat glands; secondly, by stimulating the circulatory and nervous system, and so favouring elimination, improving the appetite, and giving the patient a sense of well-being. The mechanical action of the friction and douching does good; pain is relieved and the joints feel more supple. It must not be forgotten, too, that one of the great advantages of Spa treatment is the opportunities for social intercourse, the bands, concerts, and other amusements, which all help by the mental effect on the sufferers.

At the Spas, too, the medical rubbers are usually possessed of
some skill, and in cases of muscular atrophy this is a line of treatment that should be carried out. Passive treatment of the joints may also be carried out by them, but if there is any active disease present this should not be done except under the eye of a medical man as there is a great danger of aggravating the disease by rough movements.

Electricity is of some benefit in this disease, the continuous current being the better; the electric bath is spoken very highly of by Dr. Stevenson who gives a full description of the method.

The application of surgical methods to this disease is somewhat limited, and is chiefly confined to mechanical surgery.
being a very small field for operative surgery. If the fingers are much flexed they might be considerably straightened by a firm pad in the palm and a back splint. When a considerable degree of straightening has been effected an apparatus, such as is used after operation for Dupuytren's contraction of the palmar fascia, might be worn at nights to prevent re-contractation. For abnormal mobility of the knee joints might be fitted on either side of the limb having joints opposite the knee allowing only of the normal movements. If the knee is contracted metal splints molded to fit the backs of the thigh and leg might be fitted and the knee, extended by means of a screw. Extension by the weight and pulley is not desirable as it confines the patient to bed for an indefinite period. If the temporo-maxillary joint is stiff
Fig. 20. Apparatus for extending a flexed knee.

The adhesions might be stretched by means of a gag. This treatment is generally supplemented by the blister already mentioned.

Of the operations practiced in this disease, aspiration and tenotomy are the chief. Excision has also been practiced with benefit, and in the case of the jaw excision, or resection of the mandible might be called for.

Aspiration is not to be recommended unless the patient
is kept to bed as the fluid acts as a buffer between the bones, and if the patient be allowed to go about there is a danger of an aggravation of the malady. I have seen one case in which both knee joints were aspirated in a medical man's surgery but the joints filled up again soon after the patient had got home.

Subcutaneous tenotomy for contraction of the knee joint has failed to produce the desired result in the cases I have seen, except in one case in which the operation was twice repeated. The operation should be thoroughly done, if at all, not hesitating to make it an open operation should this be necessary in order to get the limb perfectly straight. If any contraction is left not overcome it is very difficult to prevent recontraction.
Prognosis.

In this disease, if it be at all advanced, a perfect cure is not to be expected as it is obvious that restitution of the eroded cartilages and absorption of the osteophytes cannot occur. In many cases, however, the sufferer seems to get rid of the disease, having only his deformed joints to remind him of his past suffering. Many such people are able to lead active lives. Such a case is recorded by Adams: If the disease has not extended beyond the synovial membrane a perfect cure is possible but very rare. I only know of one such case; a patient at the Devonshire Hospital, Buxton, with pulpy swelling of the synovial membrane of both wrists. After a twelve weeks’ stay she went home cured.

1 Adams: Rheumatic Joint, ii ed., p. 319.
B. Localized Arthritis Deformans.

The localized form of Arthritis Deformans although paid to present anatomical changes identical with the generalized or polyarticular variety differs from it in many important clinical features. Whereas the generalized form is commonly found at all ages after puberty, the localized is rarely seen before the age of forty. Again, the localized form unlike the generalized is more common in the male sex than in the female; this difference, however, being mainly, if not entirely due to the prevalence of that condition of the hip joint known as Morbus coxae senilis or Malum coxae senile, and if we take the view of those who assert that this malady condition is not an arthritis but a degenerative change, and
put it "out of court" in the disease under consideration, it will be found that women are the usual sufferers. The two varieties also differ in the joints liable to be affected, and in their malignancy. In the localized form the joints attacked are usually the larger and more central joints, and it is commoner in the lower than in the upper extremity; further, as its name indicates, it is usually confined to one joint, and although the opposite joint may be attacked, the two joints generally present different degrees of the disease. On the other hand, in the generalized or constitutional form the disease usually starts in the peripheral joints, and is more common in the upper extremity; symmetry of the lesions is usually extremely well marked in this form and is not merely seen in
"the simultaneous or consecutive
invasion of corresponding joints
but even extends to the portions
of the cartilage which are
destroyed in each." Although,
in the generalized form the
disease may become arrested
after attacking a few joints there
is always a liability of metastasis
to other joints; and, although
it may start in one of the larger
joints it is not long before it
shows its malignant character;
but, if the disease becomes fixed
in one of the larger joints there
seems to be at no time any
likelihood of its developing into
the generalized form. One sometimes
sees Heberden's nodes along with
localized Arthritis deformans but
the relationship is probably
accidental and not a metastasis
from the affected joint to the fingers
The same relationship is occasionally
seen in Diabetes Arthritis.

1 Garrod A. E. Rheumatism p. 250.
As we have already said, the disease in its localized form is usually found in the larger joints and those nearest the trunk, and if these, if we include, as I think we should, the condition known as morbus coxae senilis, the hip joint is the one most usually affected. At this point it is as well to say that the appellation morbus coxae senilis does not cover all cases of the disease in the hip as it is sometimes found, as pointed out by Robert Adams in comparatively young men.

Next in frequency to the hip comes the knee joint, and this follows the same rule as the polyarticular form, in as much as women are more frequently the subject of it than men. Other joints occasionally attacked are the ankle and shoulder, and rarely the elbow.

1 Adams R., Rh. Foot. ii ed. page 47.
The disease in the Hip joint.

This condition usually occurs after middle life and for this reason Robert Adams gave it the designation 'Morbus coxae senilis', but having met it at the ages of 30 and 40 he substituted the name 'Chronic Rheumatic arthritis' of the hip. It is most common in men, probably over 90% of cases occurring in the male sex.

A number of views have been held as to the nature of this affection; by some the symptoms and post-mortem appearances have been regarded as pointing to a united fracture of the neck of the femur. It has also been thought to be an atrophic change following injury to the vessels entering the head of the femur through the round ligament.

"Adams R. Rh. Jour. ii edit. h. 47."
Others, again, have considered it to be a senile change due to "wear and tear". The fact that bony lipping occurs around the acetabulum as well as round the head of the femur negates the view of its being the result of fracture, degeneration, or trauma. Injury is probably the chief predisposing cause, and, as the post-mortem appearances are similar to what is seen in the generalized form of the disease, this condition is regarded by some as being of the same nature.

Stiffness about the hip joint is complained of, this stiffness being worse in the morning and wearing off somewhat towards night. Along with this stiffness there is a dull aching pain in the hollow behind the great trochanter and also in the groin, extending down the front of the thigh. This pain is increased
by throwing the weight on the joint. Sometimes pain is referred to the knee, on account of the intimate nerve supply of the two joints.

The patient stands with the foot everted, and the thigh slightly flexed. The limb appears much shorter than its fellow. This shortening is more apparent than real, owing to the patient holding his pelvis obliquely in order to throw his weight on to the other limb. This pelvic obliquity causes a certain amount of lordosis of the lumbar portion of the spine. There is also some actual shortening, due to shortening and bending of the neck of the femur which brings the trochanter higher up.

The patient walks lamely going down on the affected side and with the foot everted. When sitting he cannot cross the affected
leg over the other without the assistance of his hands; he has also to lift the limb with his hands in order to put the foot on a chair or step. To climb steps he always advances the sound limb first.

On examination the great trochanter is seen to be larger and more prominent than on the sound side. There is flattening of the buttock and the gluteal fold is absent. There is some atrophy of the thigh.

On moving the limb flexion is seen to be greatly limited. In examining for this one must be careful not to be deceived by rolling of the pelvis.

I have noticed in some cases oedema of the foot and sometimes also of the leg, there being no oedema of the sound limb.
Diagnosis.

This common affection is often mistaken for Sciatica. Other affections for which it may be mistaken, or which may be mistaken for it are neuralgia of the anterior crural nerve, tubercle of the hip, or displacement of a tendon or muscle causing fixation of the joint.

In Sciatica the character of the pain is different, being as a rule of a sharp paroxysmal character rather than a dull aching pain, and is as bad in the night as in the day, often making the patient pass many sleepless nights; in Morbus cocae penis the pain is easier when lying down. The seat of the pain is also different, the pain in Sciatica being confined to the trunk of the nerve and its distribution.

We must not, however, forget that Sciatica is sometimes associated...
with arthritis of the hip, but the latter is absent is easily excluded by the absence of shortening and eversion and the other signs just described. In neuralgia of the anterior crural nerve the signs of morbus coxae penis is are all absent with the exception of pain in the front of the thigh.

Tubercle of the hip usually occurs in children, whereas morbus coxae penis seldom occurs under 40. In tubercle there is much more pain on manipulation, the limb being held rigid during examination, so that if movements are attempted they all take place at the lumbar joints. Atrophy of the limb is also much greater in tubercle. In tubercle the buttock is full, and not flat as in arthritis deformans, the hollow behind the trochanter being filled up.

I have, I believe, in rare instances been deceived into regarding as
Arthritis Deformans of the Hip: what were really cases of displacement of tendons or muscles in the neighbourhood of the hip joint. I have been led to this belief by a chapter on "Bone-setting" in Howard Marsh's work on "Diseases of the Joints."

The following is one of the cases above referred to: A man aged 26 came as an out-patient to the Devonshire Hospital, Buxton, with a history of Sciatica coming on after an alright injury 10 weeks before. He complained of pain through the hip from the outer side to the groin. He walked lamely with the aid of a stick and presented the appearance of dislocation of the hip in the obturator foramen, i.e. the limb was adducted, slightly flexed, and outwardly rotated, and appeared to be longer than its fellow. This apparent lengthening was due to tilting down of

1 Loc. cit. page 231. Vide also Paget S.J. "Clinical Lectures."

No. 89, 4.69.
the heels in order to bring the foot to the ground. This tilting caused a curvature in the lumbar region. On actual measurement the limb was the same length as its fellow. Due to the flexion the gluteal fold was absent, movement was greatly limited. This condition is rare and may be distinguished from Arthritis Deformans by its sudden onset. In Arthritis Deformans there is actual shortening of the limb; in this condition both limbs are of equal length.

As the chief predisposing cause of Arthritis Deformans, we have the history of an injury, usually slight. In others, it is paid to follow Acute or Chronic Rheumatic Arthritis. Exposure and Colds is frequently attributed as a cause. Heredity is also paid to play a part. Its greater frequency in men is probably accounted for by their being more subject to its predisposing causes, e.g., cold, exposure, rheumatic arthritis, injury.
The Disease in the Knee Joint.

The disease commences insidiously as a rule, or in cases marked by much effusion it may come on rapidly, the effusion persisting for a considerable time without any other sign of the disease, and leading to a diagnosis of chronic synovitis being given. The usual signs of articular inflammation are present, such as pain, heat, and swelling of the joint. One or both knees may be affected, one joint often being in a more advanced stage than its fellow.

As the disease advances it may present one of two types: one being marked by little or no effusion, but soon presenting symptoms of destruction of the articular cartilage, such as echinosis on movement of the joint and pain which is often considerable; the other presenting the characters of a chronic synovitis with little or no pain, the patient rather complaining of weakness of the joint. Both types,
sooner or later, show lipping around the ends of the bones.

In the former type, pain which is referred to the inner side of the joint and around and under the patella is complained of. There is great tenderness on the inner side of the joint in the line of the articulation. The pain is increased by walking, and in some cases is very severe at nights the patient being kept awake by starting of the limb as in tubercular caries. In others, again, the pain is easier when resting. Stiffness is complained of which is worse first thing in the morning, or after sitting for some time. If the hand be placed over the joint it is often felt to be distinctly warmer than its fellow, and if the joint be moved distinct grating is felt "as if there were "coarse wet sand in the joint". This grating is sometimes audible and Adams

"compared it in one case to" the noises "which accompany the discharge of "electrical shocks when emitted in "quick succession from an electrical "apparatus."

As the disease advances osseous enlargement of the ends of the bones takes place and there is great thickening of the ligaments so that the joint is greatly limited in movement, and sometimes becomes quite rigid. The patella is generally involved and becomes broader than normal, and comes to lie over the outer condyle of the femur.

In those cases marked by synovitis, effusion may be the only sign for some time, when the other symptoms begin to manifest themselves. The same osteophytic changes occur as in the former type, but the ligaments instead of becoming sclerosed are stretched by the effusion so that more or less abnormal movement of the joint develops which is most marked in a lateral direction.
giving the patient a "wobbly" bow-legged gait. Luxation of the joint has been known to occur.

The fluid distends the joint and the capsule can be clearly defined in front. A distinct sense of fluctuation can be elicited. In addition to this a sausage-like swelling of the bursa in the popliteal space can often be felt, this bursa frequently communicating with the joint. In time, the fluid in the joint may disappear, the pad of fat under the ligamentum patellae is absorbed and the ligament stands well out. Oedema of the limb below the joint is sometimes present in both the above types. In the latter type, pain is hardly, if at all, complained of, but rather weakness.

**Diagnosis.**

This disease may be and often is confused with tubercular disease of the knee joint but it usually commences after middle age, tubercular disease being more common in young
people. In localized Arthritis Deformans affecting the knee the muscular atrophy is slight and the muscles feel firm, whereas in tubercular disease the atrophy is generally marked and the muscles are flabby. Moreover, the former disease is unattended by constitutional symptoms and there is rarely a general rise of temperature, which, if it is present does not present the hectic character of tubercular disease. Where the only sign is effusion it is most difficult to tell it from that form of tubercular synovitis known as Hydrops articularis. If in doubt treat as tubercles. It can hardly be mistaken for that form of tubercular disease known as 'white-swelling' or 'gelatinous degeneration of the synovial membrane' as in this form of the disease the swelling feels firm, solid, and elastic.

As the constitutional form of Arthritis Deformans presents some
differences from the local, we will now indicate what they are. In the constitutional form muscular atrophy is much more marked, and there is often a great tendency to shortening of the muscles, the patient experiencing this by a feeling of drawing at the back of the knee. Although the wasting is greater on the extensor aspect of the thigh, yet the hamstring muscles being further from their insertions have a greater power of shortening and this leads to contracture of the knees, any attempt to extend them causing great pain. It is noticeable, as we have pointed out before, that where muscular contraction is greatest there is little or no destruction of the cartilages, patients often recovering the use of the joints after they have been flexed for months or even years.

In other cases the disease presents the characters of the local variety, and in these cases the joint is sometimes locked by the bony outgrowths, but
bony union does not occur. Sometimes the bones of the leg and the patella are rotated outwards in relation to the femur.

The Disease in the Shoulder.

The most evident sign is wasting of the muscles clothing the scapula and shoulder, so that the acromion process and spine of the scapula are very prominent, described as the point of the shoulder sticking out. Fluctuation is sometimes present. Movement is limited being confined to abduction and this is chiefly brought about by movement of the scapula on the trunk.

In some cases owing to absorption of the head of the humerus and detachment of the tendons around the neck there is abnormal mobility and helplessness of the joint. The limb being quite flail like.

Diagnosis.

It is most likely to be confused with
that type of tubercular disease known as "Arthritis Sicca". In this disease the patient is much younger, pain on movement is more marked; the constitutional effect is much greater, the patient sometimes losing several stones in weight. It eventually proceeds to suppuration, especially if wrongly treated on the supposition that the disease is 'rheumatic'.

Pathology of Localised Arthritis Deformans.

Like the generalised form, nothing is definitely known as to the cause of the localised form of the disease. Judging from its morbid appearances I am inclined to think that it is of the same infective nature as the generalised type. In the majority of cases of the localised form there is a history of some slight injury preceding the onset of the disease, in others it is attributed to kneeling on cold floor, to
draughts, standing in wet, or some other form of local exposure. The organism probably gains access to the joint thus debilitated and finds a suitable niche for its growth much the same as in tubercular arthritis. The generalized form of the disease might be compared to pyemic arthritis in which there is a general infection, the local to an ordinary infective or septic arthritis.

Treatment

Treatment should be carried out on the same general principles laid down in our consideration of the polyarticular form of the disease. It is in this form that the best chance of benefiting by surgical means is held out. If we believe it its infective character local antisepctic treatment, would be rational, such as incision and irrigation, if the injection of a suitable emulsion.
C. Heberden's Nodes.

In this malady there is bony enlargement of the small tubercles normally found at the ends of the phalanges on each side of their dorsal aspect. In addition to this there is bony thickening all round the joint. These nodes occur at the ends of the middle phalanx. All the fingers may be affected but the thumb generally escapes. The nodes consist of a true osteophytic enlargement and are sometimes covered by a bursal or a synovial prolongation from the joint. Radiate deviation of the terminal phalanges is often seen.

Pain is sometimes present but is not severe. Often, however, they are painless and cause little or no inconvenience beyond giving the hand a clumsy appearance, this sometimes being a matter of concern to female sufferers.

They are occasionally present in
the subjects of Arthritis Deformans and Gout. On account of this relationship, there is much difference of opinion as to whether it is a true Gouty, or osteo-arthritis manifestation, or common to both.

Heberden, who first described the condition, stated that it had no connection with Gout, and this view was supported by Charcot, Garrod (Sir A. B.) and Garrod, A. E., the last named, however, stating that he had seen cases in which there were clear histories of Gout. Sir A. B. Garrod said he had seldom seen them in patients who were sufferers from true Gout. It might also be said that they are seldom seen in patients who are sufferers from true Arthritis Deformans.

Charcot considered the disease to be a special form of Arthritis Deformans and this is the view held by most authors of the present time.

The osteo-arthritis view was opposed by Bechteriev, who considered
that Heberden's notes were a certain indication of the Gouty diathesis, and stated that "they are found chiefly among the upper classes, or among the luxurious and well fed of their dependants, and are seldom or never found disfiguring the hands of the industrious and hard working mechanic." Sir Dye Duckworth also maintains that this condition is of a Gouty nature and points out that those supporters of the osteo-arthritis view do so with some reservation. Pfeiffer was equally emphatic as to its gouty origin saying that "the fact of its being mainly a disease of advanced life and of the female sex is quite compatible with its gouty nature, for it is to these chronic forms of Gout that females and elderly people are more particularly subject." But he based his opinion chiefly on the results of chemical examination of the Urine.
Russell Forsbrook's showed by Pfeiffer test "that if the test be true
there are some, probably very
many cases, at least of Heberden's
nodes, which cannot be referred
"to Gout." In all the cases examined
by him (six in number) this test
showed them to be not gouty.
In my own experience it occurs
in its most typical form in people
without any manifestation of
Gout or Arthritis Deformans. In
Arthritis Deformans the terminal
inter-phalangeal joints usually escape,
whereas the condition known as
Heberden's nodes is confined to
these joints. In the Gouty form
there is generally long duration
of all the inter-phalangeal joints,
both the proximal and distal rows,
as seen in Sir Dyce Duckworth's cases.
Personally, I am inclined to
regard the pure forms as a disease

"For books, W.H.R. osteo-arthritis, page 96."
of the degenerative period of life, and
to regard the bony and osseo-arthritis
manifestations which somewhat
resemble it as having no relation
to this disease. If this view be
taken it is easy to explain its
much greater frequency in the
female sex, as the physical
changes, are in them, so much
more marked at this period.
"Wear and tear" of which we
hear so much in connection with
arthritic deformans might have
something to do with this disease
as we see a somewhat analogous
condition in the "ring-bone" of
horses.

Fig. 21. Heberden's nodes; showing radial deviation
of the terminal phalanges.
Figs. 22-23. Showing a condition of Heberden's nodes in a gouty subject. In this case the thumb is affected and there is chronic gout of the left wrist & right elbow. There were tophi in the ears. Patient was a cook in a nobleman's family.
Fig. 24. Heberden's nodes with radial deviation of the terminal phalanges. (From a photo.)

Fig. 25. Heberden's nodes. (From a photo.)
D. Arthritis Deformans of the Vertebral Column

(Spondylitis Deformans).

As far as we have discussed it Arthritis Deformans has been seen to be a disease chiefly affecting the joints of the limbs, but we are now about to describe a condition in which the disease specially selects the joints of the vertebrae. In the generalized form the vertebral column is frequently affected in its cervical portion, probably on account of the great range of movement of the first two vertebrae, but in this form there is often stiffness of the spine almost throughout its entire length.

In the cervical region there is generally some movement at the occipito-atlantal joints, allowing nodding movements of the head, and in many cases bending of the neck is possible. Adams states
that "the rotatory movement of the first vertebra on the second permitting the patient to turn his face from side to side is usually preserved, while the rest of the cervical region seems stiff and rigid". In my own experience this movement is generally limited to a marked degree.

In the dorsal region the natural convexity of the back is increased and the chest correspondingly sunk in. Costal respiration is greatly limited, owing to involvement of the costo-vertebral articulations.

In the lumbar region the spinous processes project so that the whole back presents a "hook-like" appearance.

If bending movements of the neck are free the head is thrown back to compensate for
the doro-lumbar curve.

The crouched attitude produces a marked fold across the abdomen above the umbilicus, and for the same reason there is a diminution in the height of the patient.

In this variety there is no involvement of the small joints of the extremities. The upper limbs escape entirely, but there is usually an extension to the hips and the knees, especially the former, so that progression is slow and difficult, and in the event of the knees being contracted altogether impossible.

If the hips are stiff the patient is able to get along, unless the knees are contracted, by turning the body from side to side with each step. Being unable to bend the hips he cannot sit in an ordinary chair, having to recline on a couch, or a low
invalid chari.

There may be radiating pains shooting round the body and down the limbs possibly owing to narrowing of the foramina causing pressure on the nerve roots, but the spinal cord and nerves are never seriously interfered with.

The general symptoms are great loss of weight, anaemia, and occasional pains of a "rheumatic" character.

The worst forms of this variety occur, in my experience, in young or middle-aged men; when it comes on in old age it is much more limited, and, as a rule does not cause much inconvenience, being confined to the dorsal region and producing a "hump", or to the lumbar causing the body to bend forward and making the patient walk with sticks as his
centre of gravity is thrown so much in front of his feet.

The only disease with which Arthritis Deformans of the spine is at all likely to be confused is Caries of the vertebrae, from which it may be distinguished by the absence, in the former, of pain on percussion over the vertebrae, or on the head, or by pressing on the shoulders. Where there is caries with angular deformity (Pott’s disease) the condition is unmistakable as in Arthritis Deformans the deformity is always “hoop-like.”

The morbid anatomy is essentially similar to that found in other joints. This is especially the case where the neural arches articulate with one another, but in between the bodies of the vertebrae, from their articulating by fibro-cartilage, there are some differences. The intervertebral discs are absorbed
and true ankylosis is common from ossification of the anterior and posterior common ligaments. Secondary changes have been found in the nerve roots and cord in some cases, probably due to pressure.

If this disease is of an infective nature it is difficult to account for its selective action on the spine. Possibly in these cases the it spreads up the spine by means of the lymphatics which are very numerous in this region.

The prognosis in these cases is unfavourable, treatment, which is as for the same disease elsewhere, being of little avail. Death might ensue from pulmonary trouble to which there is a liability from impairment of the respiratory movements by locking of the ribs.

Fig. 26. Arthritis Deformans of the Vertebral Column. (From a photo)
Fig. 27. Walking machine. (Demelvui Hospital.)