

ing, and was almost blue-black. A wad of oakum was placed over it for a compress, and a very firm roller carried over the whole, Prof. W. H. Pancoast, of Philadelphia, being present.

8th.—Removed roller and compress in presence of Drs. Pancoast and Clay, and we were so much surprised at the improvement in color, and diminution in size of the tumor, that I decided not to open it, but to try to absorb it by pressure. Child had slept well, and was comfortable.

9th.—Still further improvement, but, an indistinct fluctuation being obtained, I made a number of small punctures, at the request of Prof. Pancoast, discharging considerable blood. One of the punctures showing pus, I made a free incision and evacuated a large quantity of broken-down cellular tissue, tough sloughs, and pus. The finger detected exposed bone at the outer portion of the scaphoid only. The wound was filled with Peruvian balsam and oakum, and firm roller applied as before.

10th.—Appearance much improved.

June 20th.—Wound has cicatrized. Pressure continued. Plaster dressing removed. Toe elevated by adhesive plaster.

August 12th.—Has continued to improve. Has not confessed to any tenderness for nearly or quite two months. Can walk on foot. Has a slight tendency to valgus. Adhesive plaster continued to retain foot in position.

November 1, 1873.—Perfectly well, without deformity, and in robust health. (See Fig. 127.)

LECTURE XV.

DISEASES OF THE JOINTS.—KNEE-JOINT.

Anatomy of.—Structures affected by Disease.—Synovitis.—Disease of Ligaments.—Extravasation of Blood into the Cancellated Lamellæ of the Bone.—Causes.—Early Symptoms, and those developed as the Disease progresses.—Pain over the Attachment of the Coronary Ligaments.

GENTLEMEN: This morning we begin the study of diseases of the knee-joint.

This joint is more subject to accidents than any other articu-

lation in the body, on account of its more exposed position. I think it is even more liable to injury than the ankle-joint, judging from the relative number of cases presenting themselves daily in my practice.

ANATOMY.—I will first briefly state the principal anatomical components of the knee-joint, a knowledge of which is essential to a full understanding of what I shall afterward explain when I come to speak of my views in respect to the origin, pathology, and treatment of diseases affecting its structures.

The condyles of the femur above, the head of the tibia below, and the patella in front, are the bones that enter into the formation of this joint.

These bones are held in position by ligaments, some of which are exterior to, while others are within, the joint. Those which are exterior are the anterior or ligamentum patellæ, the posterior or ligamentum posticum Winslowii, the internal lateral, the two external lateral, and the capsular.

The ligaments found within the joint are the anterior or external crucial, the posterior or internal crucial, the transverse, and the coronary.

The two semilunar fibro-cartilages of this joint are also placed among the internal ligaments by some writers.

In addition there are the ligamentum mucosum and the ligamenta alaria, which are merely prolongations from the synovial membrane.

There are also two bursæ: one situated between the patella and the skin, covering its anterior surface; the other smaller in size, situated between the ligamentum patellæ and the upper part of the tuberosity of the tibia. The posterior surface of the ligament is separated above from the knee-joint by a large mass of adipose tissue.

Inflammation of these bursæ sometimes gives rise to appearances very much resembling those presented by the so-called "white swelling" of the knee-joint. The synovial membrane of this joint is the largest and most extensive in the body, and forms various *culs-de-sac* in the process of enveloping the internal surfaces of the joint. The articular surfaces of the bones are covered with cartilages which subserve the purpose of "buffers," or cushions (the same as buffers upon railway-cars), to mitigate jars and concussions which otherwise might do serious injury to the inter-

nal structures. As the situation of the muscles which flex and extend the leg upon the thigh is important to be understood in applying extension, in the case of diseased knee-joint, more special reference to them will be reserved until we come to the subject of treatment.

PATHOLOGY.—All the structures which enter into the formation of the joint proper may become the seat of disease. We have, therefore, diseases affecting the ligaments, the synovial membrane, or, which perhaps most commonly leads to serious destructive changes involving the joint, injury of the deeper tissues, chiefly extravasations of blood. In a single case two or more structures may be involved; or, what is much less frequent, the symptoms will indicate the presence of disease affecting one structure principally.

We shall, however, be obliged, in order to gain a clear idea of these different affections, to study them separately; while at the same time you must understand they are likely to be associated.

In this latter case the symptoms of each affection should, as far as possible, be separated from those of the others.

ETIOLOGY.—The causes of disease affecting this joint are the same as those which produce disease in other joints, such as blows; sprains, contusions, over-exertion, strains and sudden check of perspiration, etc., etc.

I now invite your attention to the diseases which affect the structures of this joint.

First, then, respecting the synovial membrane.

SYNOVITIS.—This disease may be caused by wrenches, blows, punctures, exposure, or sudden changes of temperature after violent exercise, or may be dependent upon constitutional affections, such as rheumatism, gonorrhœa, etc.

The disease is usually considered under two heads, *acute* and *chronic*.

If, then, a wrench, blow, or other cause, produces results chiefly affecting the synovial membrane, an effusion of fluid soon takes place, which may be readily detected by the change produced in the external appearance of the joint. The effusion distends the synovial sac to a greater or less extent, and causes it to bulge out upon either side of the ligamentum patellæ.

If there is *acute* inflammation, it will be attended with great heat, swelling, and redness, sense of tension and throbbing, and

sooner or later intense pain. These symptoms will also be accompanied by a general febrile movement. If the effusion into the joint is moderately abundant, distinct fluctuation may be obtained. When the effusion is considerable, the patella is lifted, so that when the leg is extended and elevated it is very easy to percuss this bone against the condyles of the femur, and produce an audible click. Under these circumstances it is almost impossible to mistake the nature of the disease. The sharp angular contour of the joint is obliterated, and there are present a general enlargement, rotundity, softness, and puffiness about the joint, which indicate the existence of an abnormal amount of fluid within the synovial sac.

In the more *chronic* form of the disease we have effusion of fluid into the joint as before, but it is usually not so marked; there is less tenderness upon pressure, and the pain is not so acute. If the disease has gone on to erosion of the structures within the joint, the erosion can be very easily detected by crowding the articular surfaces together and slightly twisting them upon each other, when the most intense pain will be produced. On the other hand, extension sufficient to separate the articular surfaces, thereby removing all pressure from the inflamed membrane or the eroded tissue, relieves the pain at once.

LIGAMENTS.—If, upon the other hand, the ligaments are the parts chiefly involved, the amount of swelling which follows the injury will not be nearly as great as that which follows an injury of the synovial membrane.

If the ligaments have been put upon such a stretch as to produce rupture, even of a small number of their fibres, the point of rupture can frequently be detected by making careful and thorough pressure with the finger along the course of the ligaments injured.

Extension by stretching the ligaments at once gives the patient pain, and if the ligaments are the parts alone involved, compression, crowding the articular surfaces together, by taking tension from the ligaments, affords instant relief. Extension and compression, therefore, in the manner indicated, are the chief means of recognizing the seat of the disease with reference to the synovial membrane and ligaments.

EXTRAVASATION OF BLOOD.—If the injury to the joint be the result of concussion, causing damage to the osseous structures and

extravasation of blood into the meshes of the bone, you will find great difficulty at times in making your diagnosis in the earlier stages. It is under these circumstances that we may have the beginning of a most serious disease, and yet no swelling whatever about the joint be present; there may, also, be absence of deformity and all appearances of injury, and for some time no abnormal heat can be detected by the hand, and it is in these cases that Dr. Seguin's thermoscope is invaluable.

Your diagnosis now can only be made by compression, extension, flexion, concussion, and the usual routine which a careful examination of a joint implies, and, as before intimated, you may be assisted by the thermoscope.

Let us trace the history of such a case a little more in detail:

In the great majority of cases a history of some injury, as a blow upon the knee, a fall upon the knee, a strain, or a sudden concussion, or anything of this nature, will be the first thing elicited when questioning the patient. The child may pay but little attention to his injury at first, and is soon at play again. After a while he may, and probably will, complain of some pain; feels a little stiff when he first starts off, but goes better when he gets warmed up a little, like a spavined horse. This may commence within a few hours after the receipt of the injury, or it may be delayed several days. After resting for a short time he feels better, and is up and out at play; within a few days he is down again; he goes to bed, remains quiet for a few days, is probably obliged to remain quiet a little longer the second time than the first; then he is up again and around as usual, and so he goes on, now down, now up, but finally gets so lame and stiff, or suffers so much pain, that the attention of the patient and parents or friends is especially attracted, and now off they go to the doctor for advice.

The doctor, if unfamiliar with these cases, probably fails to determine the real condition, and, discovering no abnormal appearance of the knee, tells the patient there is nothing the matter with it, and that he is "humberging." Yet the patient is unable to walk without suffering a feeling of uneasiness, and more or less pain. In certain positions, perhaps, he can stand upon his leg, but the instant he bends it the pain will be very much increased.

The patient thus dismissed, still disabled and becoming daily

more incredulous, consults another doctor, who, taking for granted what his predecessor said, confirms his decision, and so the patient is laid up, perhaps, four or five months, gets no relief, and the damage becomes irreparable. So, you will observe, the symptoms are sometimes exceedingly obscure, and let me advise you, when you have a case of this kind, to explore the joint in every possible direction, for the very fact of his having had a severe concussion affecting the part should be sufficient to make you thoroughly awake to the danger of the case.

In the first stage of this condition, the injury to the bone may be exceedingly slight, just a light blow that has caused the extravasation of but one drop of blood—but the injured surface being constantly irritated, instead of the blood being absorbed, inflammation supervenes, and at last suppuration takes place with disorganization of the whole joint.

When the disease has progressed thus far it becomes very easy to make a diagnosis. The thing which you must first clearly ascertain is the *locus in quo*, as upon this depends the character of the disease as well as the nature of your treatment. You will, therefore, excuse reiteration, gentlemen, in my efforts to impress upon you the importance of determining whether the disease originates in the synovial membrane, in the ligaments, or in the cartilage proper. There is so little circulation in cartilage, however, that I doubt if disease of any kind ever commences here unless it be directly cut or torn; although necrosis readily occurs in this tissue, as its vitality is so slight.

In ordinary cases of so-called disease of the cartilage, the disease commences in the network of blood-vessels immediately underneath the cartilage. The cartilages are simply attached to the bones, have no circulation through their structure, except enough to vitalize them, and are not liable to serious injury. On the contrary, the blood-vessels which underlie these cartilages are very easily injured by blows or concussions, and are the fruitful source of chronic trouble. In the normal state the cartilages have very little sensibility, but when inflamed they are exceedingly sensitive.

When the disease has gone to destruction of the cartilages and other structures within the joint, serious constitutional disturbance will be developed, as loss of appetite, sleeplessness, great emaciation, and perhaps hectic. The joint is usually enor-

mously enlarged, and presents a striking contrast to the emaciated limb both above and below. The tissues about the joint are usually infiltrated with serum, and, consequently, have a boggy feel. They may, too, contain collections of pus, and this, by its burrowing, forms long, tortuous sinuses in various directions. The muscles will be "on guard," as already mentioned when speaking of diseases of the ankle-joint. The symptoms, when the cartilages become involved, are entirely different from any that have preceded them. The patient will suffer from spasms of the limb, and every now and then, particularly when asleep, cry out with a sharp, shrill scream. This is due, probably, to the fact that, while the patient is awake, the contraction of the muscles is more uniform, and the pressure is so constant as to numb the sensibility of the parts; but, when sleep comes, momentary relaxation of the muscles takes place, some involuntary movement abruptly causes a sudden resumption of the contracted



FIG. 128.



FIG. 129.

condition, and the diseased surfaces are snapped together violently, causing intense pain.

At this stage of the disease the tibia is usually subluxated

backward and rotated outward. This has been caused by the powerful contraction of the biceps-cruris muscle, and, when present, gives to the joint that peculiar overhanging prominence so characteristic of the advanced stage of the disease, as seen in Figs. 128 and 129.

When the disease has become developed sufficient to give rise to the symptoms just enumerated, the case will present an unmistakable example of what is known as "white-swelling" or "scrofulous disease of the knee-joint." You may remember that the authorities in our profession from time immemorial have regarded destructive disease of the knee-joint, commonly called "white-swelling," as being essentially of constitutional origin. In other words, that it is scrofulous disease developing itself in a joint, the same as scrofula may develop itself elsewhere.

Now, with all due deference to the opinions of the profession, I understand this subject of scrofula, or "white-swelling" of joints, in a very different light; and while I do not deny that the disease in question may and does occur in persons having a scrofulous diathesis, I shall prove to you that the scrofulous diathesis is simply an accidental accompaniment, and has no more to do with the development of the local disease within the joint than has the hæmorrhagic diathesis, nor, in fact, as much, since a peculiar form of hæmorrhage into the cancellous tissue of the epiphyses from violence in some form is almost invariably the origin of this so-called scrofulous disease, or "white-swelling."

Instead of accepting the usual designation of this disease, "white-swelling or scrofulous disease of the joint," I consider it to be an inflammatory softening of the epiphyses, and the result of the extravasation of blood, from rupture of blood-vessels situated immediately beneath their protecting cartilages. If this extravasation of blood into the meshes of the injured bones, for it generally results from violent concussion, is not absorbed, it will develop a condition which will terminate in inflammatory softening, that will lead directly to erosion and ulcerative destruction of the bones and their intervening cartilages. The synovial membrane, if not injured by the original concussion, or other cause which has given rise to the disease, will sooner or later take on inflammatory action from lying in contact with the parts of the joint involved. The disintegration and ulcerative destruction of the injured portion of bone and cartilage are very much

increased by the unremitting pressure exercised upon the diseased surfaces by reason of the contraction of the muscles surrounding the joints. This muscular contraction is reflex in character, and is excited by the presence of the disease within the joint. If this grinding of the injured surfaces together is not counteracted by extension and counter-extension, great destruction of the bony structures may take place, attended with unavoidable deformity.

The outer condyle of the femur is the part which, almost exclusively, suffers from the unintermitting pressure, caused by muscular contraction. The constant traction of the single muscle attached to the outer side of the limb keeps up pressure at one particular spot, therefore causes interstitial absorption more rapidly than the contraction of the four muscles on the inner side, because of their varying points of pressure; consequently the outer edge of the articulating surface becomes more rapidly disintegrated, and gives rise to abduction, eversion, and rotation, after the manner illustrated by Fig. 130, taken from a plaster cast.

In addition to my own observations, I have found this statement amply confirmed by examination of many morbid specimens of this disease in the anatomical museums of Europe as well as those of this country.

The apparent scrofulous condition of these patients is simply in consequence of the exhaustion induced by the presence of a chronic joint-disease. If the disease is purely constitutional, it should be cured by internal remedies, but the use of internal remedies alone does not cure, and the case gradually grows worse, unless something is done to remedy the local difficulty, and the trouble will finally kill the patient by the irritation and exhaustive suppuration produced.

This is the usual termination of these cases when left to themselves, or when simply treated by the use of internal remedies. Cure may, however, and does sometimes take place with the limb distorted and the joint ankylosed, and in many instances the distortion is most surprising, as seen by these models. (See Figs. 129 and 130.)

Before leaving the study of the symptoms of this disease I wish to make special reference to *pain*.



Fig. 130.

In many cases disease of a joint may be recognized by the location of the pain which accompanies it, as, for example, the pain in hip-disease is frequently entirely referred to the knee. In a case of chronic disease of the knee-joint, you will always find the pain most acute and most easily developed by pressure at the outer portion of the head of the tibia, just over the insertions of the coronary ligaments. It is quite common to be able to make pressure over the whole surface of the joint without causing pain, if you will avoid this particular point; but, the moment pressure is made over either the internal or external coronary ligaments, more especially the external, intense pain will be produced.

This pain is distinct from that caused by suddenly striking the head of the tibia against the condyles of the femur, and also, distinct from that caused by the pressure upon the diseased articular surfaces produced by reflex muscular contraction.

Pain produced by pressure over the situation of the coronary ligaments has a special value as a symptom, for, by its presence or absence, we are able to safely judge with regard to the continuation or cessation of extension in the treatment, as pain can be developed at these points by a reasonable amount of pressure long after all other symptoms of joint-disease have passed away; consequently, treatment should be continued until a reasonable amount of pressure over the attachments of these ligaments can be borne without producing pain.

We will next turn our attention to the subject of treatment.

LECTURE XVI.

DISEASES OF THE JOINTS.—KNEE-JOINT (CONTINUED).

Treatment of Disease of.—Early Treatment.—Treatment in the Advanced Stages of the So-called "White-Swelling."—Apparatus for making Extension.—Mode of Application.

GENTLEMEN: At our last lecture we studied the anatomy of the knee-joint, the diseases which may affect this articulation, their causes and early symptoms, and also the symptoms which