

formity is almost always dependent upon softening of the bones; hence bow-legged children are usually those who have some constitutional disease. The deformity then is really dependent upon some cachexia or diaphesis; and the disease chiefly productive of this condition is rachitis.

The treatment, therefore, which is necessary in such cases is both local and constitutional. Locally, some kind of mechanical apparatus will be necessary to bring the legs into the proper position and hold them there. Constitutionally you are to resort to such remedies as give support to the system, such as cod-liver oil, etc., but the lactate and phosphates of lime are the most important. The object of administering these remedies is to furnish some of the elements necessary to give the bone hardness and power of resistance to pressure. Internal treatment should not be commenced until the deformity has been corrected by the application of some mechanical apparatus.

This may consist of a well-fitting splint of sole-leather upon the outer surface of the thigh, well lined and firmly secured by a roller-bandage. The splint should be long enough to extend below the knee for a considerable distance. The portion of the splint below the knee is left free, and projecting straight from the surface of the thigh. Around this portion of the splint and the leg place a rubber band. The constant tendency of this band will be to spring the bones into a straight position.

The bending must be done gradually, but, if the elastic tension is steadily applied, the outward curvature of the bones of the leg can be overcome and the leg made straight.

Such a plan of management you will find much easier and better than any attempt to adapt an instrument to the distorted limb. In order to make this splint more stiff, it is well to secure, on the outer side of the leather which surrounds the thigh, an iron rod or piece of wood extending down as long as the limb; the leather which nearly surrounds the thigh will keep this rod or wooden splint in position, and the iron rod or strip of wood will prevent the leather from bending.

If, however, it is desirable to have the benefit of some nicely-arranged instrument, the one illustrated in the annexed diagram may be employed.

It consists of two upright lateral bars fastened to the band, which encircles the thigh above *b*, and terminates in a shoe below.

At *e* is a joint opposite the ankle-joint, and a pad which presses against the foot. At *d* is a pad which presses against the thigh



FIG. 104.

and at *a* and *e* are bands which pass around one of the upright bars, and the leg where the limb is most curved, for the purpose of bringing the leg in a straight position.

## LECTURE XIII.

## DISEASES OF THE JOINTS.—ANKLE-JOINT.

Anatomy of the Ankle-Joint.—Pathology of Disease of.—Symptoms.—Treatment.

GENTLEMEN: We will next study diseases affecting the ankle-joint. This subject is a proper one for consideration by the orthopedic surgeon, for the diseases of this joint frequently terminate in deformity, and, as "an ounce of prevention is worth a pound of cure," the method of preventing deformity during the continuance of the disease makes it a proper subject for consideration in our department. It is to the pathology, symptoms, and treatment of the disease, then, that I shall specially direct your attention. Before proceeding, however, to the study of the dis-

eases affecting the ankle-joint, we must turn our attention to the construction of this joint, and to some of its anatomical peculiarities.

**ANATOMY.**—The bones which enter into the formation of the ankle-joint are the lower extremity of the tibia with its malleolus, the lower extremity of the fibula, or the external malleolus, and the upper convex surface of the astragalus. These articular surfaces, covered with cartilage, are held in place by the internal and external ligaments and the anterior ligament of the ankle-joint, which are lined by synovial membrane.

The important thing to be remembered with reference to this joint is, that it is simply a hinge-joint, has a to-and-fro movement and *no other*. The articulation between the astragalus, the lower extremity of the tibia, and the two malleoli, is so complete, close, and perfect, that it will admit of no lateral movement whatever. This is one of the statements which I make with positiveness. The apparent lateral motion which takes place is not at the astragalo-tibial articulation, but below, at the articulation of the astragalus with the os calcis. When the toes are turned out or in, it is in obedience to rotation of the leg and thigh at the hip-joint; or, if the leg is flexed upon the thigh by the action of the biceps and tensor vaginae femoris, giving a revolving motion to the head of the fibula.

**PATHOLOGY.**—All lateral movements made at the ankle-joint are done at the expense of an injury to the structures of that joint; for no lateral movement, external or internal, abduction or adduction, can take place without producing undue pressure against the synovial membrane and articular cartilages, or the basement membrane beneath them. These articular cartilages, like those in other joints, are elastic, non-vascular, and receive their nutriment by imbibition from the synovial membrane and from the vessels of the articular lamella. Necrosis of these cartilages takes place with the greatest rapidity on account of the low degree of vitality they possess, hence they are the source of great danger when, in any manner, the tissues beneath them become so disturbed as to interfere in the least with their nutrition. I do not believe, however, that disease ever commences in the cartilage itself. The malleoli, which stand as guards on the side of the joint, are not so well protected, because in the normal movements of the foot they are not subject to much pressure, and con-

sequently the cartilage covering them is not so thick as that covering the top of the astragalus or bottom of the tibia. You have probably all at some time twisted your ankle in walking, and you cannot have failed to notice how instantly the mal-position of the joint is followed by a spasm of the muscles of the leg.

We may have diseases of the ankle-joint which commence either in the ligaments or in the synovial membrane; or, which I believe to be far the most frequent, in the articular lamella immediately beneath the articular cartilage.

In a great majority of instances what we have to deal with is an extravasation of blood beneath the synovial membrane, or between the cartilage and bone, quite analogous to the "blood-blisters" which is formed upon the external surface whenever the skin is severely pinched but not broken. This may occur either upon the astragalus, or at the lower extremity of the tibia, or, still more commonly, as the result of pressure produced by the astragalus against the inner surfaces of the malleoli, which are not sufficiently protected to resist severe pressure. Under such circumstances, no swelling occurs that can be seen; there is pain, probably, but the cases are very liable to be neglected, their importance overlooked, and thus a slight injury, producing only trifling damage at first, may be permitted to go on and develop the most serious condition, ending in inflammation, which goes on to softening of the bone, necrosis of the cartilages, and destruction of all the tissues involved in the joint. The inflammation may extend to other bones, and you may have as a result softening and caries of all the bones of the tarsus, as in the case you now see before you.



FIG. 105.

(See Fig. 105.) These are the cases that are called "scrofulous disease of the ankle-joint." There is no scrofula about it in the

vast majority of cases. It is simply inflammatory softening, ending in caries and necrosis of the bones, and ulcerative destruction of other tissues entering into the formation of the joint; and instead of being constitutional in its origin, dependent upon a constitutional cachexia, it is simply inflammation of the joint dependent upon injury, consequently *traumatic* in its origin.

When children who have a scrofulous diathesis receive, as of course they may, an injury sufficient to lead to serious results, such results are usually more rapidly developed and less amenable to treatment than when the injury occurs to previously healthy children, or children born of healthy parents.

**SYMPTOMS.**—With this view of the subject, gentlemen, you can at once see the very great importance of *early* recognition of the exact nature of these trifling injuries to the structures of the joint, which may lead, if neglected, to such serious results. To this end, therefore, I shall endeavor to point out to you in the plainest manner possible the symptoms by which you will be able to recognize them in their very earliest stages, so that you may be able to adopt a plan of treatment which will *prevent* such unfavorable results.

First, then, if the twist, wrench, sprain, or bruise, which the patient has received has produced an injury that involves the synovial membrane chiefly, it will be followed very speedily by increased effusion within the joint, giving to the joint a peculiar fullness in front of either malleolus, within which swelling an indistinct fluctuation can be recognized. This in a few hours is followed by great heat and intense pain; a sense of tension, accompanied by throbbing, and great tenderness and pain will be present when the articulating surfaces are crowded together and slightly twisted upon each other. If, on the other hand, the ligaments are involved more than the synovial membrane, the injury will not be attended with so much swelling as when the synovial membrane alone is involved; and the tenderness and pain are not produced by pressing the articular surfaces together, but, on the contrary, are relieved, and it is by making extension and rotation, together with pressure upon the ligaments over their points of attachment, that pain is produced and tenderness detected. If, however, the injury is the result of a blow or concussion, with or without much twisting, but received in such a manner as to produce rupture of blood-vessels underneath the articular cartilage, in the articular lamella,

either at the top of the astragalus, base of the tibia, or inner surfaces of the malleoli, then there will be but slight pain at first, but afterward the suffering will be altogether out of proportion to the appearances presented. At first the extravasation of blood into the bone is very slight, and, being in a tissue which cannot swell, no apparent enlargement takes place; nor is discoloration observed, because the extravasation is so deep-seated. The ligaments not being specially involved, making them tense does not produce pain. All these facts add to the deception, and make us very liable to pass over the case as one of trifling importance.

When this accident has occurred, the only manner in which it can be recognized is by means of direct pressure upon the part affected by the extravasation. The seat of the injury may be at any point on the surfaces of the joint, and it therefore becomes necessary to make pressure upon all parts of the joint, by moving the bones in every direction, and also making lateral pressure so as to bring it to bear upon the sides of the malleoli.

We are not safe in giving a diagnosis in these cases until in this manner we have thoroughly explored every portion of the joint.

You must not, however, entertain the idea that you will see very many cases in which the symptoms of either *one* of these three conditions just described will be present, clearly defined and alone, unassociated with symptoms indicating the presence of one and perhaps both of the other conditions. A wrench, or sprain, or bruise, may be received, which will give rise to symptoms indicating injury to *all* the structures of the joint—ligaments, synovial membrane, and articular lamella; but your examination must be conducted upon the same plan in such cases, for in that manner only will you be able to determine positively what structures have become involved.

The important thing for you to recollect and always keep in mind when you are called to examine and treat this class of cases is, that serious injuries of joints compel attention, and slight ones are neglected, and, generally speaking, the slighter the accident the more apt to be neglected; but those are the very ones which are exceedingly dangerous.

If an injury be severe—for example, a fracture involving a joint, a dislocation, or even a severe sprain—it cannot be overlooked or neglected; surgical aid is indispensable, and is immediately

called for, and generally a cure results after a reasonable time. When, however, a person receives what is termed a "slight sprain of the ankle," the amount of mischief from a neglect in recognizing what structures are involved, and instituting a proper method of treatment, is often extreme, and may terminate in a sacrifice of the limb as the only remedy for a chronic inflammation of the joint involved.

Let us, then, next consider how such disastrous results may be brought about. We will take, for example, a simple sprain of the ankle, which is very common, and from which all of you, it may be, have suffered. As I have already told you, a "blood-blister," or extravasation, is first produced. Such a "blood-blister" is considered as insignificant under ordinary circumstances, if it be allowed immediately to heal. If, however, the "blood-blister" is constantly irritated by friction, an ulcer is formed which rapidly increases in size, and involves the deeper tissues.

This, I believe, is exactly the morbid process going on in one of these neglected sprained ankles. The small quantity of blood effused behind the synovial membrane, or between the cartilage and bone, would be speedily absorbed, if sufficient rest were allowed to the part; but there is no swelling, and little pain, it may be, to give warning of the mischief done, and the patient does not stop his usual walks and exercise. The "blood-blister" becomes irritated and increases in size, and finally, on account of the disturbance produced, he is obliged to lay by for a short time. The trouble apparently disappears, and he resumes his avocations; a slight over-exertion, however, brings back the same train of symptoms, namely, exhaustion, stiffness, pain, tenderness, and perhaps swelling. This is repeated again and again, as often as rest allays and exertion awakes the morbid process, the attacks becoming more and more severe and prolonged, till at last the condition of chronic inflammation is reached. The liquid now contained in the joint is abnormally abundant, and is changed in consistency; instead of the clear synovia, there is an opaque, viscid substance. To this, in part at least, is due that peculiar distention and "boggy" feel which the joint now presents. Ordinarily, suppuration very rapidly supervenes upon this condition of the articulation. The cartilages become necrotic, and caries of the adjacent surfaces of the bones is set up. The pain

now is often excruciating, as is generally the case when cartilage is undergoing disintegration. As a result of this process, the constitutional disturbance is usually quite severe, and the pain produces sleeplessness and loss of appetite. The muscles affecting the articulation are constantly "on guard" to fix the joint, and prevent any rubbing together of its surfaces.

Such constant tension causes an atrophy of the limb both above and below the joint; though in the latter situation it may be obscured by the swelling. At night, when the sleep has become so sound that the muscles relax their tonic contraction, motion will take place in the joint, and the patient awakes with a sudden, piercing shriek. So quickly do the muscles resume their conservative contraction, that, by the time the nurse has reached the bedside, the patient is again asleep or is unconscious of the cause of his awakening. This pressure of the joint-surfaces, although painful, is less so than the motion which would occur if the muscles were not thus contracted, but it very much increases the destruction of the cartilage and bone, and you will find, in *post-mortem* examination of the parts, erosion of the tissues farthest advanced at those points where the pressure from muscular contraction has been greatest.

When the joint is thus filled with a liquid, which is causing disturbance as a foreign body, one of two terminations is necessary, the absorption or evacuation of the liquid.

If there is a probability that absorption of the fluid can take place, it is best promoted by fixing the joint in such a manner as will relieve the pain and defend it from attrition of the articular surfaces, thus allowing our attempts to renovate and invigorate the system really to take effect.

If in addition we apply some apparatus, which will permit the patient to take out-of-door exercise without disturbing the *rest* so essential to the articulation, we shall have done the best thing possible, and, fortunately, our efforts will often be crowned with success. If, however, such precautions are not employed, and often, indeed, in spite of them, the disease proceeds to ulceration of the bone, and, now if we do not make an exit for the pus, it will eventually make one for itself. In the mean time, however, long and tortuous sinuses will have formed, the pus burrowing this way and that among the muscles and between fasciæ, so that these tissues are involved, while by long-continued

action of the pus the disease of the bones becomes greatly extended. Much of this trouble is avoided by opening the joint when we are convinced that any considerable amount of pus is contained within its cavity. The old-established doctrine of the great danger of opening a joint still continues, for the most part, to be fully accepted to-day. I must, however, express my dissent from this general belief. Of course, no one would dream of opening a joint so long as there was a probability of the integrity of the articulation; but when the articular surfaces are wholly or in part destroyed, then, I say, the characteristics of a joint are also destroyed; there remains nothing but an abscess of a joint, which is to be treated in the same manner as an abscess elsewhere, or, more exactly, as an abscess connected with bone.

When the disease has advanced to this stage, the case is looked upon by the mass of the profession as an unmistakable illustration of "scrofulous disease of the joint," but I believe it to be the result of inflammatory processes dependent upon a traumatic cause.

TREATMENT.—We are now ready to study the treatment to be adopted for the various conditions which have been described. In all sprains or bruises affecting the ankle-joint, involving the ligaments or producing effusion of blood, the very best treatment that can be adopted is to immediately immerse the limb in water of as high temperature as can possibly be borne, gradually increasing this temperature, until the heat is carried up to the highest point the patient can tolerate, and then maintain this for a varying length of time, perhaps several hours, until all pain upon pressure and slight movement has entirely subsided.

Many have recommended that various articles be added to the water, such as wormwood, smartweed, wood-ashes, Pond's extract, tincture of arnica, etc., etc., but it is questionable if any of them are of much service; the principal agent is the heat, and that can always be obtained, whereas the articles recommended may not be at hand, or cannot be procured. When the pain is relieved by the foot-bath, the patient should be placed in an horizontal position, with the limb elevated and firmly bandaged with a flannel roller from the toes to the knee, and then kept wet, or dry, as may be more agreeable to the feelings of the patient.

Perfect rest of the limb in the elevated position, with this even compression, is to be maintained until all tenderness upon firm pressure has completely subsided, and until the limb can be

held in the dependent position without producing any unpleasant symptoms. If the *synovial membrane* has been involved in the injury, and effusion and over-extension of the joint have ensued, *elastic compression* is the essential element in the treatment. This can be obtained by surrounding the joint with a large sponge. The sponge should first be thoroughly saturated with warm water, then made as dry as possible by squeezing with the hand, and finally made to completely surround the joint, being particular to have it quite thick over the instep and both malleoli. After it has been properly applied around the joint, bind it firmly in place with a bandage that will permit water to pass through its meshes. This bandage should include the foot, ankle, and leg, and, after the sponge has thus been compressed by the bandage, both sponge and bandage should be thoroughly soaked with water; the sponge, absorbing the water, will increase in size, and, as the bandage prevents it from expanding outward, the pressure induced by its enlargement is done at the expense of additional pressure of the parts enveloped by the sponge. This method of making elastic pressure is within the reach of every surgeon.

A more convenient method of making even pressure over the

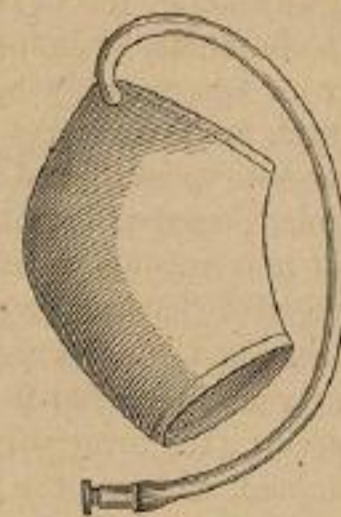


FIG. 106.

joint is by means of the double India-rubber bag, manufactured by Tiemann & Co. of this city. It is simply an India-rubber sac with double walls, which incloses the ankle and foot; a tube connects with this hollow bag, which can have warm water poured into it, and then the bag is to be blown up either by the mouth or a pair of bellows, and a stopcock turned which retains the air. (See Fig.

106.) In this manner pressure can be made which will be exceedingly powerful, and yet so soft and elastic as to be easily borne. Such pressure, constantly applied, on account of its elastic character, will cause an absorption of the fluids within the joint; and also, by this very pressure, we have a tendency to separate the articulating surfaces; therefore, to a very considerable extent, we secure the double advantage of pressure and extension and counter-extension, by forcing the fluid into the joint, thus preventing the articulating surfaces from being forced upon each other by muscular contraction. After a few days have elapsed, friction with the hand is of the greatest possible advantage; but to afford the best result it should be much more briskly applied, and continued for a much longer time, than has generally been done by the great majority of surgeons.

In fact, many cases of quite severe injury affecting the ankle-joint, or any other joint, such as a wrench or a sprain, will yield, in a comparatively short time, to manipulations and friction persistently applied for some few hours every day.

You may call this "*massage*" if you have a fancy for a new name, but I have employed this plan of treatment for many years, and long before the term "*massage*" was applied to it. It is, however, sometimes necessary that a method of treatment should go across the water and be baptized with a new name before it becomes popular.

So much, gentlemen, for the treatment to be adopted when the injury is first received. This is the important time for the application of measures which are to prevent the further development of the disease, and, could such treatment be faithfully carried out in every case from its earliest commencement, there would rarely be need of the mechanical appliances and surgical interference to be described at our next lecture.

## LECTURE XIV.

## DISEASES OF THE JOINTS.—ANKLE-JOINT (CONTINUED).

Treatment (continued).—Description of Instrument.—Mode of Application.—Cases.—  
Disease of the Tarso-Metatarsal Articulation.—Case.

GENTLEMEN: At the close of my last lecture I was speaking of the importance of early treatment of injuries of the ankle-joint, hoping thereby to prevent destructive disease. Unfortunately, however, very many cases pass unrecognized, or, being recognized, are neglected, and gradually arrive at a stage in which surgical aid is sought, and then they probably are in a condition which will demand some more formidable method of treatment than that which has already been given; and it is to this part of our subject that I invite your attention to-day. When there is still hope of preserving the joint intact, which is to be determined by the length of time the condition has existed, the amount and character of the fluid in the joint, the degree of constitutional disturbance, and the general condition of the joint, I employ an instrument which I have devised for this purpose.

This instrument consists of a firm steel plate, made to fit the sole of the foot; at the heel is a hinge-joint, and attached to it a rod,

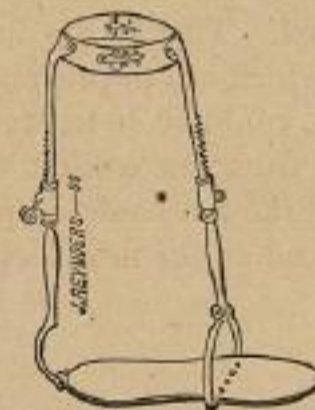


FIG. 107.

slightly curved at the bottom, and extending up the back of the leg to near the knee. Over the instep is an arch, like the top of a stirrup, with a hinge-joint at its summit from which springs another rod, which runs in front of the leg, of equal length with the