

## Original Articles.

INFECTIOUS ARTHRITIS.<sup>1</sup>

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THE following paper is presented without apology, however unusual it may be for an orthopedic surgeon to write upon a subject belonging so largely to the realm of general medicine, since it is only by the most exact knowledge of the various aspects of such diseases that the treatment of the disabled joints which result from them can be intelligently carried out. It was in this spirit that the work was originally undertaken, and it is my hope that the results may be of as distinct service to others in the treatment of the acute disease as they have been to me in the treatment of the results of the disease. It is my hope at the same time that the confusion which exists in regard to the various non-tubercular joint diseases may be somewhat less as the result of this communication.

The term here used may not be above criticism, but it is simple and represents a reasonable mode of approach to this large class of disease which includes many of the cases of "rheumatism" and many of the other conditions which have been variously classified. Subdivisions under the term will undoubtedly follow, based upon the organism which may be present in a given case, or upon the results of the presence of that organism, but as the principles underlying all these conditions are the same it is thought wise to consider the whole subject in this form, allowing the individual observer to make the special application. For the opportunity to study the acute cases, especially the so-called acute rheumatism, I am indebted largely to the medical staff of the Massachusetts General Hospital, all of the members of which have been most kind and helpful in the work.

The term infectious arthritis is used to designate a joint disease resulting from the presence within the body of some infectious organism, the symptoms being due either to the presence of the organism itself within the joint or to some toxin produced by that organism in some other part of the body. The condition is rarely primary, but usually appears as a sequela of some other disease, representing in all probability the extension of an infection. The primary disease may be mild and attract but little attention, so that in a large number of cases, especially the so-called acute rheumatisms, the few symptoms of the primary disease are often considered to be prodromata of the joint lesion. Upon careful inquiry it will be found that in the majority of cases definite symptoms did precede the trouble in the joint and that these are too varied both in character and location to be fairly considered prodromata, especially as with the majority of persons having similar symptoms no joint disease develops. It seems more reasonable there-

fore to consider the joint condition as a sequela of the original disease rather than that the joint disease itself is an entity. This is exactly the position that is held in regard to much of the disease of the middle ear or the mastoid cells, and as with these and other analogous conditions the same thing is true with this type of joint lesion, that the secondary is frequently more serious and annoying than the primary disease.

Infectious arthritis may result from practically any of the infectious or pus producing organisms and the type of the lesion or its character will naturally depend upon the special organism involved. The disease may be mild and of short duration with complete recovery, or it may be very severe with much suffering and at times fatal termination. One joint may be affected, and if so the disease in this joint may be very slight or may go on to considerable destruction of the articulation; on the other hand, many of the joints may be involved, — at times all of the joints in the body, — and, as when the single joint is affected, there may be severe permanent changes or the disease may soon be over, leaving little to show for its presence.

In this type of disease the onset is usually abrupt, at times symptoms of great acuteness resulting within a few hours. At other times the process is more insidious and gradual, some weeks being required for its development. It is, however, characteristic of this general class of disease, whether mild or severe, of abrupt onset or gradual development, that all of the joints that are to be affected become affected at practically the same time. With those organisms which have but a short period of active life the joints which are to be affected become so at once and there is no farther extension to the other joints. With some of the other organisms, such as the gonococcus, which may live in the various tissues for many weeks, while the beginning of the joint disease may be abrupt, other joints may develop symptoms later at any portion of the time during which the organism is active, but even under these conditions, the progression is confined to a few months at most, and is in marked contrast to the type of disease described under the head of "atrophic or rheumatoid arthritis," in which, although many or all of the joints may be involved, the extension of the disease is very gradual, joint after joint breaking down at long intervals, so that the complete extension of the disease is not reached until many years have elapsed.

With infectious arthritis the symptoms depend upon the severity of the infection; if it be mild there may be little if any temperature, the pulse but slightly accelerated, the glandular enlargement not marked, with only a serous effusion into one or more of the joints which subsides in a few days, with or without treatment, leaving no permanent impairment. If the infection is more profound the temperature is more elevated, the pulse is much accelerated, the blood count shows a definite increase of the leucocytes, the lymphatic glands are enlarged

<sup>1</sup> At about the time this paper was completed a paper by Dr. T. J. Harrington appeared in this JOURNAL Jan. 28, 1904, emphasizing some of the features here described. In spite of the danger of repetition the paper is still published, as too much attention cannot be attracted to this subject at the present time.

throughout the body and there is marked effusion into the affected joints which frequently goes on to the infiltration of the membranes and ligaments about the joint.

In the exposed joints, especially in the fingers, the swelling produces a distinct spindle shape, and at first glance may be mistaken for the spindle joint of the atrophic or "rheumatoid" arthritis. At first the swelling is simply a distension of the synovial sac, but unless this is absorbed within a few days the membranes and periarticular structures become infiltrated and the swelling persists, but not from fluid within the joint, but from the swelling of the membranes and the soft structures about the joint. In the healing or organization which follows such a condition, the membranes if left to themselves usually adhere so that the joint motion is restricted either wholly or in part.

The joint lesion in infectious arthritis is, in the majority of cases, of the nature of a toxemia. The organisms are not found in the joint, but the marked hyperemia of the membranes, the rapid increase in the joint fluid, with the general aspect of the case in its onset, clinical course, and its behavior under treatment, all suggest the result of an infection.

At times the organism itself may be present within the joint, and whenever this is the case the symptoms are much more severe, and not infrequently marked destructive changes result. Here, as with practically all of the other features, the extent of the destruction depends upon the organism present. Occasionally, in a given case many of the joints may show the changes, suggesting a toxemia, while in some one or two joints the organism itself may be present producing in those joints the more serious destructive changes, while the other joints in which the symptoms were those of a toxemia recover with less, or entirely without, impairment of the joint function.

The origin of the infection or the point from which the absorption has taken place, is, of course, of considerable importance and at times can be definitely determined and the organism isolated. At other times this is not possible, but it is not, however, unreasonable to consider such cases as infectious, since the pathological appearance of the joints is in keeping with this theory, as well as the entire clinical aspect together with the fact that the cases are in every way similar to those in which the nature of the infection can be definitely proven. The same reasoning is used in many of the ordinary infectious diseases in which the nature of the infection has not as yet been demonstrated.

It is, it seems to me, only in this way that many of the cases can be understood, and when such a theory is once accepted, it serves to connect and to make comprehensible the various opinions which have at times been advanced in connection with rheumatism or the rheumatoid diseases. It explains at once the reports of the finding of organisms in the joints of certain cases of rheumatism, as certain cases of infectious

arthritis undoubtedly have organisms in the joint, but as in only a few of the cases is the infection severe enough for them to be present it is easy to understand why the organism is found so infrequently and why in many cases even those who have urged the germ theory most strongly are unable to detect them. It also makes comprehensible the fact that the organisms which have recently been reported by two or three groups of men are distinctly different in their characteristics. It explains the fact that some of the cases of rheumatism are mild and some are severe; that some of the mild cases are of short duration while others last for a much longer period; that some of the severe cases are of much longer duration than others; that some of the cases which are severe may have little elevation of temperature (this being particularly true of the gonococcus infection) while with other cases, really no more severe, the temperature is very high, the so-called "rheumatic fever;" that some of the acute cases become chronic, or do not recover promptly; that with some of the acute cases which become chronic one joint may be troublesome, or the chronic condition may persist in all of the joints; that with some the heart is affected, since the endocardium is not infrequently involved in the general septic processes, but this feature would naturally be expected only when the infection is quite severe. It makes comprehensible, also, the type of disease originally described by Still as simulating rheumatoid arthritis but being more rapid in its onset with glandular enlargement and other evidences of infection and, according to Still, ending fatally, but it also explains why some of the cases of Still's disease are now being reported as going on to complete recovery, the recovery or the general course of the disease depending naturally upon the severity of the infection.

The result of the infection in a given case must necessarily depend upon the organism from which the infectious element is absorbed. If due to the typhoid bacillus, the joint process may consist simply of a toxemia with a slight increase of temperature, with a serous exudate into the joint, and with recovery in a short time leaving no permanent change in the joint function. The same organism may, on the other hand, be present in the joint in pure culture causing severe destructive changes. In the first case, the process, if seen in the spine, would ultimately show nothing abnormal, while in the latter case the evidences of the more serious condition would at once be apparent, with the limitation of the motions and in the extreme cases when there had been bone destruction, a true kyphos.

That which is true of the typhoid bacillus is true also of the other organisms. The pneumococcus, the streptococcus, the staphylococcus, the gonococcus, the influenza bacillus, dysenteric bacillus, etc., may all produce a toxemia with joint changes which would be in keeping with such a condition, or they may be present in a given joint in pure culture, producing more

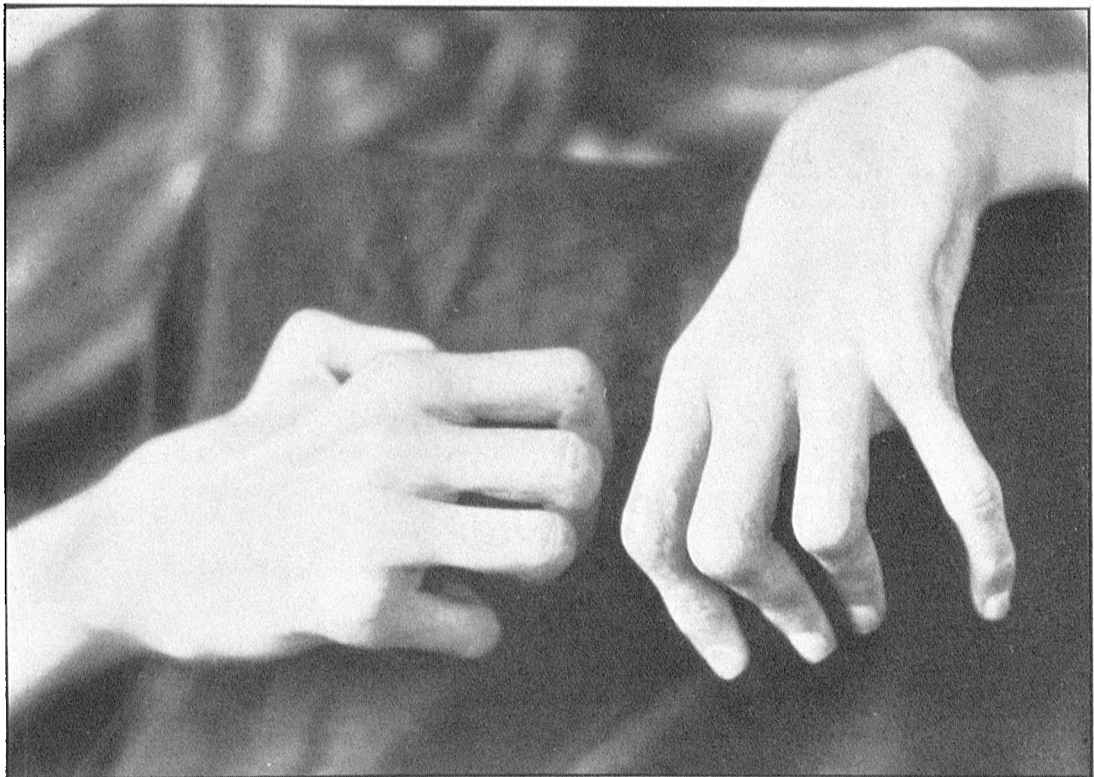


FIG. 1.— Showing the swollen and distorted fingers of Infectious Arthritis without bone or cartilage change. Case 16.



FIG. 2.— The hand of Fig. 1, showing no atrophy of the joint structures, although all of the joints of the fingers and wrist are stiff. Case 16.

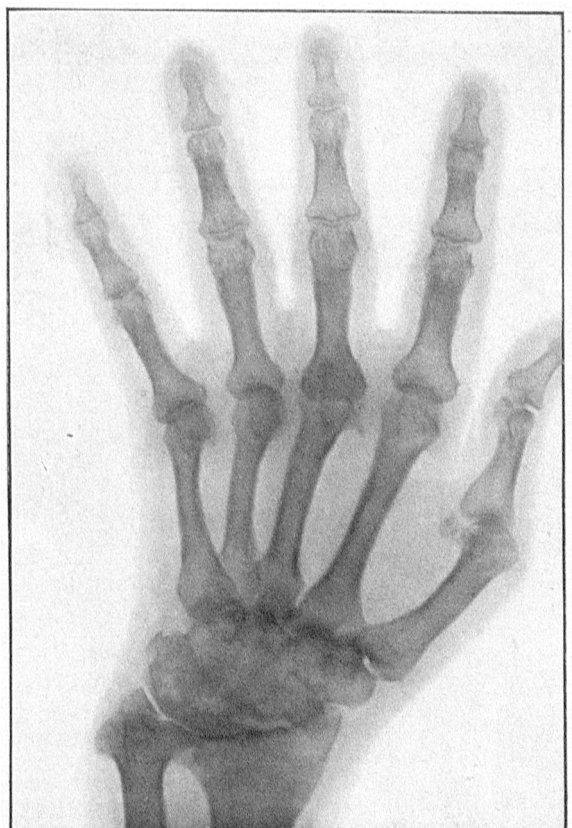


FIG. 3.— Atrophic or Rheumatoid Arthritis, showing the atrophy of both bone and cartilage, with fusion of the carpal bones and actual telescoping at the metacarpo-phalangeal articulations.

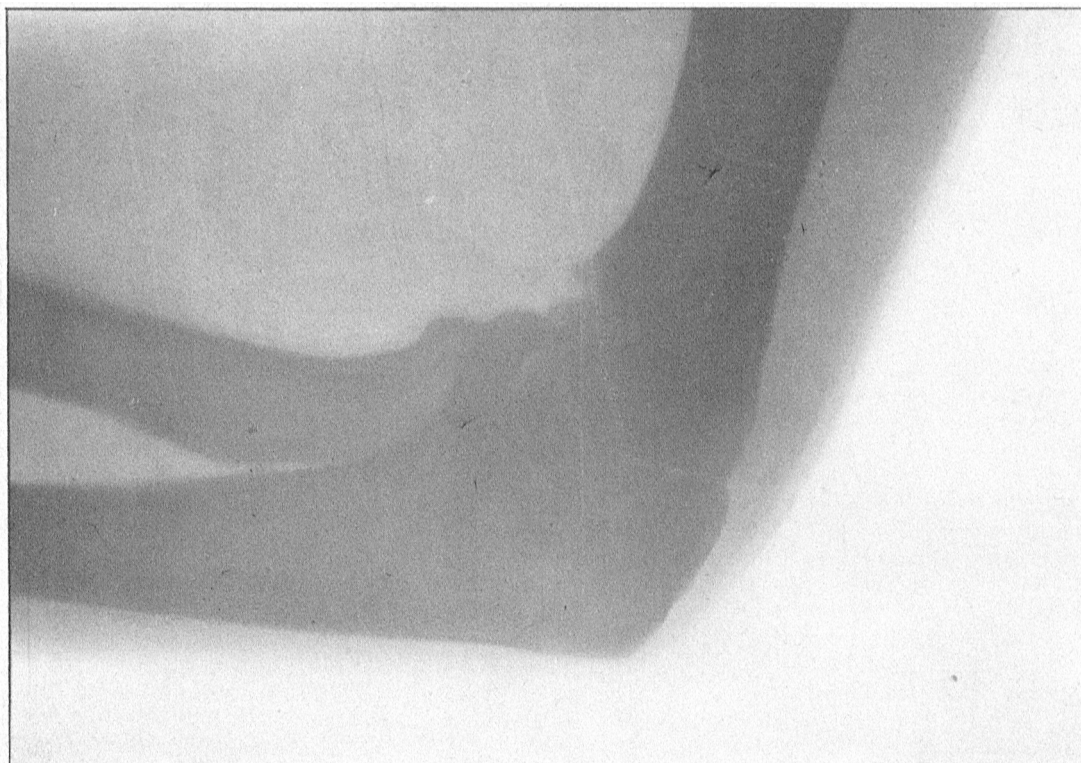


FIG. 4.—Hypertrophic or Osteo arthritis, showing the elongation of both the coronoid and the olecranon processes due to the hypertrophy of the edge of the articular cartilage, without the fusion of the bones. Some motion is present, but is limited by the thickened cartilage.

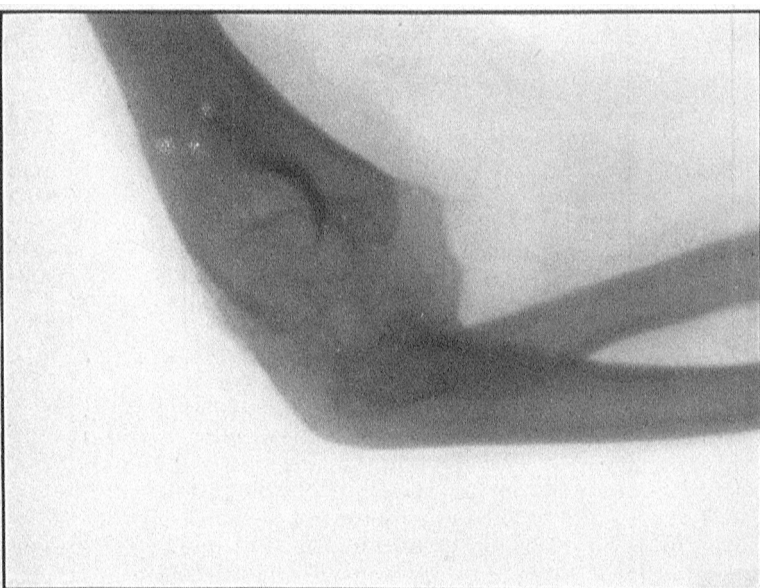


FIG. 5.—The result of Infectious Arthritis with suppurative and bone destruction, showing the character of the bone thickening. The bones are fused together, causing complete ankylosis. Case 7.



FIG. 6.—Infectious Arthritis without suppurative, but with a perfectly still shoulder due to the infiltration of the capsule and the consequent obliteration of the joint. There is no bone or cartilage atrophy or hypertrophy. Case 7.



serious lesions. The pneumococcus and the streptococcus, as is true with the typhoid bacillus, may cause marked destructive changes of the bones as well as of the soft parts. The gonococcus, on the other hand, rarely leads to bone changes, but is associated with much thickening of the capsule and interference with joint function. It is possible that a similar condition may result from the tubercle bacillus, but it seems more probable in the tubercular cases that the joint symptoms suggesting "rheumatism" are due to toxins which result from some of the other organisms which are almost always present with the tubercle bacillus (the so-called mixed infection) in the last stage of tuberculosis, the stage when the so-called rheumatic symptoms are most seen. It is also possible, and indeed probable, in the light of recent reports, that organisms have been found or will be found which will explain some of the cases which, up to the present time, have been shown to be undoubtedly infectious, but in which the definite organism could not be found.

The character of the onset with the different organisms varies. With the typhoid bacillus the onset of pain is sudden, but the temperature requires a few days before the maximum is reached, this lasting a few days, after which the decline also is slow, suggesting at once the character of the chart of typhoid fever as it is usually seen. The streptococcus and the pneumococcus usually have a more abrupt onset with the sudden rise of temperature and with a rather rapid fall if the symptoms represent a toxemia, or continuing at the height until drainage is obtained or until the abscess is walled off if the organism is present. With the pneumococcus the joint symptoms may follow the process in the lung or may develop without other signs in the body. With the gonococcus the onset is usually very abrupt, frequently within a few hours, with marked swelling, pain and tenderness, but with only a moderate elevation of temperature. With this organism the condition is rarely grave unless the infection becomes more general (the organism has been found in pure culture in the heart), but means in the severe cases without treatment a long period of suffering with the ultimate loss of function of the joint, due to the changes in the membranes and periarticular structures.

In the differential diagnosis of infectious arthritis from the other types of rheumatoid disease, in case the history, the general appearance of the patient, and the local lesion is not distinct, the x-ray is of the utmost importance. In infectious arthritis the process is a local inflammation; the joint is swollen; the capsule, if the inflammation has lasted for any length of time, is thickened, giving the spindle shaped swellings (Fig. 1) in any exposed joints, with practically no change in the bone or cartilage (Fig. 2) unless the process is of the destructive nature, in which case the mere extent of the destruction would make the recognition of the condition easy.

In atrophic arthritis, with which the condition will be most often confounded, from the very

beginning of the disease, atrophy takes place, at first showing in the cartilage between the bones, but ultimately in the bones themselves. (Fig. 3.)

In infectious arthritis, the bones are of normal density; the cartilage is present and of normal thickness (Fig. 6), and although the joints may be ankylosed, the ankylosis is due to the adhesions which have resulted as a part of the inflammation. In atrophic arthritis, the ankylosis, if it takes place, may be due either to adhesions formed from the disintegrated material resulting from the atrophy or there may be actual fusion of the bones together.

In case the infectious arthritis goes on to more destructive changes in the repair there may be new bone formed about the joint and true ankylosis result, but the appearances are entirely different, as shown in the illustrations, from the atrophic or rheumatoid arthritis, and also the hypertrophic or osteo-arthritis with which, because of the marked thickening, the condition in this stage would be most apt to be confounded. In hypertrophic arthritis the thickening is always primarily at the edge of the articular cartilage growing outward from this line as is shown in Fig. 4. The joint motion may be much impaired, but except in the spine and in a few rare instances does complete ankylosis take place. In infectious arthritis the new formation of bone is similar in every way to the new formation of bone which follows a septic periostitis. It is not a thickening of bone at the edge of the cartilage, but thickening of the bone at the point of infection wherever the periosteum is present as is shown in (Fig. 5).

The blood in infectious arthritis in the beginning and during the active stage shows a marked increase of the leucocytes with usually a high percentage of hemoglobin. As the disease progresses and the acute symptoms subside the increase of the leucocytes gradually disappears, and the percentage of hemoglobin becomes less so that in the later stages of the disease a secondary anemia is almost invariably present. In atrophic arthritis the leucocytes are not increased and the secondary anemia does not develop. The extent to which the changes in the blood occur naturally depends upon the severity of the infection, but even in the comparatively mild cases, the increase of the leucocytes is quite marked.

The lymphatic glands in infectious arthritis are almost always somewhat enlarged in the beginning of the process, and this enlargement remains until the toxemia has been overcome, when it gradually and entirely subsides. If any one joint develops symptoms more pronounced than the others or in case suppuration develops, the glands which would be affected by that joint naturally are larger than those in other parts of the body, and at times, in the particularly virulent cases, may go on to suppuration.

The urine of infectious arthritis is not peculiar unless the infectious process be quite profound, in which case the characteristics are

simply those of a septicemia, and what is true of the kidneys is true also of the other organs.

The treatment of infectious arthritis must be considered in two parts, that which pertains to the general condition and that which is required for the local process. It is of the first importance to keep up the general health as much as possible, and for this purpose all the details of general care should be observed, as they would be carried out in a case of septicemia. In the very beginning, if the disease be acute, with much fever, naturally the diet should be restricted, but after this period has passed, the diet should be wholesome and generous, with the idea of increasing the general strength and nutrition as much as possible. In the mild cases with good general care recovery may take place entirely without the aid of drugs, but if drugs are to be used tonics and reconstitutives are indicated. In the early stages in many of the cases salicylic acid or some of its compounds will be of distinct help to relieve pain, but in case this drug is to be used it should be borne in mind that in many of the cases it affords no relief whatever, and also that if it is to be of help that the improvement is noticed at once. It should also be borne in mind that although it relieves pain it is a distinct depressant, disturbing both the action of the heart and the digestion, and if continued for any considerable length of time is distinctly harmful, as it lessens the resisting power of the patient. For this reason in case salicylic acid is to be used it should not be continued for more than a few days, after which in the majority of cases it is possible to entirely dispense with it, using instead some of the simple alkalies with at the same time the use of large quantities of water internally.

It is undoubtedly essential that the eliminative functions, both from the kidneys and the bowels, should be kept as near the normal standard as possible. For the former the large quantity of water with the simple alkalies, such as the bicarbonate of soda or potassium, the phosphate of soda or the salts of lithium, are usually sufficient, and any tendency to the increased acidity, due either to the presence of the formic or uric acid, which are a result of the condition and not the cause, is entirely overcome. For the intestinal elimination cathartics should, of course, be used if needed, and frequently olive oil in half ounce doses once or twice daily is helpful to improve or correct this feature. Aside from this the medication should be planned with reference to the infection, and tonics and reconstitutives should be used freely with fresh air, stimulating bathing, and any such measures as improve the body tone.

It is probable, in the light of the pathological and clinical nature of the disease, that as the condition represents so probably an infection, that some anti-toxine may be discovered, the use of which will control the disease. At this time observations are being made with the anti-streptococcus serum, but as yet the results of this treatment are too recent to report definitely.

For the local treatment in the active stage

there is comparatively little to be done other than to protect the affected joint, and by means of hot applications, either moist or dry, liniments and such remedies, to relieve the discomfort as much as possible. If the process be acute, fixation will undoubtedly give relief, and this can be accomplished by the application of some form of splint, or a pillow folded about the leg and held with straps is oftentimes enough. At times complete fixation is necessary, in which case the plaster of Paris bandage is the most satisfactory. In arranging the position of the joint during this active period, the danger of contractures or dislocations should be borne in mind, and after the inflammation has passed, in case any stiffness or impairment of motion remains, passive motion, manipulation, and massage should be used in order to restore the joint to its normal function as soon as possible. In case the joint lesion represents a toxemia the recovery is rapid, so that within a week or two the acute symptoms have passed and motion should be encouraged. If the infection prove to be of the more serious type in which the organism itself is present in the joint more radical measures are frequently indicated and the joint should be opened and thoroughly irrigated. The infiltration of the capsule seen in this more severe type of the disease and which is responsible for the impairment of motion in many of the cases, particularly those due to the gonorrheal infection, does not take place to any marked degree until after the first three or four weeks. Up to that time the infection and swelling is confined largely to the joint itself. For this reason, if the improvement is not marked at the end of the first three or four weeks, in case only one or two of the joints are involved, they should be opened and thoroughly washed out. The same principle holds in the cases of this nature in which many joints are involved, but as in these cases the virulence of the process is less severe, measures as radical as incision are rarely necessary. In some cases, especially those due to the presence of the pneumococcus or the streptococcus, the symptoms may develop so rapidly and indicate so definitely an active septic process in the joint that there can be no question but that the joint should be opened at once and thoroughly drained, it being frequently possible in this way to prevent the marked destructive changes which otherwise would take place.

In operating the joint should be as thoroughly explored as possible, and in the exposed joints, such as the knee or elbow, the opening should be made on both sides, so that the irrigation may be thorough. In the gonorrheal cases, which are probably those in which the operation is most commonly needed, simply flushing the joint with water at the temperature of 120° F. is sufficient to destroy the organism. With the infections due to other organisms, definite antiseptics will be required and any of them in proper strength may be used. In the gonorrheal cases the wounds should be closed tightly except for one or two strands of silk which are allowed to

remain in the joint for twenty-four or forty-eight hours. After that it is customary for the healing to take place rapidly, and the function of the joint to return almost as rapidly. The marked relief from pain in these gonorrheal cases which follows such an operation is at times very striking. If the organism present is a more active pus producing element, such as the pneumococcus or the streptococcus, the joint should not only be flushed out, but drainage of some sort should be inserted so that repeated irrigations may be possible, and any accumulations of pus which may form, easily escape.

With the pneumococcus infections, if the joint alone is affected, the prognosis is good and healing takes place rapidly after the joint is once thoroughly opened. With the streptococcus the healing is apt to be more delayed, requiring a longer course of treatment, and the end result almost invariably shows some impairment of function of the affected joint. As both of these organisms, and several of the others, if allowed to remain in the joint for any considerable length of time attack the bone as well as the soft parts, naturally the operation should be performed at the earliest possible moment after the diagnosis is made.

In many of the cases of infectious arthritis and even those which are quite mild after the acute swelling and sensitiveness has passed, instead of the joint returning to its normal size and function, some swelling persists and the joint remains sensitive, weak and uncertain for an indefinite period. This condition is due usually to the fact that as a part of the original inflammation the membranes are swollen, and instead of contracting to their normal size as the inflammation subsides, the swelling remains and leads to the formation of folds and fringes, so that a villous arthritis results. It is also true that in certain cases the fibrin in the synovial fluid is precipitated, so that after the swelling goes down these masses of fibrin remain and act within the joint, as a foreign body, producing irritation and symptoms exactly as would any other foreign body. Both of these conditions should be definitely recognized, and if after a reasonable length of time, with stimulating bathing and local tonic treatment, the part does not return to its normal size and function the joint should be opened, and these features removed. This undoubtedly explains the persistence of symptoms in many cases which are at first supposed to be simply acute rheumatism, but in which the symptoms do not entirely disappear, and what is considered as chronic rheumatism develops.

If, as is not infrequent in a considerable number of cases, the patients are seen for the first time after the acute symptoms have passed and after the thickening of the capsule has resulted, and the contractures or the other undesirable features have taken place, an effort should be made to improve the condition. If there are dislocations attempts should be made to reduce them; if contractions, they should be overcome; and every possible effort

made to restore the joint to as near as possible its normal condition. In practically any case, no matter how extreme the condition may be, improvement is possible, but, of course, in varying degrees; in some the joints can be made nearly normal; in others the improvement is necessarily less marked, but an attempt should be made in any such case, no matter how severe the crippling may be, to improve the condition of the patient.

During all of this late period of the disease the rheumatic remedies are naturally not of the slightest use and should be carefully avoided, the whole plan of treatment, both internal and external, being to improve the patient's general health as much as possible.

The following cases are reported, as offering suggestive evidence to the conclusions presented above. It is to be understood that they are only suggestive, and do not pretend to offer positive proof:

**CASE I.** Mr. C., a man thirty-five years of age, was seen at the Massachusetts General Hospital, giving the following history: Having previously been well, one week before entrance he started in with what apparently was a hard cold. There was general feeling of malaise with cough and considerable muco-purulent expectoration. The day before entrance several of the joints became swollen and tender, supposed to be rheumatism. One wrist and several of the other joints were involved. The temperature was but little elevated, the glands could be felt all over the body, and the blood count showed over 20,000 leucocytes. Under rest in bed with local warmth to the affected joints, and with salicylic acid the condition entirely cleared up, so far as the pain and swelling was concerned, in four or five days.

The case suggests an influenza or severe cold with a toxemia following in which the joints were involved.

**CASE II.** A child of five years was seen at the Children's Hospital with trouble with the shoulder joint of two weeks' duration. At the time of the first examination the general condition was very poor, and the joint was swollen and reddened. A diagnosis of septic arthritis was made and the joint opened, the pus showing the pure culture of the pneumococcus. The recovery was rapid with a fairly good functional result.

In this case the joint symptoms were due to the pneumococcus which was present in pure culture.

**CASE III.** Mrs. E. D. R. was seen at the Massachusetts General Hospital with Dr. F. C. Shattuck. She had a typical severe attack of lobar pneumonia with pleurisy, with a gradual subsidence of symptoms until two days before she was seen by me. At that time she began to have joint symptoms referred to the knees, left shoulder, hand and elbow and to the right elbow. There was swelling and marked tenderness on motion. The white count was naturally high during the pneumonia, but had fallen so that at the onset of the joint symptoms it was 12,200. There was moderate glandular enlargement and a serous exudate into the joints. In a few days with nothing more than good care the joint symptoms subsided and the normal function returned, the condition probably representing a toxemia following the pneumonia.

CASE IV. E. E., a physician thirty years of age, was seen by me several years ago in reference to an attack of supposed rheumatism in several of the joints, particularly one knee. The onset had been abrupt and the symptoms in all of the joints but one knee soon disappeared. The swelling and pain in the knee persisted for two or three weeks and then disappeared leaving a normal joint. A few days before the onset of the joint trouble the patient had had a sharp attack of pharyngitis and the culture taken at the time of my first visit showed a pure culture of streptococcus.

The treatment consisted chiefly in tonics, with a splint for the knee, followed by a bandage for a short time after the swelling subsided.

The joint symptoms in this case were of the nature of a toxemia and probably came from the throat where the streptococcus was found in pure culture.

CASE V. J. H., a physician thirty years of age, had a sharp attack of dysentery from which there was marked prostration with much septic absorption. During the recovery, after the acute intestinal symptoms had subsided, when the patient was still very weak, symptoms developed very abruptly in one knee, one foot, and one sternoclavicular articulation. The joints were swollen and tender. The joint condition gradually improved under moderate protection during the stage of swelling, with active use as soon as this had subsided. The internal treatment consisted of the use of large quantities of water with tonics and stimulants. The sternoclavicular articulation and the knee recovered in a few weeks under protection but several months elapsed before the sensitiveness about the foot at the attachment of the tendon Achilles disappeared. Several years have now elapsed since the trouble developed, and no further trouble has followed.

The joint symptoms represented undoubtedly a part of a general toxemia, following the dysentery.

CASE VI. L. H., a woman forty-five years of age, was admitted to the Massachusetts General Hospital in August, 1903, and was under the care of Dr. J. J. Minot, at whose request she was seen by me.

The patient having previously been well, had had, three weeks before entrance, a sharp attack of pain and swelling in the right knee. One week later the right wrist and the joints of the fingers became red, swollen and painful and a few days later the left hand developed symptoms similar to the right, only less acute.

The condition presented the appearance of an acute articular rheumatism, and with good general care steadily and rapidly improved except the right wrist which remained swollen and gradually grew worse. The redness and swelling increased until suppurative changes were evident, when the joint was opened, thoroughly cleaned out, and drained. After this the healing went on rapidly and steadily. Before the operation there had been a moderate elevation of temperature. The case represents a toxemia with rapid recovery in all but one joint in which the suppurative changes indicated the presence of the organism itself. There was no growth on the ordinary culture media employed in this case.

CASE VII. Mrs. H. A., thirty-one years of age. The patient, the wife of a physician, was seen in September, 1902, giving a history of having been perfectly well up to a year and a half before, at which time she had an attack of erysipelas about the head. A short time after her recovery from this, the right shoulder, the left elbow, both knees and the right ankle became swollen and painful. Abscesses formed at the right shoulder, the right ankle and the left elbow, which

discharged and rapidly healed. She was kept in bed for seven months and was considered very ill.

At the time of the examination, the left elbow was firmly ankylosed with no swelling or evidence of active joint disease; the right foot was stiff and in the position of valgus; the ankle and shoulder were completely ankylosed, and one knee was quite stiff. The condition undoubtedly represented a profound toxemia probably resulting from the erysipelas, associated with suppurative changes in some of the joints. There had been no extension of the disease and the type, as illustrated in the x-ray, Fig. 5, does not suggest atrophic arthritis or hypertrophic arthritis. In the joints in which the suppuration occurred, there is considerable formation of new bone, not the thickening confined to the edge of the cartilage, as is seen in hypertrophic arthritis, but the general thickening following an inflammatory process in which the periosteum or the general joint structures are involved. In the joints which did not suppurate there is no evidence of cartilage or bone atrophy. (Fig. 6.)

CASE VIII. Mr. J. B., twenty-eight years of age. In 1896, patient had an attack of gonorrheal arthritis, both knees, the right shoulder, the toes, the back and one finger being affected. After a few months the condition entirely cleared up except the lumbar spine and the left knee which continued to pain and have remained troublesome ever since. The knee joint has been aspirated several times and he has received much treatment at the various baths, none of which have yielded more than temporary relief. During periods of quiet the swelling and irritation of the joint subside but they are always made worse by active use.

On examination, the joints were normal except the lumbar spine which was quite stiff with some pain on motion, and the left knee which showed considerable thickening of the capsule with such a definite villous arthritis that the fringes could be palpated and readily demonstrated on motion. The condition is undoubtedly one in which for some reason following the toxemia of a gonorrheal process a few joints became more involved than the others. The condition in the affected joint at the present time is not a gonorrheal process, but the result of that infection, the symptoms at the present time being due entirely to the presence of the synovial fringes or villi and the mechanical irritation which their presence represents to motion. Naturally in such a case on any considerable amount of use, the fluid in the joint would increase, and aspiration or such other treatment as has previously been tried would give relief but would not cure the condition. The treatment which offers hope of cure must naturally be the thorough opening of the joint and the removal of the villi which are responsible for the irritation. The patient is awaiting operation.

CASE IX. J. L. Q., machinist, aged twenty-five years, admitted to the Massachusetts General Hospital Jan. 6, 1904. About one week before onset of the joint symptoms he had an acute attack of urethritis. The joints first involved were the feet, a few days later the elbows, both knees, back and several finger joints. The shoulders were unaffected. Some of the joints were not swollen at all; several of the others showed periarticular thickening with apparently no increase in the joint fluid. The spindle shaped swelling of the second phalangeal joint in the index finger of the right hand was very noticeable. The glands all over the body were moderately enlarged. During the stay in the hospital the temperature ranged from 99° to 100°; pulse was quickened, reaching 122. Hemoglobin 70%; whites 18,600; urine shows slight trace of albumen with occasional



casts and round cells. The improvement under good, general care was rapid.

The case represents an infectious arthritis of moderate severity following a gonorrheal arthritis, with little to produce permanent changes.

CASE X. Mr. A. B., forty years of age, was seen in consultation with Dr. E. C. Boland. Shortly after a definite attack of gonorrhea, he developed symptoms in the left knee. The onset was abrupt; the swelling marked; the suffering very great, with no relief from the rheumatic remedies or from protection of the joint which was kept up for four weeks. Large doses of morphia were necessary to control the pain. After waiting four weeks without improvement the joint was opened and irrigated with water at the temperature of 120°; the wound closed, except for a strand of silk and sterilized dressings applied.

The pain was at once relieved by the operation and motion was possible within a few days, and function gradually and steadily improved.

The examination in this case of the fluid confirmed the diagnosis of gonorrheal arthritis.

CASE XI. V. Y., a man forty-five years of age, was seen with Dr. H. F. Vickery at the Massachusetts General Hospital with what appeared at first to be an ordinary but severe case of acute rheumatism. The onset of joint symptoms and the early history was not noted so that the nature of the early infection is not known. The patient seemed quite sick with a moderate elevation of temperature, with a rapid pulse, and with the general enlargement of the glands, besides the swelling and pain in most of the large joints. With good general care the excess of the joint fluid was gradually absorbed leaving the periarticular structures considerably infiltrated. The patient's general condition did not improve and later on symptoms of valvular disease of the heart developed, which increased in severity and death followed in a few days. The pathologist's report was that death was due to a "septic endocarditis."

The case represents a profound toxemia with a final lesion involving the heart.

CASE XII. Miss I. M. P., twenty-nine years of age. Patient entered the Massachusetts General Hospital in the service of Dr. James J. Minot in June, 1903. Three months previous she had an attack of typhoid fever, and three weeks after the onset of the disease severe pain developed in the back, relieved only by morphia. This continued for three weeks and then largely disappeared, and the patient was able to be about until five days ago when the pain in the back recurred with such severity that the patient was put to bed. For a week her temperature ranged about 101° and after that gradually fell to normal and remained there during the balance of her stay in the hospital.

At the time of the examination the motions of the lumbar and low dorsal vertebrae were much restricted with marked tenderness over the spinous processes in the region of the upper two or three lumbar vertebrae. All motion of the spine was so painful at this time that it was with difficulty that a thorough examination was made. The heart and lungs were negative; the urine was normal; the hemoglobin was 70%; there were 10,600 whites in the blood count and the widal reaction was positive.

At that time a diagnosis of typhoid spine was made and a plaster of Paris jacket applied to immobilize the spine until the active inflammation subsided. The patient was kept in bed with the jacket on for about a month. During the first part of the use of the jacket

the pain continued, the only benefit from the support being the greater ease in moving from side to side. After that the pain gradually disappeared and a leather jacket was substituted for the plaster one. The patient then left the hospital with the understanding that the leather jacket was to be gradually discontinued. The spinal motions at that time were distinctly limited in the region of the inflammation, and undoubtedly much of this will be permanent.

The spinal process represented undoubtedly a definite infection due to the typhoid bacillus with enough inflammatory change and thickening to cause permanent thickening and thus limit the spinal motions. In the simple toxemias which undoubtedly do at times affect the spine the relief from the pain would probably have followed the application of the jacket, while in the case reported with the organism itself probably present, in spite of the fixation, the pain persisted, as is usual in such infections until the temperature disappeared and the evidences of the active life of the organism had passed.

CASE XIII. Pauline W., ten years of age, seen in January, 1903, in consultation with Dr. T. M. Rotch, had the following history: Until four years ago the child had been so unusually well as to be considered a model of health by the people of the neighborhood. At that time the child had some trouble with a tooth which was followed by acute disease of the cervical glands. Shortly after this she began to have trouble with the feet so that it was difficult to pull on her boots. With this there was some lameness, and a short time afterward the neck became suddenly sensitive and the head was drawn to the right. Soon after the knees and then the hands and wrists became swollen. All the joints which are now involved or which have been involved became so during the first six months. Under the supposition that the condition was rheumatism the patient was treated with the ordinary rheumatic remedies, was taken to the Hot Springs in Virginia for some time without benefit and under the various forms of anti-rheumatic treatment she ran down in health steadily.

At the time of the examination the tarsal and ankle joints were swollen and boggy but the motion was not much affected; both knees were swollen, and also the wrists with but little restriction of motion; the cervical spine was stiff with very little apparent swelling and the inguinal, axillary and cervical glands were moderately enlarged. The x-rays taken at that time showed no atrophy of the bone or cartilage, the joint swelling being due apparently to the infiltration and relaxation of the membranes. The child was put upon a course of general stimulating tonic treatment, and the father, who is a physician, reported three months later that she was much better and was continuing to follow the same general directions.

This case represents quite typically the disease described by Still, except that it was of a milder type than the cases reported by him. From the most careful study of the disease it suggests an infectious process, the infection most probably having been absorbed from the abscess about the tooth. Unlike the atrophic form of arthritis the disease has not progressed since that time, nor has the swelling of the individual joints subsided and gone on to ultimate atrophy. At present the swelling of the various joints is undoubtedly due to the hyperemia of the mem-

branes and the villous arthritic change which results from this. In case the general stimulating and tonic treatment does not effect a material improvement in the condition, an operation with the idea of removing the villi which represent the mechanical irritation to the joints must be considered.

**CASE XIV.** Miss E. M. S., a patient of Dr. W. W. Pillsbury, having previously been well and with a good family history, in March, 1903, met with a slight injury to the left knee. This was followed by a synovitis, and shortly afterward pain developed in the joint so that motions were restricted, and gradually during the next four or five months the process extended from joint to joint until at the present time practically all of the joints in the body are affected. In the individual joint there is comparatively little increase in the joint fluid but much infiltration of the membranes and periarticular structures, giving in the exposed joints a marked spindle shaped appearance. All during the developmental stage of the disease there has been a slight increase of temperature, from one to two degrees, and the pulse has been much accelerated, from 120 to 130 most of the time. The glands throughout the body are much enlarged. While at first there was comparatively little abnormal in the character of the blood, a profound anemia has developed.

The case suggests in all its appearances a typical chronic rheumatism, undoubtedly resulting from some organism, the exact nature of which we do not at the present time know. It seems probable that it is in such a case that the organisms which have been recently recognized in cases of rheumatism will be found to represent the causative factor.

**CASE XV.** Mr. R. W., twenty-one years of age. Four years previous to the time of the examination in July, 1903, the patient had an attack of pneumonia which was followed by an empyema, for which a radical operation was discussed, but which for some reason was not performed. The convalescence from this condition occupied a long time and in that time pain developed in one hip. Shortly afterward the other hip, both knees, one ankle, shoulder, elbow and jaw became affected. Two years later the patient had scarlet fever, following which all of the symptoms were worse. The condition at first was considered an acute articular rheumatism which has gradually gone on to a chronic condition.

At the time of the examination many of the joints were involved as stated. The spine was stiff, both hips allowed only a slight amount of motion, the knees were flexed with considerable stiffness, the right ankle was swollen and stiff, the jaw was practically ankylosed and the left shoulder could be moved but little. The other joints were practically free. None of the joints showed any changes of atrophy and there had been no progression or extension of the disease since the original trouble began. The patient presents the typical appearance of chronic rheumatism and in the light of similar cases probably represents a toxemia following upon the pneumonia and the empyema, the organism probably responsible for the infection being the streptococcus. A pneumococcus toxemia does not as a rule last so long, and for the organism to have been present itself would have undoubtedly been followed by suppuration in some of the joints.

The treatment with this patient, as the active disease was over when he was first seen, has consisted of regular manipulation of the joints, tonics to improve

the general nutrition, and has been followed by considerable improvement in the function of the affected parts.

**CASE XVI.** Mr. F. R., twenty-one years of age, having previously been well, two years ago developed suddenly an attack of what was called rheumatism, confined at first to the right knee. The joint was red, hot and considerably swollen. In three months the other knee became involved, then gradually the neck, elbows, feet, hips and shoulders. Each joint behaved in the same way, showing swelling with much sensitiveness which gradually subsided leaving in almost each instance some restriction of motion. At the time of the examination the cervical spine was stiff, the motions in the left shoulder restricted about one half. The left elbow, which had been more seriously affected than the other joints, was completely ankylosed. Both knees were flexed to about 45°; the wrists were stiff, and the fingers of both hands were flexed and distorted (Figs. 1 and 2); the feet were quite flat and the right one stiff at the ankle. The case represented undoubtedly the so-called chronic rheumatism, and at the time of the first examination there was very little evidence of active disease. The glands, however, were still somewhat enlarged; there was practically no elevation of temperature, but the anemia was quite marked.

For treatment the patient has had regular and repeated manipulations of the various joints with the idea of improving their function as much as possible. He is, at the present time, able to walk about with his legs straight; the hands are used more perfectly, and in all the joints there has been some improvement. The degree of helplessness as the result of treatment has been materially lessened.

**CASE XVII.** Mrs. B., thirty-five years of age. Two years previous to the time of her first being seen the patient had a severe attack of what was called articular rheumatism, many of the joints being swollen and acutely painful, the right hip being especially involved. The symptoms of acute suffering lasted for several weeks, during which period the patient was kept upon her back, the leg raised and supported upon pillows with considerable adduction. This position was maintained throughout the period of active inflammation, and after the acute symptoms had passed and the patient began to get about it was found that the right hip was dislocated, the dislocation having undoubtedly resulted from the distension of the joint during the inflammation together with the position of flexion and adduction which would make dislocation easy.

There was at the time of the examination no apparent destruction of bone, and accordingly the leg was manipulated under ether, and with comparatively little difficulty the head of the femur put back into place. The position was maintained with fixed dressing for a few weeks, after which motion and weight bearing were allowed. The bones remained in the proper position and the function of the part improved so that except for some limitation of motion in the extremes there was little to show for the previous condition.

This case illustrates a result which may follow a comparatively simple inflammatory process unless the position of the part is carefully considered.

**CASE XVIII.** Mr. A. O., a young man twenty-two years of age, was seen in July, 1903, in consultation with Dr. J. J. Whoriskey. Having previously been well, he developed following the wearing of an imperfectly fitted shoe a blister upon the heel, which was

followed by a small pustule at that point. Twenty-four hours later symptoms of acute infection developed, with high temperature, rapid pulse and glandular enlargement. The pustule was promptly opened with temporary relief, but one parotid gland became infected and went on to suppuration. One or two other points of infection developed, and finally a few weeks after the first onset of the disease the left hip became acutely sensitive. From the beginning of the infection the patient was very seriously ill, and with the development of the symptoms in the hip the condition was so grave that a rapid incision was made into the joint for drainage as an operation of last resort. The hip joint was filled with pus, as had been all the other parts in which the infection had manifested itself. Under gradual, stimulating tonic treatment, with protection of the joint, and with such treatment as would tend to lessen the suppuration in these parts, the patient gradually recovered with a moderate restoration of function in the affected part.

The case represents an infectious process starting in the subcutaneous tissue, followed by joint suppuration, the specific organism not being determined as the culture was lost. In such a case, it is, of course, impossible to expect normal recovery because of the amount of destruction of tissue which has taken place.

#### SOME POINTS ON THE DIAGNOSIS AND TREATMENT OF CERTAIN NEGLECTED MINOR SURGICAL LESIONS.<sup>1</sup>

BY E. A. CODMAN, M.D., BOSTON.

THE subject on which I have chosen to speak to you is not remarkable for its brilliancy, as you may guess by the title. I think that we may justly criticise ourselves as surgeons, for our tendency to pay too much attention to the cases on which we may obtain brilliant and striking results, rather than to endeavor to do our best for every surgical case which is presented to us. In the cases which I shall describe, as a rule, the results are not very good and even when intelligently treated, the patients are apt to think that doctor so and so made some error because the limb is not more useful. The material which I have used for this paper I have obtained mainly from my service in the Surgical Out-Patient Department of the Massachusetts General Hospital. In my work there, the cases in which I am not able to make a satisfactory diagnosis are always more interesting to me than those in which the diagnosis is clear and the treatment sharply indicated.

Among the lesions which have been most troublesome, are certain unrecognized fractures which we have only lately learned to distinguish from sprains. It used to be said that a sprain was worse than a break, but from my experience of the last four or five years, I feel quite certain that the majority of sprains which do not promptly recover are in reality breaks. Among the most

common of these unrecognized fractures is that of the scaphoid bone of the wrist. The history of the following case is quite typical:

H. S. F., aged twenty, injured his wrist in playing football at Cambridge. He was seen by the surgeon of the football squad and the wrist was put in splints for several days. The swelling and tenderness subsided to a certain extent. No crepitus was obtained, no ecchymosis, and the patient could use his fingers and wrist a certain amount. There was no abnormal mobility. In football practice it is found that a sprain does better if the use of the limb is kept up, and this wrist was treated on this principle. While there was some improvement, the joint still remained sore, forced motions beyond a slight angle were very painful and the gain in strength was slow. About six weeks after the original injury the patient consulted me at my office. I made a diagnosis of fracture of the scaphoid and confirmed it by an x-ray. Feeling that it was too late to endeavor to obtain union between the fractured ends of the bone, I only kept the wrist on splints for about two weeks and then had it massaged. The rest on the splints improved the joint to a considerable extent but it still remained somewhat swollen and gave pain if extreme motions were forced. The young man was prevented from doing any sort of athletics with the wrist, he could not play football, and frequently found that he hurt it in scrapping with the other fellows. This condition has lasted over two years with a very gradual gain, so that even now the wrist cannot be extended beyond an angle of 25° without giving extreme pain; flexion is less painful, but in the extreme position almost as bad as in extension. There is marked tenderness over the scaphoid bone which is best obtained by adducting the wrist and pressing with the thumb just in front of the styloid process of the radius in the anatomical muff box.

This history is typical of fracture of the scaphoid and while at first I found the x-ray a necessity in making the diagnosis of this fracture, I can now in a large proportion of cases diagnose it from the clinical side alone. With the assistance of Dr. H. M. Chase, I have collected about 15 cases which have been at the Massachusetts General Hospital and obtained their detailed histories. We hope to publish these cases soon. In addition to these there are perhaps twenty-five more of whom we have x-ray plates, but whose clinical histories we have not been able to obtain.

Prof. Dwight has offered the suggestion that these fractures are perhaps due to a congenital condition of the scaphoid bone which is characterized by the forming of two centers of ossification instead of one, so that a lamina of cartilage is left between the two halves of the bone and that it is through this weakened area that the fracture takes place. Be this as it may, fracture does take place and in my opinion the assumption that such a weakened portion of the bone exists is entirely a theoretical one. To sum up the diagnosis of fracture of the scaphoid: There is no deformity, no ecchymosis, no crepitus, no abnormal mobility — in other words the classical signs of fracture are absent. What we do have is localized swelling and tenderness in the region of the scaphoid bone, *i. e.*, in the radial half of the wrist joint; limitation of active joint motion and sharp pain called forth by efforts at

<sup>1</sup> This paper was prepared to be read at a meeting of the Worcester District Medical Society on March 9, 1904. A number of anatomical preparations on the bursa about the wrist, shoulder and ankle were demonstrated, and lantern slides illustrating this paper were shown. Owing to lack of time, the formal reading of the paper was omitted.