Arthritis deformans : the report of a series of one hundred and ten cases from the Johns Hopkins Hospital / Thomas McCrae.

Edwin Clarke

ARTHRITIS DEFORMANS

THE REPORT OF A SERIES OF ONE HUNDRED AND TEN CASES FROM THE JOHNS HOPKINS HOSPITAL

THOMAS McCRAE, M.D., M.R.C.P. (Lond.)
The Johns Hopkins Hospital.
BALTIMORE

Reprinted from The Journal of the American Medical Association.

CHICAGO:
PRESS OF AMERICAN MEDICAL ASSOCIATION
ONE HUNDRED AND THREE DEARBORN AVENUE
1903.

ARTHRITIS DEFORMANS.

THE REPORT OF A SERIES OF ONE HUNDRED AND TEN CASES FROM THE JOHNS HOPKINS HOSPITAL.

(FROM THE CLINIC OF PROFESSOR OSLER.)

THOMAS McCRAE, M.D., M.R.C.P. (Lond.)

THE JOHNS HOPKINS HOSPITAL.

BALTIMORE.

There is no intention in this paper to make any attempt to discuss the many debatable points relative to arthritis deformans. There is, perhaps, no common disease in the calendar about which we have as little exact knowledge. Much misapprehension has been caused by the use of names which suggest that this disease has some association with rheumatism. Beginning with the very name to be given to it, we have great diversity of opinion, which continues through the etiology and pathology of the disease. Dr. Bradford[1] has recently described well the chaotic condition of our knowledge, or rather lack of it, and laid emphasis on the necessity of more careful study of the disease. We are to-day really proving the truth of words spoken by Haygarth in 1805, who said: "The term rheumatism has been applied without sufficient discrimination to a great variety of disorders, which, except pain, have but few symptoms that connect them together."

In the present paper a series of 110 cases which have occurred in the Johns Hopkins Hospital are reported. The clinical features will be especially discussed. A point of much importance is the relative frequency of the disease. With the present confusion of our knowledge of the disease, any statistical figures seem to possess but little value. As some of the cases here reported suggest strongly that one type of the disease is very commonly

1. American Medicine,, 1902, iv, 17.

taken for acute articular rheumatism, and as probably one other form of the disease—spondylitis—has usually been overlooked, statistics are only likely to lead to false conclusions. It probably occurs less frequently than true articular rheumatism, but the difference in number may not be as great as we have usually thought.

One point to which special attention will be drawn is the study of early diagnosis. How much we can do to prevent the later manifestations of the disease by recognition and treatment of the early conditions is difficult to say. Certainly we are in a position to try, whereas by making a diagnosis only when the damage is done, treatment then can only be palliative.

PATHOLOGY.

Of this we have but little accurate knowledge. With the etiologic feature unknown we can only discuss the morbid anatomy and not the pathologic basis. In the usual descriptions of the disease we have given only the later changes, many of which are degenerative. That the early acute conditions have received little attention is natural, for the material has been lacking. Patients rarely die of the disease, and certainly not in the early stages. Dr. White[2] has recently reported the result of an autopsy on a comparatively early case. It is to be hoped that no like opportunity for examination of such a case will be missed.

The two great views of the etiology—namely, the infective (either due to a specific organism or to a variety of organisms) and the neural—need not be discussed. The clinical features of this series seem rather to point toward an infective cause, although our cultural results have been negative.

Some writers suggest that under the term arthritis deformans we have really two diseases. Whether or not this be correct, we can distinguish two types of cases, one in which the bony changes, especially hypertrophy, predominate, often termed the "osteoarthritic," and the other in which the joint structures other than the bony parts are especially involved, sometimes termed "rheumatoid." These are usually distinctly different conditions. Do they represent different diseases, or are they varying manifestations of the same disease? The answer is difficult at present, but there seems little doubt of the co-existence of lesions of both types in some patients.

---

2. Guy's Hospital Reports, lvii.

Thus, in patients with spondylitis usually regarded as being "osteoarthritic" we may find involvement of other joints with the condition regarded as "rheumatoid."[3] Whether the same etiologic factor is active in both, it is at present impossible to say.

Some reference should be made to the association of arthritis deformans and rheumatism. Some writers describe arthritis deformans as coming on after acute rheumatism. The two diseases may have occurred in the same patient, but it is not any more likely than that rheumatism and gout should have done so. If we see a patient in successive attacks of acute polyarthritis which we regard as acute rheumatism, until he comes back, perhaps, with a tophus, do we say that gout has followed acute rheumatism? If we are honest, we frankly admit our error in mistaking the nature of the arthritis. Why not the same in regard to arthritis deformans? When a patient comes with undoubted manifestations of this disease it seems more reasonable to consider previous acute attacks to have been of the same nature. The two diseases may have occurred in the same patient, but it seems more probable that the acute attacks were of arthritis deformans than acute rheumatism. The large number of cases to be noted later support this view. It seems most reasonable to hold that arthritis deformans is distinct from acute rheumatism.

For clinical study it is necessary to divide the cases, and in this report the following classes are used:

1. Heberden's nodes.
2. Polyarticular form (excluding the spondylitis cases, which are in one sense polyarticular).
3. Monarticular form.
4. Spondylitis.

It must be understood that the lines between these are not always definite. A patient with spondylitis or Heberden's nodes may have general polyarticular involvement, although this mixing of the types is not very common.

The statistics for the whole series will first be given, and afterward each group will be discussed in detail. That the present series gives any guide to the relative frequency of various groups is not probable. This is

---

3. The use of the term "rheumatoid" is to be regretted. Everything suggesting any association with rheumatism should, in my opinion, be eliminated. I have used the term "polyarticular" to designate the group in which these lesions especially occur.

especially to be kept in mind in reference to the cases with local involvement of the spine. The cases of general spinal involvement offer but little difficulty in recognition, but we have only recently learned to recognize the other cases, and therefore their absence in the records of previous years has been due to non-recognition. These cases occur especially in males, and doubtless future records will show a more equal distribution between the sexes than previous ones have done. It will be seen that in this series the males and females are equal, rather unusual in any large series.

It may be noted that no cases with Heberden's nodes only are included in this series. Two cases of the so-called "Still's disease" are included in the polyarticular group. These cases are somewhat doubtful, but it seems most reasonable to consider them as arthritis deformans.

GENERAL STATISTICS.

Incidence.—In the present series of 110 cases, 55 were males and 55 females. The white patients numbered 106, the colored only 4, 2 of whom were males and 2 females. The small number of colored patients with the disease is of considerable interest, especially in reference to the association of previous septic conditions as etiologic factors. The colored race is susceptible to the majority of infections, and especially gonorrhea. While in the hospital the proportion of white to colored is as about 7 to 1, the incidence of arthritis deformans is about 26 to 1. The negro is also apparently rather more prone to acute articular rheumatism, as has been elsewhere brought out,[4] the proportion in this clinic of white and colored with this disease being as 4.8 to 1.

Conjugal Condition.—Fifty-three of the patients were married, 41 single, and 16 were widows or widowers.

Nationality.—It is interesting to note the preponderance of the native-born. Ninety-six were born on this continent, and only 14 abroad. Of these, 8 were German, 2 Irish, 1 each English, Bohemian, Russian and Pole.

Occupation.—The largest number were engaged in housework of various kinds, namely, 47. Seven others were engaged in similar occupations, such as sewing,

4. McCrae: The Journal A. M. A., Jan. 24, 1903.

washing, etc. The next largest group comprised 24 cases; they were merchants, clerks, teachers, etc. There were 11 farmers and 10 engaged in laborers' and mechanics' work. The remainder were of no especial occupation. The proportion engaged in occupations involving special exposure to wet, damp, etc, is seen to be surprisingly small.

Age.—The age of patients on admission was as follows:

1 to 10	2	51 to 60	19
11 to 20	8	61 to 70	7
21 to 30	19	71 to 80	2
31 to 40	35	81 to 90	1
41 to 50	17		

The youngest patient was aged 4 (a case of "Still's disease"), the oldest 83, with Heberden's nodes and some changes in other joints.

Complaint.—The complaints made by the patients were very various. By far the largest group (36) complained of "rheumatism"; 23 complained of general joint symptoms, pain, stiffness and swelling; 20 complained especially of the pain; 10 of stiffness of the back, and the remainder of various things—6 of loss of power in the legs and difficulty in walking; 3 of sciatica; 2 of neuritis, etc.

Family History.—The family history is of interest. The difficulty in obtaining an exact description of an arthritis in the family history is well known. There was a definite family history of arthritis in 44 cases. Of these, 10 were undoubtedly arthritis deformans, 22 were given as rheumatism, 1 as gout, and in 11 the nature was unknown. Endeavor was made to find out if the disease developed earlier in the patients who had a family history of arthritis than in the others. The results are given in tabular form:

Age.	Age of onset with a family history of arthritis.		Percentage.	General percentage of onset in all.
1 to 10	7	=	16	11
11 to 20	10	=	23	20
21 to 30	9	=	21	20
31 to 40	7	=	16	22
41 to 50	4	=	9	9
51 to 60	4	=	9	12
61 to 70	2	=	5	3
71 to 80	0	=	0	2

One case was doubtful, and is not included in the first column, and two are doubtful in the second. The percentages are so nearly alike that no positive conclusion can be drawn, although the cases with a history

of arthritis show a slightly larger percentage for the earlier decades. There was a family history of tuberculosis in 28 cases, and in 9 this was associated with arthritis.

Previous History.—Of the ordinary acute infections, measles is by far the most common, a history of it being obtained in 68 cases. Following this came whooping cough in 31, mumps in 20, scarlet fever and malaria each in 18, chicken-pox and influenza each in 13, typhoid fever in 10, pneumonia in 7, diphtheria in 5, smallpox and erysipelas in 2 each. Tonsillitis in recurring attacks was noted only in 3 cases. There was one instance each of otitis media, bronchitis, pleurisy and carbuncles. There was a previous history of gonorrhea obtained in only 14 cases, or about 13 per cent. This, it will be noted, is in striking contrast to the percentage of 40, given in Dr. Stewart's[5] Montreal statistics. There was a history of syphilis in 4 and of chancroid in 1. Dyspepsia had been a prominent feature in 3 cases, and dysentery or diarrhea in 2. Four patients gave a history of nervous prostration; 2 insisted especially on their severe mental strain and worry for some years; 1 of great physical hardship, and 2 of working in especially damp surroundings. In regard to this latter, attention should be drawn to its apparent rarity in this series, as so many of the writers lay great stress on its importance as an etiologic factor.

Alcoholic History.—Twenty-seven of the patients had used alcohol, 6 described as heavy drinkers, the remainder moderate. This is in striking contrast to the figures given in the series of gout cases reported from this clinic, where practically all were alcoholics.

Pregnancy and Miscarriage.—Twenty-six of the female patients had borne children, and seven had had miscarriages, varying in number from 1 to 4. Five patients had both borne children and had miscarriages.

Onset.—This was apparently associated with some condition in 28 cases. The patients, at any rate, thought there was some association. In 7 cases the onset was associated with exposure to cold and wet; in 3 each the onset was apparently associated with injury, diarrhea or dysentery, confinement, an attack of influenza, and an attack of measles; 2 followed closely after typhoid fever; and in 1 each it was associated with the follow-

5. Stewart: Brit. Med. Jour., 1897, ii, p. 1225.

ing conditions: Very marked mental strain, constant physical strain, miscarriage and the menopause. The small number associated with exposure is to be noted. Our series of cases of acute rheumatism gave practically double the percentage. In one-half of all the cases the onset was before the age of 30, and in about one-third, before 20.

In the further study of the clinical types it is much more convenient to study each of the groups previously mentioned separately.

GROUP I. HEBERDEN'S NODES.

This clinical group requires but little discussion. Generally accepted as undoubted manifestations of arthritis deformans, anatomically, this must be considered as usually belonging to the osteoarthritic type previously referred to. No figures as to the relative frequency of their occurrence can be given. There can be little doubt that the general idea that they are rarely associated with the more severe manifestations of the disease in other joints is substantially correct. In the present series, Heberden's nodes occurred in association with manifestations in other joints only nine times among the 94 polyarticular cases. Of these 9, in 4 the other manifestations were slight; in 3, moderate, and in 2, severe. They did not occur in association with any of the cases of spondylitis. As to the idea of Charcot that patients having these nodes were especially prone to cancer, I have no figures to offer. Certainly, one sees the association not infrequently. One point of interest in this group is the association of these lesions which we term "osteoarthritic," with those in other joints which are undoubtedly more of the "rheumatoid type." That this does occur there can be no question. It certainly speaks for a possible association of the two types.

Frankly, we have to confess that of accurate knowledge as to Heberden's nodes we have little. It can be summed up by saying that these bony outgrowths at the terminal phalangeal joints of the fingers rarely cause any troublesome symptoms, usually occur without the larger joints being involved, but may be associated with the other manifestations of the disease, although these cases are comparatively rare. In one particular they agree with the lesions in the other joints, namely, they are susceptible to injury. A blow on an affected joint

is nearly always followed by some increase in the local symptoms, exactly as in the larger joints. Curiously enough, just as this was being written a patient came under observation with Heberden's nodes showing an unusual condition. She came on account of another disease. There was marked deformity of the terminal finger joints, and definite crepitus was obtained in some of them, an unusual thing in such cases in our experience.

GROUP II. POLYARTICULAR CASES.

This comprises by far the largest number of cases in this series. There are 92, to which may be added 2 cases of "Still's disease," although in the tables these are kept separate. These cases and their clinical features show many variations, but an attempt will be made to classify them, at any rate to some extent. As already said, the changes are largely of the "periarticular" kind, and the bony changes are secondary.

Onset.—The ages at onset of these cases are shown in the following table:

1 to 10	11	41 to 50	10
11 to 20	17	51 to 60	11
21 to 30	18	61 to 70	2
31 to 40	22	71 to 80	1

Method of Onset.—This is of especial interest. On studying the cases, one finds two fairly definite kinds of onset can be recognized, namely, a sudden and a gradual beginning. Of the 92 cases in this group, the method of onset was doubtful in 6, in 45 it was gradual (in 31 of these several joints being involved together at the beginning, and in 14 one joint, others following some time later); in 41 cases the onset was sudden, in 19 of these in one joint, and in 21 in many joints about the same time. In one case the onset was in the joints of the neck. Especial attention is directed to the number of cases showing a sudden mode of onset. So many of the descriptions of the disease lead one to believe that the sudden onset is unusual, and that we see, ordinarily, a slow, gradually advancing arthritis. This point will be especially dealt with later. Of the 2 cases of "Still's disease," in 1 the onset was gradual in one joint, and in the other sudden in many joints.

The Joint First Involved.—This was as follows: 3, no definite history; 28, many joints involved; 3, the neck joint first involved; 5, the shoulders, 3 being only in one shoulder; 4, one arm; 1, an elbow; 3, a wrist;

1, a thumb; 1, a single finger; 1, both hands; 9, one hip; 10, one knee; 3, both knees; 1, knees and elbows both; 1, both ankles; 1, one ankle; 10, the feet; 3, the great toe; 2, other toes; 2, the joints of one leg.

The Character of the Attacks.—It is, of course, impossible in a disease such as this to definitely classify all the cases or the attacks. There is so much variation in the order of the joints involved, the character of the successive attacks, etc., that only an approximate classification is possible. Considering the course of the disease, perhaps three groups may be recognized. The first of these is the slow, progressive type, in which, after either an acute or a gradual onset, the symptoms slowly advance, joint after joint being involved. This may go on for a great many years. Of this class there are 44 cases. In sharp distinction comes the second class, those in which the attacks are acute and very commonly come on at intervals and at intervening times, perhaps for many years the patient may be practically free of any symptoms, although at length permanent damage is done. In certain of these cases the patient may apparently recover perfectly, or almost so, between the attacks, and it may be only after repeated acute attacks that permanent changes appear in the joints. To this class belong 29 cases. There is a third class which shows in some ways features of both the first and second groups; namely, in that they had acute attacks, but with these there was a steady progress, a certain amount of damage being left each time. In this class there were 12 cases. The remaining 7 cases it was impossible to classify.

Class 1. *The Slow Progressive Type.*—It is not necessary to spend time in describing these cases. Beginning either acutely or slowly in one or many joints, the process gradually advances, perhaps sometimes aggravated by accidental conditions, to a greater or less degree of deformity. Many joints are usually involved, the changes being rather in the periarticular structures than in the bony ones, the adjacent muscular structures showing a marked atrophy, deformities resulting, and at the last, a condition of more or less helplessness. A typical case may be briefly quoted:

No. 87.—B. K., white, male, age 40. He was admitted complaining of contraction of the legs and inability to walk. His family history was negative. The history of his pres-

ent trouble was that twenty-eight years before he began to have pain in the left hip. This soon became stiff and he had difficulty in walking. After six weeks he noticed pain in the other hip, and for a time had much difficulty in walking. He then got about for a time, but always limped. Four or five months later he had a second attack and spent over a year in bed, without any acute symptoms. At the end of this time the knees gradually became involved. After some months he managed to get about, although always more or less stooped, having to walk with the hands on the knees. After a time he had to give this up and take to a wheel chair. The knees became gradually fixed, and for twenty-two years he has not been able to walk. A history in which there was never any acute attack, but only a slow continued progress.

This case, of course, showed involvement only of the lower extremities. A second case may be quoted:

No. 26.—O. F., white, female, aged 40. She was admitted complaining of pain and deformity of the joints. There was a history of arthritis on both sides of the family, and the mother has arthritis deformans. The previous history was negative. Fifteen years before, after a wetting, she complained of some pain in the left arm, which was thought to be rheumatism, was not severe, and did not last long. After this she was free of symptoms until ten years ago, when she began to have pain in the feet, especially after walking. There was no swelling, and the pain was not especially in the joints. At this time she began to notice some changes beginning in the finger joints. These gradually progressed, and for five years she had some general pains and deformity, especially of the feet and hands. During this time her general health varied. It was usually rather bad. She was very nervous. Five years ago her symptoms became very troublesome. The knees were involved, swollen and tender; pain appeared in the neck, and the temporomaxillary joint was involved. After this there was gradual swelling of the ankles, elbows and shoulders. For six months past she had pain and was almost helpless, requiring to have help in putting on her clothes, taking her meals and getting about. There was nothing acute in the symptoms at any time.

Such cases might be quoted at length, but to no purpose. The type is perfectly familiar.

Of the second group, namely, the acute, two illustrative cases may be quoted:

No. 48.—M. W., white, female, age 60. She was admitted complaining of rheumatism. She had a family history of arthritis. Her previous history was negative. At thirty-five she had an attack of acute arthritis, with swelling and pain in many joints. She was laid up in bed for two weeks. After-

ward she apparently recovered completely. She had a second attack much like this at forty-five, after which she was practically well. The menopause occurred at fifty-three. Fifteen months ago she began to have pain in the great toe of the left foot. After this the knees, shoulders, elbows, wrists, and hands were all involved. The changes in the joints were more or less permanent, and she now has difficulty in getting about. She herself had noticed that the joints, although swollen and painful, were not red, and that she had no fever.

This is a fairly common history in these cases, recurring acute attacks leaving little damage, but finally permanent changes occurring. A second case in a boy of 13 may be quoted:

No. 53.—E. S., white male, age 13. He complained of swelling and pain in the feet and legs. His family and previous history were negative. His first attack of arthritis was at seven years. This lasted only for a short time, but was accompanied by severe pain. Following this he had eight or ten attacks, all acute, the first one lasting only three days. The one before admission had lasted for two months. Between the earlier attacks he would be perfectly well in every way, but after the later ones it was noticed that a certain amount of stiffness persisted. The last attack was ten months before admission. He had gone to bed well. The next morning on rising he found both ankles so swollen that he could not get his boots on and he was unable to stand. Three months later the wrists became involved suddenly and remained so. On admission the involvement was in many joints.

Many histories of features much like these might be quoted, but it is unnecessary. They all serve to emphasize, however, the comparative frequency of this type of the disease. It is such histories that have suggested previous attacks of acute rheumatism as being common before the development of arthritis deformans. That all these attacks were of the one disease there seems little doubt. In the majority of these cases there is little difficulty in distinguishing them from acute rheumatism. This will be considered later in the section on diagnosis. But a point which seems worthy of emphasis is the frequency of these acute attacks. Nearly one-half of the cases of this group showed these acute manifestations at one time or other. Of the 32 cases in which there was a history of previous acute attacks after which they were practically free of symptoms, 14 had one such previous attack, 2 had two attacks, 4 three attacks, 4 four attacks, 2 five attacks, and 1 ten attacks.

There were 33 cases in which an intercurrent condition was thought to have determined the onset of another attack or further symptoms. In 8 this was an injury of some kind, usually to one joint, and followed at once by acute symptoms in it. Sometimes after this other joints followed. In 6 a wetting or exposure, in 5 an attack of dysentery or diarrhea seemed to have determined a fresh outbreak, in 2 an attack of influenza, in 2 confinement (repeated in successive pregnancies), in 2 a miscarriage, in 2 a marked shock, and in 1 each an attack of gonorrhea, an attack of measles, hot bathing, excessive fatigue, menstruation and a chancroid. Some of these may be only coincidence, but in the majority the association seemed definite.

CONSIDERATION OF THE SYMPTOMS IN DETAIL.

In the discussion of these, especially the features pertaining to the joints, we have to keep in mind the more acute forms and the chronic deformities. With the latter especially we are familiar, and they require but little description. Along with these goes the muscular atrophy which is so common. To consider first the features in the joints:

The Cervical Vertebræ.—These require especial mention quite apart from the condition of spondylitis, because at some time or other in the polyarticular form it is not uncommon to have the neck involved. This was the case in 29 out of the 92 cases. This involvement we have often found to be transitory. There may for a time be pain complained of on moving, motion is much restricted, but on ordinary examination little is to be made out. Sometimes there is some deformity, the head being held definitely to one side. Judging from our cases, the condition is rarely permanent, many of the patients, especially in the acute attacks, having marked symptoms, which disappear completely as they improve. In very few of our cases has there been any permanent stiffness, apart, of course, from the cases of spondylitis.

The Temporo-Maxillary Joint.—This is involved comparatively frequently—in 22 cases of this series. Involvement is often unilateral and transient, but there may be all variations from this up to complete ankylosis, so that the patient may require to have teeth removed in order to be fed. This, however, has been rare in our cases. In the majority of instances there has been no

permanent disability. In a few cases there was almost complete ankylosis and afterward fair recovery. One patient had teeth removed at one time, and later was able to open the mouth to a moderate extent. Involvement of this joint should be considered an important point in the diagnosis of a doubtful polyarthritis.

The Sternal Clavicular Joint.—This was involved in 6 instances. There was usually pain, sometimes slight swelling, and complaint of any motion involving the clavicle. It apparently is not a serious condition, and rarely causes any great discomfort.

The Shoulder Joints.—One or both shoulders were involved in 50 instances; of these, both shoulders in 39 cases; the right only in 8 cases; the left only in 3 cases.

In the acute attacks the patient usually complains of pain and limitation of motion, especially shown in attempts to raise the hand toward the head. It is very common to see them able to raise the hand to the level of the shoulder, but no higher. When the joint condition becomes more chronic there is usually the continuation of pain, some stiffness on handling, often definite limitation of motion, and very commonly crepitus. Fluid in the shoulder joints seems to be comparatively rare. Later there is often a certain amount of muscular atrophy of the shoulder girdle muscles, which, with the disability, often gives a very characteristic picture.

The Elbow Joints.—These were involved in 43 cases: Both elbows in 31 cases; the right only in 4 cases; the left only in 8 cases. In the acute attacks the elbow is usually held in a flexed position, there is often some swelling, and not infrequently a certain amount of involvement of the muscular tissues above and below the joint. This seems often more marked about the elbow than the other joints. In one case the elbow joint was opened during a moderately acute condition. The patient was thought to have gonorrheal arthritis. The muscles were found to be slightly edematous, and there was some fibrin between the muscle fibers. There were some small areas of hemorrhage. The joint contained some viscid yellow fluid. The synovial membrane showed hemorrhage and had a gelatinous appearance. In the later stages the joint may be fixed in flexion or partial flexion, but the thickening about the joints rarely advances to the extent that it often does about the knees.

The Wrist Joints.—These were involved in 46 cases: Both wrists in 36 cases; the right only in 5 cases; the left only in 5 cases. The changes in the wrists are often very characteristic. Only occasionally is there effusion into the joint (noted in one instance in this series), but there is often marked swelling above and below the joint, especially below. As a result of this the usual outlines of the wrist become completely lost. In the later stages we may find extreme polyarticular thickening and a certain loss of motion, although this is usually not so marked as at the elbow. Crepitus is very often obtained.

The Hands.—There was involvement of the metacarpal-phalangeal joints in 41 cases. The changes in these joints are usually very characteristic. In the acute attacks there may be a certain amount of redness, swelling and tenderness. As this subsides, a variable amount of thickening is left around the joints. In the later stages the thickening is permanent, mobility is lessened, there is usually flexion of the joints, and, not uncommonly, some subluxation. It is not uncommon to find some of these joints involved and others free. In six other cases of the series there is only a note that the hands were involved, which probably means these joints.

The Fingers.—These were involved in 52 cases. The thumbs were only involved in 7. The changes in the fingers were often very characteristic. In the acute attacks there may be but little visible change. There is some swelling and limitation of motion, but no great deformity. Subsequently, the thickening about the joints becomes more marked, and the typical "pod-shaped" or fusiform finger is produced. In the later stages we have a great variety of deformities. A common form is a flexion of the first phalanx with hyperextension of the terminal ones, but all the joints may be partially flexed, or only the terminal one be hyperextended. With this one may have also lateral deflection, especially of the terminal joint; and in some cases subluxation may result.

There are several features associated with the hands worthy of note. The patients are rarely able to "make a fist." There is very commonly ulnar deflection of all the fingers, which probably means only the position of greater ease. There are some other features which may possibly not be associated so much with the joints as with other structures. One of these is sudden weakness

of the wrist joint, so that the patient drops articles which are being held. This is not an uncommon occurrence, sometimes happening in the earlier stages. Another point is the complaint of pain about the ball of the thumb, or on the ulnar surface of the wrist. This may be found in certain instances quite apart from any active arthritis, and it seems worthy of being noted. In certain cases one notes atrophic changes about the hands. In others the nails are ribbed, or show coarse markings. The skin, in common with that of other parts of the body, may be glossy and shining.

The Hip Joints.—These were involved in 31 cases: Both hips in 25 cases; the right only in 3 cases; the left only in 3 cases. It is not uncommon to have complaint made of pain in the hip joint during an acute attack, but on examination nothing very definite is to be made out except tenderness. In the later stages there may be, as in other joints, more or less permanent deformity. The joint becomes fixed, often with the thigh slightly flexed and more or less abducted. The changes are often not as marked as in the cases with monarticular disease of the hips or spondylitis.

The Knee Joints.—These are by far the most frequently involved in the cases of this series, there being a total of 80 cases. The next most frequent of the single joints is the shoulder. The figures are: Both knees in 65 cases; the right only in 7 cases; the left only in 8 cases. Effusion occurs in the knee joint with considerable frequency, this being quite marked in 14 instances.[6] The knee joints in the acute attacks often show nothing very characteristic. There is some redness, swelling and tenderness. In later stages the joint commonly becomes somewhat fixed, and there is very often crepitus and marked thickening in the polyarticular structures. Along with this frequently goes marked thickening of the capsule. This can be readily appreciated by running the thumb up and down the inner surface of the joint opposite the interval between the two bones. A thickening of the capsule can thus be very readily perceived, and the thickened folds readily felt. One is often deceived into thinking that there is marked enlargement of the bony parts of the knee joints, whereas this appear-

6. It is, of course, often difficult to be certain of the presence of small amounts of fluid in a joint. Probably it occurs much more frequently than figures generally indicate. In all these cases the presence of fluid was established beyond a doubt.

ance is due principally to the periarticular thickening and muscular atrophy above and below the joint.

The Ankle Joints.—These were involved in 48 cases: Both ankles in 37 cases; the right alone in 5 cases; the left alone in 6 cases. The ankles show often much the same features as the wrists. There is considerable swelling about the joint, and there is stiffness and restriction of motion, with but comparatively little change in the joint itself.

The Feet and Toes.—There was involvement in some of the joints of the feet in 11 cases; of the toes in 10; of the great toe only in 6. The disparity between the involvement of the fingers and of the toes is very striking. Notice should be directed to the cases having involvement only of the great toe among the joints of the feet. In a doubtful case this suggests gout, but the changes in the other joints may be characteristic.

The Symmetry of the Joint Involved.—The majority of writers are very fond of laying emphasis on the symmetry of the disease, but, as will be noted from the figures given before of joint involvement, in a considerable number of instances only one joint was involved. For example, in 11 out of 50 cases of shoulder joint involvement, the disease was unilateral; in 12 out of 43 cases at the elbow joint; in 15 out of 80 in the knee joint, etc. The total number of instances of involvement of the joints of the upper extremity was 238, and of the lower extremity 186. The larger joints of the leg were involved 159 times, and those of the arms 126 times. The preponderance of joint involvement was markedly in the upper extremity in 4 cases, in the lower extremity in 12. This preponderance is, of course, analogous to the greater frequency of the involvement of the large joints of the leg. In only three instances, however, were the joints of one side of the body involved to the exclusion of the other side. One pair of joints only were involved in 3 cases, in 2 the knees, and in 1 the wrists.

How satisfactory the explanation sometimes given may be (namely, that the joints most involved are the ones most in use), there can be little doubt that, as a general rule, the large joints of the legs suffer more than the large joints of the arms. The hands suffer more than the feet. In reference to the association of the polyarticular forms with Heberden's nodes, the fig-

ures have already been given. Of the cases with spondylitis there was involvement with the other joints in 8 cases, in 4 of which there were multiple joints; in 1 in the hands; in 1 in the shoulders; in 1 in the knees and hips, and in 1 in the knees, hips and ankles.

Effusion.—The fluid obtained by aspiration is usually somewhat turbid, and contains a certain amount of granular material, with polymorphonuclear leucocytes. We have never found a hemorrhagic exudate.

Muscular Atrophy.—This is present in the majority of cases, but it is well to remember that in certain of the acute forms with a short duration there may be but little atrophy until after successive attacks. This is not invariable, for even after a short duration of symptoms in some cases there may be quite marked atrophy. The significance of this it is not the purpose to discuss here, nor to what extent it suggests a diseased condition in the central nervous system. The atrophy is often characteristic and striking, especially with the appearances in the joints. This is often true of the hands when the wasting of the interossei gives a very typical picture. The rapid onset of this sometimes gives a clew to the diagnosis in a doubtful case.

General Joint Features in the Acute Attacks.—Reference may be made to these, especially as there is so much difficulty in distinguishing the condition from acute rheumatism. There is usually a polyarthritis, but rarely any succession of joints becoming involved and then clear, as in rheumatism. A joint when once attacked is rarely free until the attack is over. There is usually considerable pain, moderate swelling, which may extend above and below the joint (especially in the elbows, wrists and knees), at times redness, but not as marked as in rheumatism, sometimes some heat, and rarely extreme tenderness. If with these features there be involvement of the joints of the hands or fingers, of the cervical vertebræ or temporomaxillary joints, the diagnosis is fairly certain. With these local conditions there is usually not high fever (often surprising when the degree of arthritis is considered), but a rather rapid pulse rate. There is rarely endocardial involvement. To sum up, a polyarthritis which does not shift about, slight fever and a rapid pulse, are the most striking features. As time goes on the fact that the joints change very little, the arthritis persists and the usual rheumatic reme-

dies are of little avail, all help to decide the diagnosis. After the subsidence of the acute features the persistence of thickening about the joints is a most suggestive feature.

Temperature.—Of this there were records in 86 cases, the remaining patients not being in the hospital long enough to obtain a complete record. Of these the figures are as follows:

Normal	15
An average of 99	28
An average of 99 to 100.0	21
An average of 99 to 100.5	5
An average of 99 to 101.0	10
An average of 99 to 102.0	1
An average of 99 to 103.0	1
An average of 100	1
An average of 100 to 102.0	1
An average of 101 to 102.0	1
Irregular	2

Of the two irregular cases, in one the temperature varied from 99 F. to 105 F. This was associated with other case the patient had a severe shaking chill, and the temperature arose to 104 F.; the only instance in the series where a severe shaking chill was noted.

These figures of the temperature records are of considerable importance. It will be seen that only fifteen cases, or 18 per cent., had a normal temperature, and that the great majority, fifty-nine, had a temperature averaging between 99 F. and 101 F. This is a point of considerable aid in the diagnosis. The majority have fever, but it is usually not high.

The Circulatory System.—There are notes of the cardiac condition in only 74 cases. Among these the heart was perfectly clear in 55. There was a soft systolic bruit, apparently not organic, in 10. In 2 there was marked irregularity, and in 7 an organic lesion. Among these latter cases there were 3 of aortic insufficiency, 2 of mitral stenosis and insufficiency, and 1 each of mitral insufficiency and mitral stenosis. In some of these the condition was associated with marked general arterial sclerosis, and probably the cardiac condition was due to this.

Of much greater significance are the records of the pulse rate. Of the 78 cases in which there were long enough records to note, the figures were as follows:

70 to 80	9	100 to 110	19
80 to 90	17	110 to 120	7
90 to 100	24	120 to 130	2

It will be seen that in two-thirds of the cases the pulse rate was above 90. This may be not only with the acute

attacks, but also in the conditions characterized by more or less slow advance. We have found it of considerable aid in the diagnosis, especially in association with slight fever.

Urine.—This showed practically nothing abnormal. In 83 cases it was clear in 64, contained a very slight trace of albumin in 9, and albumin and casts in 10. Sugar was found in one instance. Determination of the total excretion of uric acid was made in a number of cases, but always with the finding of the normal amount.

Glandular Enlargement.—Of 33 cases of which we have careful records there was general glandular enlargement in 13, definite enlargement of some of the glands in 4, and no general enlargement in 16. This condition would probably have been found in many other instances had it been carefully looked for. In the majority of cases, at any rate with acute features, the glands in association with the affected joints are enlarged. This is worthy of note as supporting the view that the condition is an infective process of some kind.

Spleen.—Of 39 cases where there are careful notes, the spleen was found enlarged in 4, and in 35 no increase in size could be made out. This is a point of considerable interest, especially in association with the cases of "Still's disease," in which the enlargement of the spleen is such a marked feature.

Subcutaneous Fibroid Nodules.—Of these there are the surprisingly large number of 7 cases, and one additional doubtful case, in which the enlargement seemed to be in association with the tendon. Regarding these nodules, there is no doubt that they are found exactly in proportion as they are looked for. In this clinic careful search is usually made for them, and in all these cases their presence was confirmed by Dr. Osler's note. These figures give a percentage of 7.4, which is very much larger than in the instances among our cases of acute rheumatism (namely, 1.5 per cent.). The opinion is now fairly general that these nodules are not essentially rheumatic, although some writers would have us believe that they were absolutely diagnostic of a rheumatic condition. Of special note is the age of the patients in whom they were found. One was 27, one 33, and all of the others over 50 years of age. In rheumatism these nodules are almost always found in children.

Pigmentation.—Marked pigmentation was noted in 8

cases of the series, but it is doubtful if this represents the total number, had it always been noted. Some writers, especially Spender, have laid emphasis on the occurrence of brown pigmented areas about the forehead, face and forearms, especially as being often diagnostic. If one follows for a time the general incidence of these pigmented areas among all patients they seem to me to be about as frequent in other conditions as in arthritis deformans.

Blood.—The average percentage of hemoglobin in 33 cases was 70.6, and the red cells in 29 cases, 4,468,000. These figures seem rather high when one remembers the very frequent pale, anemic look of these patients; but the pallor is often more striking than the actual anemia.

The average leucocyte count in 33 cases was 7,600. Of these in only 9 was the count over 10,000. In two of these the leucocytosis was probably due to other conditions. In one with an acute pleurisy the leucocytes arose to 18,000; in the other the count of 15,000 was associated with a general pneumococcus infection. These two counts are not included in the average. Of the remaining 7 cases it is interesting to note that in only 2 were the counts taken during acute attacks, rather a surprising result. In 6 cases the leucocytes were 5,000 or lower. Full differential counts were made in 8 cases. These gave an average of: Polymorphonuclears, 76 per cent.; small mononuclears, 14 per cent.; large mononuclears and transitionals, 8 per cent.; eosinophiles, 1.5 per cent.; mastzellen, 0.5 per cent. These are practically normal findings.

Reflexes.—The study of these is of interest, especially as some writers, R. L. Jones,[6] for example, attach some importance to them in the diagnosis. In the cases of this series there are not enough complete reports of the reflexes to draw any conclusions. But the general rule seems fairly well established that the reflexes in association with affected joints are usually increased. This was very evident in some of our cases where the involvement was asymmetrical. On the side affected the reflexes were exaggerated, but normal on the sound side. Whether the explanation lies in the changed local condition or alterations in the cord, is difficult to say. In addition to the deep reflexes, the superficial ones are often much exaggerated, which we have found especially

6. The Lancet, Dec. 27, 1902.

true of the cremasteric reflex. This rather speaks for other than a local cause.

But the findings are not constant. The cases are so variable and the conditions so different that this may later be easily explained. Practically, the reflexes in different cases have been found exaggerated, normal, or decreased, but rarely absent. Ankle clonus was obtained in a few instances, but we have never obtained a definite extensor response to plantar stimulation.

How strongly the conditions of the reflexes speak for spinal cord involvement it hardly seems yet possible definitely to say.

Unusual Features.—These require no special mention. They comprise: Pleurisy, 2; severe diarrhea, 2; chill, 1; jaundice, 1; abdominal pain, 1; mental features, 1; purpura, 1; enlarged thyroid, 1; bronchitis, 1; paralysis, 1. The case with severe abdominal pain is of interest, as there have been cases with like features reported both in acute rheumatism and gout.

PATHOLOGY.

This is again one of the doubtful points in the disease. Until we are certain of the etiology we can determine the morbid anatomy only. The essential element in our knowledge of the pathology is lacking. It is not the purpose here to discuss the various opinions at length. The two principal views are that the disease is (1) due to an infective agent (either a specific organism or a variety of organisms or their toxins) or (2) of neural origin.

For the infective view there are many suggestive points. Here, of course, only the polyarticular form is discussed. The mode of onset, often sudden, with involvement of many joints, the fever, increased pulse rate, are all in favor of an infection. The subsidence of these after a time, often to recur in subsequent attacks—the interval perhaps having been free of symptoms—and usually first or last the appearance of permanent changes about the joints are all important. In some patients there is permanent change dating from the first attack, in others this may only occur after repeated attacks. These seem comparable to the condition often seen in the endocardium of rheumatic patients. A first attack may leave the valves permanently damaged, or only more liable to involvement in subsequent attacks.

Could we determine a definite organism to be asso-

ciated with the disease, the matter is settled. In this series we have never succeeded in obtaining any results from cultures, in spite of the greatest care in following the methods given (for example, by Bloxall). If we hold the view that many organisms (such as those of influenza, gonorrhea, etc.) are etiologic factors, there are many suggestive facts to support this. There seems no doubt of the association of attacks or exacerbations with various infections such as influenza. This may mean only lowered resistance, for we find this an important factor. Ill health from any cause, anemic or depressing conditions, may all apparently precipitate an exacerbation or another attack. In reference to the association with, for example, previous gonorrhea, it has already been noted that the disease is here very uncommon among the colored race, among whom gonorrhea is almost of general occurrence.

Some features are usually referred to as being much in favor of a neural origin, such as the rapid muscular atrophy, the curious association of alteration in reflexes, such as between the gluteal and plantar, etc. Of the rapid muscular atrophy there can be no doubt. It may occur long before there is any possibility of disuse producing it. After a very prolonged attack of acute rheumatism there may be considerable atrophy, but rarely with the rapidity and certainly not with the certainty of its development in arthritis deformans. The association of the reflexes often follows their segmental distribution, as may also the curious localized distribution of the lesions in the hands. Thus the middle and ring fingers only may be involved, or show special changes. In another case the thumb and first finger may show the same association. These may speak for primary spinal cord involvement, but the explanation suggested that they may be due to changes due to toxic substances seems worthy of note. The changes found in the posterior columns of the cord do not seem necessarily primary. We know that they may be found with any chronic toxic condition, as, for example, diabetes or pernicious anemia. May not the chronic cases of arthritis deformans with suggestive nervous manifestations possibly belong to the same class?

A point worth noting is the occurrence of enlarged lymphatic glands in many of the cases, nearly half of these where we have complete records. In the so-

called "Still's disease" they are very marked. This is no more than we might have expected, if this be regarded as a form of arthritis deformans. The glandular system of children reacts more markedly to toxic absorption than that of adults. This glandular involvement seems to support the view that we have a toxic condition, probably due to some infection.

While the whole question must as yet be left open, the evidence seems to point more to the infective theory. Toxemia, secondary to infection, explains some, at any rate, of the nervous symptoms.

Morbid Anatomy.—Here again, in the majority of descriptions, we find only the late changes described. Opportunities for autopsies in the early stages are very rare. To describe the late changes throws no light on the condition. The majority might come from any long-continued degenerative joint condition. It is these that the majority of the writers have given as the pathologic anatomy.

One of the most important of recent observations has been made by Dr. Hale White, who had an opportunity to examine a comparatively acute case postmortem. In a proximal interphalangeal joint with marked changes he found that the most marked alteration was in the synovial membrane. This showed the formation of new fibrous tissue, and evidence of both recent and chronic inflammation. The membrane on the cartilage opposite the thickened fringe showed thickening, and the formation of fibrous tissue. The cartilage beneath this was thinned and eroded, and in places the erosion had gone through the cartilage. In connection with these areas there were foci of inflammation in the bone, but these changes were slight in comparison with those found in the synovial membrane. The synovial fringes in the knee joint showed no bony deformity, only the usual "thinned" condition of the ends of the bones so characteristic of these cases.

The only case of this series coming to autopsy affords but little information, so far as concerns the morbid anatomy of the disease. The patient was admitted with a general pneumococcus infection, with which was a pneumococcus arthritis. He had symptoms of arthritis deformans for over two years. The joint changes had gone on to erosion and eburnation of the bones. Each knee joint contained about 100 c.c. of purulent fluid.

The synovial membrane was much thickened and injected, and there was evidently much overgrowth of connective tissue. Sections of these showed the surface covered with an exudate consisting of granular material and of polynuclear leucocytes. Below this was a layer of flat endothelial cells which merged into underlying fibroblasts, under which were many blood vessels and polynuclear leucocytes. Next to this layer was much fibrous tissue. These all seem to speak for inflammatory changes more than degenerative, at any rate in the early stages.

The findings—few though they be—all speak for an inflammatory condition at the onset. Degeneration comes later, but the beginning seems rather due to inflammation beginning in the synovial structures. This suggests infection, rather than neural causation.

Some writers have laid stress on various septic conditions, such as pyorrhea alveolaris. This may have some causal association, but its occurrence is so nearly universal as to throw doubt on its importance.

DIAGNOSIS.

Undoubtedly an essential thing in a correct diagnosis is a knowledge of the fact that arthritis deformans often occurs as an acute polyarthritis, with a sudden onset, and that unless care is taken the condition is especially apt to be regarded as acute articular rheumatism. Here, as is usually the case, knowledge of the possibilities is an essential to correct diagnosis. It may be taken for granted that the advanced stages with the marked characteristic deformity are not likely to be mistaken, but of what value is diagnosis then when the possibility of preventing these later changes is the hoped-for thing? Practically, the study of the diagnosis will be confined to the early stages. The more acute forms have to be diagnosed, especially from acute articular rheumatism, acute gout, acute polyarthritis from other causes (for example, septic conditions, etc.), and gonorrheal arthritis.

Acute Articular Rheumatism.—There are several features that give one help in the diagnosis: the first, it may be said, is the knowledge of the two diseases. The polyarthritis of arthritis deformans rarely shifts from joint to joint. When the joint is once attacked, it rarely clears up suddenly. One seldom sees the rapid disappearance of arthritis in a given joint, which is so char-

acteristic of rheumatism. The joints rarely show the severe local tenderness of rheumatism. There may be redness, but it is rarely extreme. The swelling is often marked, but in many of the joints it is distinctly more in the surrounding structures than in the joint itself. There may be effusion, especially in the knee joints. Certain joints are often involved which are rarely concerned in rheumatism, especially the joints of the neck and the temporomaxillary joint. The involvement of the fingers is often especially characteristic. We may find that only two fingers are involved, very commonly the middle or ring fingers, or it may be the first finger and the thumb. There is a curious appearance often given by the fingers, really the early stage of the "fusiform" condition. This we have found of considerable help. The temperature is usually not very high, and it may seem low in proportion to the amount of arthritis. The pulse is nearly always above normal. If this persists after the subsidence of the acute features, it is a very suspicious factor. The enlargement of the lymph glands, especially those associated with the affected joints, speaks for arthritis deformans. The absence of cardiac involvement and the usual lack of any help from the use of salicylates, is often an important point. Another suggestive fact is the common rapid muscular atrophy. Undoubtedly in prolonged cases of rheumatism one sees considerable atrophy, but it rarely appears with the rapidity that it does in arthritis deformans. The early atrophy of the interossei muscles is especially to be noted. The exaggeration of the reflexes is a point to be kept in mind. Then, too, the case is apt to drag on, the temperature perhaps remaining at 99 F., or slightly over it, the pulse rate increased, and the joint symptoms persisting. This is always suspicious, and in case of a diagnosis of acute rheumatism, should always lead to a careful re-examination of the case. If after the acute symptoms are over joint deformity or alteration persists, one should always reconsider a diagnosis of acute rheumatism.

Acute Gout.—This is not likely to be a frequent cause of difficulty, but it is a possibility. The common alcoholic history in such patients, the attacks usually clearing up rapidly and leaving little damage in the joints, and the results of uric acid estimations, should all prevent error.

Gonorrheal Arthritis.—This is likely to give difficulty in diagnosis only where several joints are involved. If one cultivates the habit of always keeping gonorrheal arthritis in mind, and searches carefully for gonococci, there is not likely to be much possibility of mistake. In all doubtful cases of polyarthritis one should cultivate a "suspicious" frame of mind toward the diagnosis of acute articular rheumatism, and make it not first but last, and after other conditions have been excluded.

From various unusual joint conditions there would seem to be little difficulty in distinguishing arthritis deformans, and this group does not require discussion.

One is much impressed in going over the histories of our cases with the very common diagnosis of acute rheumatism made in the previous attacks. Often there are little facts mentioned which are enough to clear the diagnosis. Thus, several patients have said that their doctor commented on the fact that they had acute articular rheumatism with very little fever, or that they had a great deal of thickening left about the wrists or hands after their rheumatism. It is a good safe rule always to hold grave doubts as to the correctness of the diagnosis of acute rheumatism when there are permanent changes left in the joints after the acute attack is over.

Regarding what may be termed early minor manifestations of the disease, I do not know that any one has written better than Dr. Spender, in the article in "Allbutt's System of Medicine." These may be merely vague pains about the ankles or wrists, or the patient may complain of pain in one joint perhaps associated with some injury or a sprain. There may be some weakness of the wrists or hands. There may be curious neuralgic pains about the joints. As Spender says, these should always attract careful attention, and a thorough examination should be made. Of some of the other special points in the diagnosis to which Spender drew attention, note may be made. He emphasizes especially the rapidity of pulse. This, as we have already said, seems an important point. The various areas of brown pigmentation, especially on the face, neck and forearms of which he speaks, have not been of any especial assistance, and there would seem considerable doubt of their distinct association with the disease. The coldness and sweating of the hands do occur frequently, but it is probably more often associated with neurotic conditions, by no means a rare

accompaniment of arthritis deformans. As Spender says, the diagnosis of rheumatism, muscular rheumatism, sprains, etc., are all pitfalls into which we are too apt to stumble.

TREATMENT.

In the discussion of this matter we are again met with the fact that there are two great groups of cases, the early and the late. The treatment in the first may undoubtedly be of great help as a preventive measure of farther damage. In the latter condition it can be only palliative, although even here much good may be done. We may first discuss the treatment of an acute attack. Patients are better at rest, and probably it is well to keep them clothed in flannel. If there be much fever the diet should be liquid. Ordinary attention should be given to the bowels. For remedies for the pain we have found that salicylates are of comparatively little use. Antipyrin in doses of 5 grains is often effectual. Guaiacol is highly recommended by some. Small doses of codeia may be used; morphia seems to be rarely required. Of local measures to the joints the ice bag sometimes gives considerable relief, or the wrapping of the joint in cold compresses surrounded by oiled silk. These may be kept on constantly. Oil of wintergreen or lead and opium lotion applied locally is of some help. The hot air baking very often gives relief to the pain. Gentle massage may be of use. In spite of all measures, in some cases the patient is but little relieved. After an acute attack, whether the patient be absolutely free of symptoms or has some damage left in the joints, the great principle of treatment seems to be keeping up the nutrition. The patients should be out of doors as much as possible. They should be given all the nourishment they will take, and this of a general kind. The mistake is too often made in considering these patients to be rheumatic or gouty, and meat is almost totally cut off. On the contrary, a full meat diet seems especially helpful. They should be given nourishment between meals and at bedtime, and every effort made to improve their general condition. With this, of course, local derangements are to be carefully treated. Carious teeth and pyorrhea alveolaris should receive attention. Any stomach or bowel disorder should be remedied, and every endeavor made to keep the patient under the most favorable conditions. General massage is usually help-

ful. Concerning the various forms of bathing no general rule can be laid down. In England there can be little doubt of the benefit of such waters as at Bath. In this country, while some patients are doubtless helped by the bathing, many others are made distinctly worse. That this is due to too prolonged hot bathing to the point of depression may be possible, but our cases rather suggest that great caution should be exercised in advising, at any rate, any severe course of baths.

The local treatment of the joints is very important. First comes massage, which in the beginning ought to be given by an assistant. But as a general rule later on the patient should be encouraged, as far as possible, to rub himself. There is usually the double benefit to the joint rubbed and to the hand employed. The hot air treatment is especially useful in many of these cases. The oven may usually be heated to 350 F., with perfect comfort to the patient, the importance of short applications being always kept in mind. Probably the majority of cases are helped most by periods of only twenty to thirty minutes in the hot air bath, and periods of an hour and an hour and a half are undoubtedly, in many cases, positively harmful.

The question often arises as to the amount of use that should be made of the affected joints. Leaving out the acute attacks, as a general rule, the more the joints are used the better. The mistake is often very serious when the patient is put to bed and any attempt at using the joints discouraged. The benefit of use is well shown by the temporomaxillary joint, which, although frequently involved, relatively rarely shows permanent damage. These measures may result in great improvement, even in a far advanced case, as, for example, in Case No. 70, that of a woman who for eighteen months had been bedridden, had been unable to feed herself, and who had some teeth pulled in order to be fed. After three months of treatment she was able to walk moderately well, could dress and feed herself, and open the mouth fairly well. Such cases are, of course, not common, but they serve to show that the outlook is not always without hope. There are two things necessary, probably both in the physician and in the patient. These are perseverance and patience. There are probably few cases, even of advanced disease, that can not be at any rate helped by persistent, patient, systematic treatment.

By far, however, the more important group, as regards treatment, are the early cases. As has been stated, too often these are regarded as rheumatism for long periods, until the damage is done. In these, when recognized early, the most important element in the treatment seems to be good nutrition. General good hygiene, lots of fresh air and sunlight, and an abundance of good food are essential. Great care should always be taken to be on the outlook for the slightest manifestations of a return of the symptoms. Every slight infection should be regarded seriously. We are unable to say how successful early recognition of the disease and persistent care may be in preventing late attacks and permanent damage. At any rate, the patients should have the chance.

In addition to all the measures previously spoken of, there seem to be two drugs which are especially useful. These are the syrup of the iodid of iron and arsenic. They may be given alternately or combined, but in any case their administration should be kept up over long periods of time, for months, or if necessary, even years, at intervals.

Surgical Treatment.—This in some cases holds out a hope of benefit. In certain of the cases with marked contractures, the tendons may be divided and the limbs straightened. In other instances, under an anesthetic, a bent limb can be forcibly straightened and put up in plaster for a few days, but it can not be kept too strongly in mind that the best treatment for these cases of contractures is the preventive one. It is not, however, always in our power to carry this out, as the patients frequently delay consultation until permanent contractures have been established. Of excision of the joints we have had little experience, but it is undoubtedly of use in certain cases. It is probably most likely to be useful in the knee or elbow joint. It may serve to give a more useful limb. In some instances, too, the excision of the joint seems to be justified on account of pain. We see patients suffering with constant severe pain which nothing relieves; excision of the joint frequently gives great relief and the patients are left with about as good a limb as before. In some cases operations on the hip have been of considerable use. It must be said, however, that as yet we have hardly enough statistics on which to draw any definite conclusions on the value of surgical intervention.

It can not be too strongly emphasized that in this and so many other diseases the great requisite to intelligent treatment is proper diagnosis; and this, in the majority of cases, would seem not such a difficult matter if the profession once realized the frequent occurrence of this disease and the fact that it is so often taken for acute rheumatism. It may also be said that prevention is often more possible and certainly more hopeful than cure.

PROGNOSIS.

This is usually rather gloomy. The general tendency of the disease is to progress, but we have to remember that in many cases the disease was never diagnosed until more or less permanent changes had occurred. How much can be done for early cases with early diagnosis we hardly have data to state. Reports have been obtained from 25 of the patients who had been in the hospital over three years ago. Of these only 2 could be described as well, 3 had died from an unknown cause, but only about half the remainder were much worse, 4 were crippled completely and 5 were only able to get about with crutches. The other half were much in the same condition.

There can be no doubt of the necessity of always giving a most guarded prognosis. They may recover, which is unlikely so far as our present knowledge goes, but we can generally only hope to keep the disease stationary by care and perseverance. It is to be hoped that early diagnosis may help the patients of the future.

"STILL'S DISEASE."

To this only brief mention will be given. There is some doubt as to the exact nature of these cases, but at present it seems best to include them among the cases of polyarticular arthritis deformans.

There were two cases in our present series, one a male aged 4, and one a female aged 5 years. They both had rickets, but there was no history of symptoms suggesting congenital syphilis. They both showed the symptom complex described by Still, namely, (1) an arthritis involving many joints, and with more change in the periarticular structures than in the joint itself; (2) an enlarged spleen, and (3) extreme enlargement of the lymph glands.

One patient was discharged somewhat improved, but

the other went out completely well—one of the very few instances of recovery from this condition.

These cases seem to suggest an infective cause very decidedly. In the case with recovery the enlarged spleen and glands diminished with improvement in the general and articular condition. It seems most reasonable at present to consider them a type of arthritis deformans.

GROUP III. MONARTICULAR FORM.

These comprise a group of cases about which there is also much difference of opinion. The frequency is doubtful. Probably many of the cases often diagnosed as chronic rheumatism belong here, and also the group termed *Morbus coxæ senilis*. The disease usually occurs in elderly people, one of the larger joints, most often the shoulder or hip, is involved and the general type of change is degenerative. There is usually marked loss of function, wasting of the muscles about the joint, and sometimes ankylosis in the hip joint. In these patients very careful examination should always be made for slight changes in other joints. These may be very slight, but in some of them undoubtedly other affected joints may be found.

There are only 3 cases of the monarticular type in this series. The more chronic cases do not often seek hospital advice. The condition may not seriously interfere with their comfort, and they are content to make the best of it. Curiously enough, two of these cases suggest in some ways an acute onset much like that described for the polyarticular form.

The symptoms may be noted briefly. Two of the patients were females, all were white, the ages were 39, 40 and 50 years. In two the shoulder was involved, and in one the hip. The former complained of pain in the hip and leg. In both the shoulder cases the onset had been rather sudden; they complained principally of pain and difficulty in moving the joint. Later the pain became less, but limitation of motion was left. The third case was more gradual. There was pain in the hip and down the leg, with gradually increasing stiffness.

The symptoms were much the same in all—pain on motion, distinct limitation of motion, crepitus, and some muscular wasting. In one of the shoulder cases the reflexes on the affected side were much exaggerated and normal on the other side. She also showed signs of slight involvement of two finger joints on the other hand.

There were also some areas of pigmentation. The temperature in two averaged 99 F., in the third it went up to 100.5 F. The pulse rate in all was about 90.

The diagnosis in these cases may offer some difficulty. A gonorrheal arthritis can usually be excluded, and the greatest trouble generally is to distinguish it from a tuberculous joint. If the characters of the joint involvement do not give the diagnosis tuberculin may be used. We have found it very satisfactory. The finding of slight suggestive changes in other joints is conclusive.

Treatment is usually only palliative. Local measures, massage, wet packs, etc., are often of use, and in some instances surgical measures may give a more efficient joint, especially at the hip. But too often the degenerative changes advance gradually as in the polyarticular form. Every endeavor should be made to keep up the general health.

GROUP IV. SPONDYLITIS.

As already said, the cases with spinal involvement fall into two groups, one with general, the other with local involvement. The former is readily diagnosed, the latter is certainly much more easily overlooked. These cases are usually considered to belong to the "osteoarthritic" group. The bony changes predominate, and especially new formation of bone. Certain writers hold that the osteoarthritic cases are quite distinct from the type previously spoken of as "rheumatoid" or those in which other than bony parts are especially involved. In certain of the cases of this series there seems no doubt of the *occurrence of both types in the same patient.* If this be true it goes far to prove that all the cases here grouped under the heading of arthritis deformans do belong to one disease which has various types. Not only were the two types of arthritis found in the one patient, but in some of those showing only osteoarthritic manifestations there was a history of attacks of acute polyarthritis exactly like those described under Group II, and from which the patient had recovered apparently completely. The histories are so characteristic that there seems little doubt of the nature of the old attacks.

There were 22 cases showing spinal involvement. In 13 of these there was spondylitis alone, while in 9 this was accompanied by symptoms in other joints; in other words, the lesions were of the polyarticular type, and these have been included in the analysis of Group II.

In taking up the study of this group it is sometimes difficult to distinguish the symptoms from the spine and those from the other joints. In reference to the extent of spine involvement the cases were as follows:

	Gen. inv. of spine	Local inv. of sp.
Spine only involved[7]	6	7
Spine and other joints[7]	9	0

It is worthy of note that when the spinal involvement was associated with changes in other joints in no instance did we recognize involvement of a portion of the spine only. But, as said before, the confession is frankly made that only recently have we learned to diagnose the local form, and it is quite possible that instances of it have been overlooked. For the same reason the relative figures of these groups mean little as to their comparative frequency.

Incidence.—Of the 22 cases, 20 were males and 2 females. The striking preponderance of males is to be noted, especially as the other type is thought usually to occur much more frequently among females. All are white. The ages were as follows:

1 to 10	0	41 to 50	2
11 to 20	1	51 to 60	2
21 to 30	6	61 to 70	2
31 to 40	9		

Complaint.—This, in the majority, was of pain and stiffness in the back and legs. With this mention was often made of the crippling and general weakness. A few laid especial emphasis on the pain.

Onset.—The age of this was:

1 to 10	2	41 to 50	1
11 to 20	10	51 to 60	2
21 to 30	4	61 to 70	1
31 to 40	2		

Only 7 cases were admitted below the age of 30 years, but in 16 the onset was before 30. The onset in a few over the age of 50 is to be noted. The early age at onset in so many of the cases is striking.

The onset in the 13 spinal cases was gradual in 11 and sudden in 1, with one doubtful. In two of these there was a history of previous acute attacks of polyarthritis which subsided and left apparently no damage. These are exceedingly interesting. One may be noted briefly:

No. 61.—J. H., white, male, aged 45, was admitted complaining of stiffness of the back. There was a history of

7. To prevent confusion it is convenient to refer to these two classes as the "spinal" and "mixed" cases.

arthritis deformans in his family. From childhood he had at times some arthritis. With these attacks he was usually laid up, but never for very long. At 28 he had his first severe attack. This involved many joints and he was two months in bed. He recovered gradually and was well for seven years, when he had another attack with many joints involved, and the neck slightly. Three years and five years latter there were subsequent attacks, in the last one his spine becoming stiff. On examination the joint changes were practically confined to the spine and hips.

In other cases there seemed little doubt of previous attacks of local spondylitis, from which they recovered completely, and were practically well for many years. There were seven with very suggestive histories of these previous attacks with apparent recovery at any rate from symptoms. These intervening periods varied from two to eighteen years. One can not help wondering if in some of these cases it is only some accidental occurrence—such as an attack of influenza—which determined another attack. If this be true it may be that many cases may recover at any rate from ordinary symptoms of the disease.

General Features of the Spondylitis Cases.—These are most characteristic in the cases of general involvement. The spine is fixed and the term "poker-back" is most expressive. In some the head is held forward and there is marked bowing of the upper spine, and all rotation in the cervical region is lost. The patient to look about has to move the whole body. There is much difficulty in stooping, and on an attempt to pick an object from the floor they have to crouch down without any bending of the spine. On examination, the natural curves of the spine are often lost and the bowing of the upper dorsal and cervical regions is at times marked.

In the type with local involvement the picture is not so striking. The area involved is usually the lower dorsal and lumbar regions. The patient may make complaint of the back—commonly of pain and stiffness, which he may refer to the spine or dorsal muscles—or very often, of pain in the legs. This latter is common, especially over the course of the sciatic nerve, and there is little doubt that many of the cases regarded as sciatica are really arthritis deformans of the lower spine. Too often the diagnosis of neurasthenia is made, and perhaps also lumbago—whatever that term may mean. These cases

on ordinary examination show nothing. It is only on the attempt to have them do certain movements that the rigidity of the spine becomes evident. This can be demonstrated by having the patient stand with the feet together. The back should be visible. Then with the hips held, to prevent movement, the patient is asked to bend forward, backward and to the side. The restriction of free movement at once becomes evident, and it may be further shown by asking him to pick up an object from the floor. The marked interference with free movement between the vertebræ is very evident.

Certain curious features occur in some of the cases. There may be some alteration in the natural curves of the spine. Lateral curvature may be present. The upper part may be bowed with the convexity backward and the head held far forward. There may be marked prominence at the junction of the cervical and dorsal regions (1 case), or the lumbar curve may have disappeared (4 cases). There may be one prominent lumbar spine (1 case). The neck may only be partly ankylosed. Bony thickening may sometimes be felt about the neck vertebræ (2 cases). In 1 case the neck was rigidly fixed to one side. Occasionally the back muscles—especially in the lumbar region—may be very rigid or they may show wasting.

In some instances the hip joints are involved and there is restriction of movement there. In others, the symptoms are all referred to one leg, and the patient may systematically "save" it, and so usually walk on the toe or with the knee slightly flexed. Such cases are often mistaken for tuberculous hip disease. Some of these patients may limp very markedly.

Emaciation.—This is often marked, and was especially so in our group of mixed cases. With this there may be marked pallor, although this is usually more marked than the actual anemia. The local wasting is often very extensive. The muscles of the back, but especially those of the buttocks and legs, suffer. This does not seem to be always symmetrical. One side of the spine at times may be more involved, and the wasting be greater also on that side.

Reflexes.—These are usually increased in the legs, both the knee jerks and the tendo Achillis reflex. With this increase in the legs, the arm reflexes in the local spinal cases are usually normal. In only one case was

a diminished knee jerk noted. The cremasteric reflex was increased in 2 cases and an ankle clonus was obtained once. In 1 case with signs more on one side the reflexes, including the cremasteric, were all increased on this side and normal on the other.

Temperature.—Of the 13 spinal cases in 4 this was normal, in 5 it averaged 99 F., and in 2 it varied from 99 F. to 100 F. Of the mixed cases 3 had a normal temperature; these averaged 99 F.; 2 varied from 99 to 100 F.

Pulse.—In the spinal cases, 5 were normal (70 to 80 F.), 4 were between 80 and 90 F., and 3 between 90 and 100 F.

Blood.—In the spinal cases there are counts in 4 with an average hemoglobin percentage of 76; red cells, 5,205,000, and leucocytes, 7,800. The leucocyte count was over 10,000 in only one instance (11,300). In 4 mixed cases the averages were: Hemoglobin, 69 per cent.; red cells, 4,980,000, and leucocytes, 6,300. These findings are practically negative. The differential counts were normal also in both forms.

Tuberculin.—This was given in all the spinal cases and always with a negative result. It is a great help in the matter of diagnosis.

Radiographs.—These show a very characteristic condition. In all but probably the very early cases, definite deposits of new bone can be made out.

PATHOLOGY.

In this osteoarthritic group we have usually a marked overgrowth of bone. There is proliferation of the articular cartilage and later ossification of these outgrowths. Certain other structures may also be involved in the bony change, such as the ligaments or fibrous tissue. These bony structures usually show little alteration in their histologic structure from ordinary bone. There is marked hypertrophy of bone in contradistinction to the type previously described where atrophy predominates.

In the spine the process frequently begins on the anterior aspects of the bodies of the vertebræ and extends along the ligaments. With this there is deposit of new bone. This may mean a more or less continuous bridge of bone, and in the radiographs of such cases the bony deposits can readily be seen between the bodies of the vertebræ. These may be on one or both sides, but in early stages are often unilateral. The subsequent course

is very variable. The process may advance only slightly and there be comparatively little change. If the process be very active the intervertebral cartilages may be replaced by bone before any absorption occurs. In such cases we have the typical "poker-spine," simply one continuous bony column. Should there be gradual atrophy of the cartilages without replacement by bone, gradual curvature will result. This is seen very markedly at times in old men, who make little complaint of any symptoms. Should such a process occur more on one side we get a lateral curvature. All these various processes may occur throughout the whole spine or be limited to certain regions, most often the lower dorsal and lumbar.

These changes may also occur in the posterior portions of the vertebræ and the lateral or spinous processes be involved. The articulations may be involved both between the vertebræ themselves and with the ribs. This latter gives an interesting condition, namely, almost complete absence of any movement of the ribs and a practical loss of all costal breathing. This was very marked in some of the cases of this series. There may even be severe pain complained of—in the acute stages—when the patient tries to take a long breath, as was well instanced in one of our cases. Should the formation of bone encroach on the foramina it is readily seen why pain referred to the distribution of the nerves passing through them is so common. This, too, may be on one side only, with unilateral involvement.

It is readily seen from the lesions why the symptoms are so varied. The stiffness is, of course, due to the local conditions. Pain may be in the back itself, but is very frequently referred to the areas of distribution of the nerves involved.

DIAGNOSIS.

As in the acute polyarticular form, the knowledge of the condition is an essential to its recognition. The cases of general involvement are so characteristic that a glance is usually enough to give the diagnosis. There is no need to dwell on them. But with the local forms the story is different. We have long been blind to what was before our eyes very frequently. To Dr. Goldthwait[8]

8. Boston Med. and Surg. Jour., vol. cxli, 1899, and vol. cxlvi, 1902.

of Boston much of the credit of drawing attention in this country to these conditions is due.

The symptoms complained of most commonly are stiffness, interference with motion, pain and muscular weakness. It may be that many of the indefinite pains complained of in the back, especially in the morning on waking, are due to this condition. Lumbago, while probably rheumatic or gouty in some, is perhaps at times due to this. Many of the cases of so-called "sciatica" are caused by arthritis of the spine, and also instances of obscure pains in the legs and about the body.

There is no intention of suggesting that every case of pain in the back or of sciatica is due to spondylitis, but it is suggested that in every such case it is most important to examine the back. Some cases otherwise regarded as neurasthenia with complaint of pain in the back (which is, unfortunately, only too common a combination), will be found to have local arthritis of the spine. Patients complaining of sciatica may have the same condition.

Of the methods of diagnosis first comes the examination of the spine. The patient should be completely stripped, or down to the hips at least. In the majority of cases little is to be made out. There may be some curvature, or a projecting spine, or more commonly an obliteration of the lumbar curve. There may be wasting of the dorsal muscles, or in the gluteal region, or of one or both legs. In some the attitude is suggestive. They stand with one leg a little flexed and "favor" that side. These results may be only suggestive. Next comes the investigation of the mobility of the spine. With the legs straight, the patient is asked to bend forward and touch the floor, bend back and to each side. Any limitation of motion is very readily recognized. This may be equally marked in all directions, or only in one, although usually at least two are combined. He may bend forward but a very short distance and to one side much less than the other, or lateral movement to one side only may be much restricted. These variations are very readily understood in view of the pathologic anatomy. These movements may cause pain, either local or referred. An attempt to bend to the right may cause the same pain in the leg of which the patient complains. The attitude on attempting to pick up an object on the floor is often characteristic. With this the sensa-

tion should be tested; areas of altered conditions are important. The reflexes are usually increased.

The diagnosis may be fairly clear from this examination, but there are two important aids, namely, tuberculin and the *x*-ray picture. The use of tuberculin excludes the most common source of difficulty, although tuberculous disease of the spine rarely gives the same disease picture as spondylitis. In some instances there is marked involvement of the hip joints with the spondylitis, and this may have led to a suspicion of tuberculous hip-joint disease. The radiograph, if it shows anything, is usually characteristic. The deposits of bone usually appear as shadows between the bodies of the vertebræ. In early cases, of course, little may be seen, and in very fat patients it may be difficult to get a clear plate.

Should the diagnosis not be certain with any of these methods, one help remains—the therapeutic test. Put a light plaster jacket on the patient, which should extend from the axillæ to the level of the trochanter, and if there be spondylitis there should be marked improvement in the symptoms in a few days. This is especially useful in the cases with sciatica.

TREATMENT.

As in the other type, attention should be given to the general nutrition. The same rules for the care of the general health, fresh air, sunlight, nutritious diet and tonics (the syrup of the iodid of iron, arsenic, cod-liver oil, etc.), should be carried out. With these, massage, bathing, hot air and baking to a limited extent, may all be used. Locally, the great object to be attained is rest. This can not be done by keeping the patient in bed, unless the back be well supported, and this is difficult to accomplish properly. Some kind of jacket is more suitable. Perhaps the best plan is to put on a plaster jacket for two to four weeks, and then a strong enough leather one to serve the purpose. With the parts at rest, the pain lessens and the muscular irritability diminishes. In the cases with much curvature the muscular contraction is often largely responsible, and a month with the jacket may almost completely correct this. The jacket should be put on with the patient standing as straight as possible, but no force should be used. If there be deformity, the jacket will often gradually correct this, and a second one can be put on in two

weeks. The jacket or support should be worn until the process is at a standstill, and later some lighter apparatus may be substituted. In such cases, after the condition is improved, every care should be taken to keep the general health as good as possible to lessen the chances of subsequent attacks.

In the cases with general involvement the damage is done. Some form of light jacket may give relief, but the general health is the most important thing we can influence.

The early diagnosis is the most important consideration in treatment. But in the prognosis one has to keep in mind that the disease may advance steadily despite all treatment, and that the most that can be done is palliative.

CONCLUSIONS.

The points to which special attention is directed are:

1. The frequency of the occurrence of acute polyarthritis in arthritis deformans and the danger of mistaking this for acute rheumatism.

2. The importance of the recognition of the spinal forms of the disease, especially the local involvement.

3. That in arthritis deformans we have an obscure disease of considerable frequency worthy of study, especially from the etiologic aspect.