flex the joint? Or is it because that portion or tissue of the joint which is diseased is supplied with the same nerve or nerves which are distributed to the flexor muscles, and thus the latter by reflex irritation contract? Or rather may it not be that the joint in its dilemma simply assumes the position which is most natural to it; that is if it is a question simply of flexion and extension? We always find the fetus with marked and the young child with decided joint flexion.

Scarcely a case will go through its course without pain, most marked when the initial lesion is in the bone, and too, when the progress of the case is acute; usually confined to the joint, occasionally, as in coxitis, remote. The night cry is characteristic of these affections, being most marked during the early hours of slumber.

Swelling of the joint is a decided symptom, more especially so as the case progresses, exceptionally so, however, in *caries sicca*. The joint enlargement is more pronounced when the synovial membrane is the seat of the inflammation than when the initial lesion is in the bone. The superficial joints evidence the swelling more promptly than the deep-seated articulations, such as the hip. The thickening of the capsule and of the periarticular structures, with exudation in the latter, and also effusion within the capsule cause the swelling.

Nineteen-twentieths of the cases occur in children; the growing epiphysis being especially vulnerable to the bacillus. In the adult the synovial membrane is more prone to be the seat of the disease.

Dislocations and marked deformities occurring during the progress of the disease do not concern us here, as we are speaking only of the early symptoms.

The tubercular troubles need not be confounded with other articular affections when we consider their frequency, their proneness to attack children, their insidiousness and their slight influence on the general health in the early stage. Ordinarily unarticular, *i. e.*, two or more joints, being rarely or never attacked at the same time. A tubercular history, inherited or acquired, would assist in the diagnosis. A suspicion of syphilitic joint disease could be cleared up by a course of specific treatment. Abscesses do not occur early, but a rheumatic or gonorrheal synovitis would be attended with more pain and more acute symptoms than a tubercular abscess. Doubt as to whether there was fluid in the joint and also as regards its character could be determined by the tapping needle. Rheumatism may attack children but likely as a polyarticular affection and with fever. The spine and joint affections following typhoid fever are ephemeral and quite amenable to treatment by rest, and thus the differential diagnosis of tubercular joint troubles is readily made out.

THE CONSERVATIVE TREATMENT OF TUBERCULAR JOINTS.

Read in the Section on Surgery and Anatomy, at the Forty-fifth Annual Meeting of the American Medical Association, held at San Francisco, June 5-8, 1894.

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The chairman of this Section has asked me to prepare a paper on the conservative treatment of tubercular joints, and this brings us to the question of what is conservatism. According to the views held a few years ago in Europe and even now

upheld by some, conservatism consisted in the immediate eradication of all foci of tuberculosis as soon as detected, on the ground that each focus was so dangerous a menace to life that it should be treated with the same kind of conservatism we would use in dealing with carcinoma. According to the observation of many men of vast experience in this country, however, this view is entirely too radical and the etiology of tubercle, both in joints and in other parts of the body, shows us that better results are to be obtained by less radical modes of procedure. For instance, let us suppose we have a bone infected with tuberculosis in the neighborhood of a joint, for it has been shown that tuberculosis of joints in the great majority of cases commences in the bone although, in a certain number of instances, it may primarily affect the synovial membrane; let us suppose, I say, that we have a tubercular focus; in order that this tubercular disease shall spread, it not only must have its germ, but it must have the proper soil in which the germ can grow and the proper conditions favoring its development, and conservative treatment in my opinion consists in so regulating the conditions of life of the patient, and the conditions of the affected joint that they are not favorable to the growth and development of disease, and if we can so regulate the conditions which surround a patient's life, that the elements necessary for the growth of tubercular bacilli are not present, the patient will recover. We see numberless instances of patients who have been practically left to nature, and who have gotten well; gotten well, however, as a usual result with deformity and disability. But if the vitality of the patient was sufficient to enable him unaided to recover with deformity, properly applied surgery should have enabled him to recover without deformity in most instances, if his vitality was sufficient to enable him to recover at all.

What are the elements necessary to the preservation of a joint that has become the seat of tuberculosis?

1. The prompt recognition of the disease in its earliest stages. This is the most important consideration in securing a good result, and one which can not be under-estimated.

2. To give the joint physiologic rest as soon as the slightest symptom of disease is detected.

3. The protection of the joint from traumatism.

4. The continuance of this protection for many months until all symptoms of disease shall have passed.

5. Building up the general health of the patient to the highest possible degree.

These general principles would, I presume, be accepted by most of us, although there might be some differences of opinion in the practical application of methods to secure these results.

The first thing that should be done when a patient comes under observation with a tubercular joint is to put that joint, as nearly as possible, in a condition of physiologic rest and to do this at once. A slight delay at the onset of treatment may mean months and years of subsequent suffering to the patient, which might have been avoided by the prompt application of measures cutting short the inflammation at the start. It is not sufficient, as a rule, to tell a patient with an inflamed joint to go to bed and keep quiet. If it is a child, it will not have intelligence enough to keep quiet, and even if it had

the intelligence, if the joint should be badly inflamed there will be sufficient reflex muscular spasm present to injure the joint in spite of the patient's will, and therefore the joint must be kept quiet by mechanical means.

The first thing to do is to adopt some way of keeping this joint free from motion, and that is the best thing to use in these cases which is most easily to be procured, and later on this can be modified as occasion may direct. If, for instance, you are called to attend a case of knee-joint disease, which requires for its proper treatment, apparatus made by an instrument-maker, do not leave the case at the mercy of the patient's will while the instrument is being made, but protect the joint as well as possible for the time being with some kind of a splint,—with a wooden or pasteboard posterior splint bandaged to the leg, or by encasing the limb in plaster-of-paris from the toes up to the hip, and if there is so much muscular spasm present that the simple application of a retentive splint does not ease the pain in the joint, apply traction by means of a weight and pulley fastened to the foot.

One of the most important causes of trauma is the weight of the body and the concussion of walking, and one of the vital elements of success is the removal of this cause. If the disease is in a lower extremity, never allow your patient to put the weight of the body on it from the time you first see the case until you think it is well and, if possible, so adjust your apparatus that the patient is *obliged* to keep his weight off of the diseased member and do not allow this to be left to his discretion.

In order to secure physiologic rest in an inflamed joint, several things are necessary,—the avoidance of traumatism in movement of the body, and the avoidance of traumatism produced by involuntary muscular spasm and in order to secure the latter, in the vast majority of instances, it is necessary to employ not only a simple retentive apparatus, but one which shall make slight traction upon the joint. The question whether or not traction is of any use in diseases of various joints has been discussed at great length, and different opinions have been held by different observers, but in my personal experience I have found that a large number of cases do not get freedom from pain until traction is applied and *properly* applied. I am accustomed to judge of the success of my methods in protecting the joint by the amount of relief which they give the patient, and I am sure that if I fail to make the patient comfortable by my treatment, I have failed to give the joint the protection which it ought to have in order to arrest the progress of disease. The mere application of a plaster-of-paris splint to the diseased ankle, knee or hip is very good, as far as it goes, and is a very great aid to the joint, but freedom from pain in many instances can not be secured in this way, and traction must be employed in order to make the patient comfortable.

It is not always necessary to employ a cumbersome apparatus to use traction. I remember a case of inflamed ankle joint, which was sent to me a couple of years ago from Texas, the doctor having employed plaster-of-paris boots for nearly a year to secure rest of the joint, without giving the patient relief from pain. She was a hospital patient, and while she was making arrangements to buy an apparatus for the protection of her ankle, I put on a

plaster-of-paris boot to protect her joint temporarily, with the result of giving her partial relief, as had been done in Texas, but not complete freedom from pain. I, therefore removed this dressing, and applied adhesive plaster strips, running from the ankle towards the knee, and long enough to be reversed back to the ankle again, and bandaged these firmly to the leg. I then applied another plaster-of-paris boot from the toes to the knee, and when it had become hard, reversed the adhesive plaster over the top of the boot and bandage and held them firmly in position by a roller bandage thus making traction on the ankle joint by the grip which the plaster-of-paris boot had on the foot, while the adhesive plaster exerted counter-traction on the leg. As soon as traction was applied in this way the patient was free from discomfort and continued to wear this apparatus, it being changed at intervals for a number of months, and eventually recovered without the necessity of resorting to the more expensive appliances constructed by the instrument-maker. In the same way, in treatment of inflammation of the wrist, traction can be applied in a very simple manner by covering a palmar splint, properly adapted to the contour of the hand and forearm, with adhesive plaster, the sticky side being outwards. This should be first bandaged to the hand and then traction should be made upon the hand by an assistant until the patient is comfortable, and the splint fastened to the patient's forearm in this position, the adhesive plaster preventing it from sliding up, thus securing such traction as is requisite to give the joint rest.

You will find that some patients are made comfortable by splints applied in this way, who are not comfortable after the simple application of antero-posterior splint bandaged to the arm and forearm before traction has been made upon the wrist.

Counter-irritation, in many instances, is a most useful addition to rest and traction, and in many cases severe pain does not subside until after the application of blisters or the actual cautery over the point of disease, and in those cases that get almost well and still have a tender spot which persists for months and months, in spite of the careful application of apparatus and sedulous protection of the joint, I have found great benefit from running the fine point of Paquelin's cautery deep into the bone. This can be done with cocain as a local anesthetic, but if the patient is nervous, care should be taken that an assistant holds the joint with great steadiness while you apply the cautery, in order that the application may be made where you desire it.

Now the question arises, How long are we to continue protection to this joint? and I would answer that there is very little danger of your protecting the joint too carefully or too long. I have seen many cases which relapsed on account of over-anxiety on the part of parents or physician to arrive at the end of treatment, but I have seen very few that had been encumbered with apparatus longer than was necessary. I think it is safe to say that as long as any symptoms are present which would suggest to you the use of protection if you were seeing the case for the first time, just so long is it necessary for you to continue protection, irrespective of the number of months or years which the case has been under treatment.

I think the length of time, which is usually laid down as the average duration for tubercular disease

is too short, and I believe that if instead of two years the patient were told in the beginning to expect three years of treatment, it would be nearer the truth. There are cases of tubercular joint disease which get well inside of a twelvemonth, but they are largely in the minority, and so exceptional that the patient should not be led to expect anything of the kind when an opinion is asked as to the length of time during which treatment will be necessary. I think that the severity of pain in the beginning or the rapidity of the onset of the disease can be used as a very accurate guide in estimating the duration of the process, for those cases which seem the simplest when they first come under observation very often are the most tedious to manage.

The question of effusion into joints is a very important one, and the wonderful benefit to be derived from rest and compression is something very surprising to those who witness it for the first time. In cases of acute synovitis, aspiration is often indicated, but in the chronic tubercular joint, compression, with a large compress sponge wrung out in cold water, and bandaged very snugly with a cheese-cloth bandage, is to be preferred.

The question of abscesses is one which comes within the scope of one of the other papers, but I would say that there is also a conservative side to the treatment of abscesses. If the abscess is simply a collection of tubercular material, I believe that it is safer to let it alone and treat it by compression, unless it is in a position where the focus of inflamed bone which gave rise to the abscess can be removed with safety without sacrificing too much healthy bone in the operation. If, however, the tubercular mass becomes infected with pyogenic organisms, the case is altogether different and demands prompt surgical interference.

The time limit which has been set by your chairman is so short that it will be impossible for me to enter into details in regard to the practical application of the principles I have just mentioned, in their relation to the different joints of the body except in the most cursory way, but I will crave your indulgence for a few moments while I rapidly mention a few points which have seemed to me to have been overlooked quite frequently by the general practitioner.

In treatment of the spine, for instance, in the case of children under 3 years of age, as a rule it is impossible to apply any apparatus which will allow the child to run about, and secure for its inflamed spine the rest which scientific treatment demands, and yet I have frequently seen children between 1 and 2 years of age to whom plaster jackets and various other kinds of apparatus had been applied while the child was allowed to run about. These children should always be treated in the recumbent position, the weight of that part of the body which lies above the point of disease being in this way removed and at the same time gentle traction should be made upon the head, while counter-traction is made upon the feet or pelvis, for the purpose of counteracting the reflex muscular spasm which is always present in inflammation of any joint. These principles can be carried out if the child is placed upon a hard bed and securely bandaged to it. But it is extremely difficult to keep the child in a proper condition of quiet on a bed of this kind, and it also has the great disadvantage that the child can not be carried up

and down stairs, and given the benefit of fresh air and outdoor life without being removed from its bed, which proceeding is necessarily attended by more or less traumatism, and I therefore prefer to put the child in a wire cuirass or fasten it to a board, like an Indian pappoose, if it is too poor to buy anything better. In fact, you practically have a portable bed made but a little larger than the child and the child and bed can be carried downstairs, placed in a rubber-wheeled baby carriage and transported wherever its health demands. In many cases of older persons this recumbent position is far better treatment for the spine than any other, but it is so difficult to carry a child about when it is 5 or 6 years of age, that it is almost always treated with some kind of an appliance which allows it to run about. In the vast majority of cases I think that the best appliance for children of this kind is the plaster-of-paris jacket combined with the jury-mast, but it is not the simply wrapping a plaster bandage around a child which does it good, but the correct application of the principle which I have sketched and having a child's spine at rest, whether it be by a plaster bandage or an iron splint, or any other material that the surgeon chooses to adopt which benefits the patient; and to simply envelope it in a loose plaster bandage which slides up and down and does not protect its spine, but is merely an additional weight, hanging upon its already enfeebled form (in some cases actually held up by shoulder straps instead of resting on the ilia) this is the treatment which I wish most strongly to condemn. In order to support the spine a plaster jacket must have a basis of support; it can not be applied to small children with undeveloped hips, and in applying it the child must first be stretched to the point at which it feels comfortable, and plaster bandages fitted so accurately that the child is retained in that position twenty-four hours a day, the jury-mast being added if the disease is above the tenth dorsal vertebra, in order to effect this object. As long as a child has a grunting respiration, a tender careful gait, and desire to support itself against any object which comes within its reach, just so long is its back imperfectly guarded by the apparatus which it carries, and those children should be taken off their feet, put to bed, and absolute rest of the inflamed bones maintained for a long period of time.

In the hip joint also, I frequently see efforts at treatment of no avail, because the gentleman who has had charge of the case has thought that the application of this, that, or the other splint was all that was needful to effect a cure, whereas it is the proper application of the principle of rest of the inflamed joint which is essential, let the principle be carried out in whatever way best suits the surgeon.

I have seen traction applied to inflamed hips, flexed, and strongly adducted, with the result of causing intense pain to the patient, simply because the traction was not applied in the proper direction, and because the patient's body was not held firmly fixed in bed, in order that the traction might have some point from which to pull. I have seen splints put on patients' limbs in this crooked position, which were only meant to be applied to the body when the legs were straight and parallel, and which under these circumstances produced great pain and suffering.

In these distorted and inflamed joints, the first thing to do is to immobilize the body and sound leg in the straight position, and allow the diseased limb

to assume such attitude as it will while the spine is flat, and a line joining the anterior superior spines of the ilia is at right angles to a line passing from the center of the sternum to the symphysis pubis. Now, make slight traction on the diseased limb, in the direction which it assumes while the trunk retains the position I have just mentioned, and make the traction just sufficiently strong to give ease and comfort, the leg being placed meantime on an inclined plane to give it support. If you have fastened the patient securely in bed, and applied traction as I have indicated, you will make him comfortable and can gradually change the direction of this traction little by little, day by day, until both legs are flat in the bed and parallel, without tilting of the pelvis or arching of the lumbar spine. If you find that traction in the line of the deformity does not give the patient absolute comfort, pass a bandage around the thigh, and make a slight lateral traction outwards. In some cases this will give ease to the joint which the longitudinal traction fails to give, but is not necessary in all cases. When the legs are parallel apply your hip splint, and not before, the object being to again allow the patient to take outdoor exercise while the inflamed joint is kept at rest, but if you find that the patient begins to have pains in his joint when you allow him to get up on his splint, or splint and crutches, it shows that you have not applied the splint in such a manner as to protect the joint from the traumatism of locomotion, and if you can not succeed in so adjusting it that the child can go in the open air without increase of tenderness in its joint and without being disturbed by cries at night, put it back in bed, and have it trundled out in the air in a baby carriage until you are capable of so applying the splint as to protect the inflamed joint and, at the same time, leave the rest of the body free for locomotion.

In passing to the knee I would draw attention to the fact that the knee is *not* simply a hinge-joint, and that efforts to straighten a knee which has taken on the characteristic deformity of chronic tubercular inflammation of the knee-joint, by simply pulling on the leg are apt to increase the pain, because the front of the knee-joint is strongly compressed by force applied in this manner. There is always a sliding backward of the head of the tibia upon the condyles of the femur in cases of chronic knee-joint disease, and to counteract this posterior displacement of the tibia, pressure must be exerted on the head of the tibia from behind forward, at the same time that traction is made in the long axis of the shaft of the tibia, if we wish to relieve the spasm of the joint, and correct the deformity of the knee. The tight ham-string muscles, brought into fierce spasms as they are by irritation within the joint, form a fulcrum, and when the knee is straightened as if it were a simple hinge the joint surfaces are pressed together with a lever of enormous strength acting upon these firm ham-string muscles as a fulcrum, which increased with articular pressure results in pain and damage to the joint. On the contrary, by applying traction for the purpose of reducing the deformity along the line of the articular surface of the condyles of the femur, the deformity is corrected gradually, almost imperceptibly, and the joint can then be put up in a splint which embodies the same principles of treatment—traction in the long axis of the tibia, and pressure from behind forward against the head of the tibia, while at the same time the patient is prevented

from bearing weight upon the inflamed joint, and able to get the benefits of fresh air and outdoor life during the months or years of treatment which will be necessary before the joint is well.

Your chairman has warned me that ten minutes is to be the limit of our papers, so all that I can hope to do is to draw your attention to the principles of treatment and leave the practical application of them to some future occasion.

THE CONSERVATIVE TREATMENT OF TUBERCULAR JOINT DISEASE,

OR, MORE EXPLICITLY, THE PURELY CONSERVATIVE TREATMENT OF TUBERCULOSIS OF THE JOINT STRUCTURES.

Read in the Section on Surgery and Anatomy at the Forty-fifth Annual Meeting of the American Medical Association, held at San Francisco, June 5-8, 1894.

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For the purpose of the present paper it does not especially concern us which or how many of the different tissues which together constitute a joint are affected, and I shall not attempt to discuss methods of treatment based on anatomic differentiation of the location of the lesion. It may, however, be stated that in the great majority of cases the initial lesion, so far as the joint is concerned, is in the bone; but in the purely conservative treatment the management of these cases differs hardly any from that of those which are primarily synovial.

Underlying the treatment of all forms of chronic tuberculosis, of whatever tissue or wherever situated, is the gospel of rest and food. This is founded upon the fact, learned in the first place by experience, and confirmed later by the results of biologic investigations, that there is in living tissues an inherent antagonism to all forms of infection, and that this antagonism is best exerted by tissues that are not functioning and are at the same time well nourished. In the infection of no tissue has this been better shown than in the infection of bone. This is due, in part, to the very chronic course these cases follow, which permits careful and extended study of them, and in part to their large number—for tuberculosis of the joints or bones constitutes more than 80 per cent. of all cases of tuberculosis in patients under 17 years of age; and I have calculated on reliable data that in San Francisco, for instance one child out of every 286 of the child population has tuberculosis.

Work, for a bone, is resistance to pressure and strain,—pressure being produced by the weight of carried structures, and strain caused by the use of the bone as a lever. As bone is a living tissue, work must physiologically be followed by a loss of energy and the need of rest. Rest for a sound bone necessitates that it shall be subjected to neither pressure nor strain beyond that which properly exists between the different parts of the skeleton with the individual quiet. Perfect rest for a diseased bone contemplates that it shall be subjected to absolutely no pressure or strain, whether that be developed in the doing of work, or be the natural result of its position in the skeleton. Practically, it is impossible to wholly eliminate the latter factor, and the aim of treatment on conservative lines is to secure, in the first place, the complete cessation of active work and