care, and especially by means of immobility and proper compression, suppuration could probably be prevented.

2d. *Prophylactic treatment.*—If we obtain, as I hope, resolution of the effusion and of the congestive arthritis, there will be two indications to meet. The first is that of combating the rheumatic cause, by advising the patient to occupy a dry room which faces the south; to avoid getting chilled, to wear flannel, and to pass, if possible, one or two seasons at one of the thermal springs which I have already mentioned, in short the advice which we usually give rheumatic patients. The second is that of maintaining constantly, while walking or standing, a certain compression upon the knee by means of a laced dog-skin or canvas knee-cap. These appliances are often troublesome bacause they are too tight, or useless because not tight enough. Careful and intelligent patients find it better to wear a flannel band two and a half inches wide and about three yards long, which they apply tightly enough to make the necessary compression without being thereby incommoded.

LECTURE XXXVII.

CHRONIC ARTHRITES OF THE KNEE, CONTINUED.—FUNGOID ARTHRITIS OR WHITE SWELLING.

Non-suppurative white swelling of the left knee in a young man 20 years old—Physical and functional symptoms—Muscular atrophy—Absence of hyperostosis—Increase of local heat—Anatomical diagnosis—Undoubted fungoid transformation of the synovial membrane and the ligaments—Presumed lesions of the diarthrodial cartilages and the ligaments—Rarefying osteitis or simple rarefaction, and fatty condition of the cancellous tissue—Etiological diagnosis—Course, termination, and prognosis; tendency to suppuration; very little tendency to anchylosis—Treatment—Indication to favour anchylosis—Cotton batting apparatus, immovable fenestrated apparatus—General treatment.

GENTLEMEN: The patient who was admitted yesterday, No. 4, ward Sainte Vierge, and who resembles two others who have been here for several months, is a young man 20 years old, a shoemaker, who says his left knee has been affected for about a year. As it caused him no pain, and only a little difficulty in moving, he has thus far done nothing for it. But a week ago, after having walked the day before a little more than usual, he suffered pain, was unable to walk, and was obliged to enter the hospital.

You are at first struck with his puny look. He is small, beardless, pale, and with thin muscles. We find the scars of no abscesses on the neck, but he told us that his childhood had been sickly, and that several times his eyes had been inflamed and there had been a discharge from his ears. Although he has had no hæmoptysis he is

subject to colds. His father is still living, but he thinks his mother died of some disease of the chest. He has two sisters who, he says, are pretty well, but he has lost two brothers, one in infancy, the other at the age of 18. In short, his constitution is lymphatic, his antecedents and those of his family show a predisposition to tuberculization.

As for his knee, it presents physical symptoms and functional symptoms.

Physical symptoms.—The knee is completely extended, uniformly swollen, rounded; the lateral depressions on each side of the patella are effaced. Placing the fingers on the outer side, a little above the superior tibio-fibular articulation, I feel a lobe a little distinct from the rest. The swelling is flabby; at certain points it yields a sensation similar to fluctuation. But, if grasping with both hands the lateral portions of the knee, I press the patella backwards with my forefinger, I find that it remains immovable, that it is not pushed towards the condyles of the femur, as it is in hydrarthrosis, and that the fingers placed upon the sides are not raised by the liquid. If we seek fluctuation by placing two fingers on the outer and two on the inner side, we do not find it. There is then no liquid in the synovial cavity; or if there is any it is not abundant enough to give fluctuation. The sensation of this kind which is felt here and there superficially is not furnished by an intra-articular liquid. It is not resistent and not elastic, and is caused rather by very soft tissues than by a collection of liquid. For more certainty I pricked two of these soft points with a pin, and saw no liquid flow except a little blood which evidently came from the prick. When we compare the two thighs we are struck with the difference in their size. The muscles of the left one are evidently atrophied; so too are those of the calf of the leg, but to a little less degree. This atrophy, which is constant after articular diseases of long duration, seems to me to be due, like that which we find after fractures (page 71), to the irregular distribution of the nutritive material between the synovial membrane which uses more and the muscles which receive less. I felt deeply to see if the femur was swollen, it did not seem to be, and, indeed, we have here a chronic disease, in a feeble patient, whose constitution, as I have already told you, does not predispose to general or very extensive hypertrophying osteitis.

As functional symptoms. I showed you an elevation of temperature, easily recognized by placing the palm of the hand alternately upon the two knees. I did not make an examination here with the thermometer, but I have done so upon others who showed the same difference of temperature, and found from two to five and a half degrees (Fahr.) of difference. When at rest, the articulation is not constantly painful; but you heard the patient say that he often felt, especially at night, shooting and throbbing pains, and, like most patients who suffer in the knee, he indicated the inner side as the principal seat of the pains. When asked to flex and extend the articulation, he was unable to do it on account of the pain. I then myself communicated these movements and showed that they were possible; I further found abnormal lateral movements, without crepitation. No general symp-

toms, no fever. The chest was carefully examined and showed no physical sign of tuberculization, notwithstanding the fears excited on this point by his antecedents.

Anatomical diagnosis.—We are again authorized here to admit the existence of an arthritis, since it is a disease with swelling, pain, and heat; we may say that this arthritis is chronic, for it began a year ago, and is not accompanied by fever. We may add, on account of the pains which have recently occurred, that it is a chronic arthritis with a subacute inflammatory attack.

We have now to determine by what lesions and by what tendencies this chronic arthritis differs from those of which I have already spoken, and those of which I shall hereafter have to speak.

Among these lesions there is one of which we have no doubt, that of the synovial membrane. It consists in a thick flabby swelling, formed of a grayish tissue, infiltrated with serosity, and moderately vascular, the appearance of which, on section, recalls that of a thin jelly. In its chemical composition there is much fibrine according to Bonnet, mucine according to Paquet; and in its histological composition we find, together with molecular granulations, fusiform and stellate cells and amorphous matter. This singular lesion is that which, since Reimar, has been known as *fungoid substance* or *fungoid synovitis*.[1] It may be considered as a profound modification, not of limited portions of, but of the entire, synovial membrane.

When the synovial membrane of an articulation has become fungoid we often find an effusion of liquid into its cavity; in this case I have found none. If there is any, it is not abundant, and is not purulent. For purulency would be accompanied by a notable increase in the quantity, and consequently by a fluctuation which would be easily appreciable.

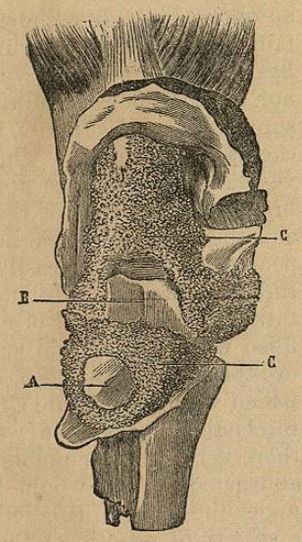
There is another lesion of which we have scarcely any more doubt. That is the lack of resistance in the ligaments due to their transformation into a similar fungoid substance. Lateral mobility, in our patient, and the frequency of autopsies in which we have found the fungoid condition of the ligaments coinciding with that of the synovial membrane, are the reasons which authorize me to admit the existence of these anatomical disorders.

Other lesions should be suspected, but they are not indicated, like the preceding ones, by physical signs. They effect the diarthrodial cartilages and the bones. They exist, do not doubt it; for anatomo-pathological studies have abundantly proved that the articular synovial membranes do not become fungoid, without, at the same time, the ligaments, cartilages, and bones being altered, and I have told you that although I have no anatomical documents to prove it, I admitted the same thing in plastic arthritis which had become chronic, and in dropsical arthritis. There is such a physiological solidarity among all the constituent parts of an articulation that the chief one of them, the synovial membrane, cannot long be troubled in its nutrition, without the nutrition of the others being modified and causing the lesions peculiar to them.

[1] Substance fongueuse, synovite fongueuse.

Here then I do not see, and I appreciate by no special sign the lesions of the diarthrodial cartilages. But it suffices that the articular affection has lasted a year, for me to believe in their existence. What I do not know is the degree which they have reached. Is it only the first degree, that in which the lesion is purely histological and consists, as Drs. Ranvier and Paquet[1] have said, in fatty degeneration of the superficial cells, and then proliferation of the deep cells of the cartilage? Is it a more advanced period, that in which the diarthrodial cartilages present the velvety aspect, that is, an uneven surface formed by a mass of fibrous prolongations instead of the normal smooth and polished surface? Is it not another lesion still more advanced, in consequence of which the cartilages, losing their means of union with the bones, strip off and fall into the articular cavity? Do those solutions of continuity described by Brodie under the name of ulcerations, exist on their free surface with or without decortication? Finally, has that absorption commenced which is so common in these organs and which accompanies or follows the preceding lesions,—is it already quite advanced? To these questions, and the same ones are to be asked for the fibro-cartilages, I do not and cannot reply positively. One single thing is unquestionable: the cartilages are injured and will become more and more so as the affection grows older, until they finally disappear, either by total absorption, or by partial absorption followed by the detachment of some portions, like that of the sequestra of necrosis, into the articular cavity.

Fig. 20



Fungoid transformation of the synovial membrane of the knee. A. Posterior face of the patella; C. C. Inner surface of the synovial membrane which has become fungoid.

Allow me to tell you in passing that lesions of the cartilages are about the same in all diseases of the joints. They are always destructions which are more or less comparable to ulcerations, but which differ from them essentially by the absence of concomitant suppuration; they are velvety change, denudation of the bone, and finally absorption. Modern researches have shown that the histological lesions of the beginning are variable, but the consecutive lesions are not. It seems that when the cells and their capsules are once deprived of their normal conditions and destroyed, the cartilage is always similarly affected and troubled in its nutrition, and that this trouble leads to a total or partial destruction. This lesion is the more important because it is irreparable and has cost the articulation one of the capital conditions of its ability to perform its functions. It is possible that the limited ulcerations heal, like those found in tarsalgia; but exten-

[1] Paquet, Thèse de Paris, 1867.

sive destructions, and still more those which involve the whole cartilage, do not heal.

The same certainties and the same doubts exist for the bones as for the cartilages. I am sure that the bones are injured, because autopsies have often shown that they always become injured to a certain degree in fungoid synovitis. I am sure that their cancellous tissue has not suppurated, for we have neither the external fistulous abscesses nor the articular suppuration which would be the consequence of this suppuration. I suppose, for it is very common, that the compact subcartilaginous layer is wholly or in part destroyed and replaced by vegetations which are continuous with those of the synovial membrane, that the cells of the cancellous tissue have become enlarged, and their trabeculi fragile, so that a probe or the finger-nail would penetrate them very easily. Are these spaces filled with a soft, gelatiniform, grayish substance similar to the vegetations, and constituting the first period of rarefying osteitis? are they, on the contrary, filled with that red and very vascular substance which made Bonnet use the name *splenisation*, or are they filled with fat and not vascular, which would constitute Cruveilhier's fatty condition, and a variety of rarefaction, rarefaction without osteitis? Are there not here and there very vascular points beside others that are hypertrophied and eburnated, which would belong to the lesion described by Nélaton under the name of tubercular infiltration, and which for me constitute a variety of osteitis of the cancellous tissue, an osteitis condensing and necrotic in some places, rarefying in others? I am not enlightened upon all these points; and since we have to deal only with presumptions I shall not explain all these lesions, which I shall, moreover, have occasion to show you whenever we dissect articulations affected with white swelling, either after amputation or after death.

What I wish to fix to-day in your minds is that we have no doubt of the fungoid condition of the synovial membrane in our patient, and that, from the moment when this fungoid condition becomes incontestable, all the other constituent parts, including the bones, are altered to one of the degrees and in one of the forms indicated by pathological anatomy, although we are not perfectly informed as to the extent of these alterations.

There is, however, a point which should detain me a moment. Our authors have spoken of white swellings, some of which begin in the soft parts, others in the bones. I presume that in this case the lesions began in the synovial membrane; for the patient has not had from the beginning those pains which denote deep osteitis of the cancellous tissue, and he has not the abscesses by which this osteitis would undoubtedly have ended if the lesion had begun with it. Retain, if you choose, a few doubts as to the starting point, but have none as to another which is capital at this moment. If there is osteitis it has not suppurated, it is not in that condition of rarefaction with suppuration in the meshes of the cancellous tissue which, for me, constitutes caries;[1]

[1] We are not all agreed upon the signification of the word *caries*; in my opinion it ought to be employed to express these two things: rarefying inflammation and suppuration of the cancellous tissue of the bones.

nor is it in that state of partial eburnation with peripheral suppuration which constitutes the interstitial necrosis of the cancellous tissue of which I spoke a moment ago, and of which I recently showed you an example.

Etiological diagnosis.—We make that easily by means of the information furnished by observation of a large number of patients. The synovial membrane of the knee becomes fungoid under the influence of that great general cause which we call scrofula, that which gives rise to either ganglionary or pulmonary tuberculosis. The existence of this cause in our patient is indicated by his constitution and his family antecedents. But it seems to have exerted no injurious influence upon the other articulations or upon other organs, especially the lungs. We hope that it will not affect them; but we can have no certainty upon this point.

Course, termination, prognosis.—Do not forget, gentlemen, the serious consequence which results from our diagnosis, fungoid arthritis or white swelling. It is the tendency to articular suppuration after a longer or shorter time. In other words, if the patient is not properly treated, or if the treatment does not succeed, this synovitis will terminate some day by suppuration, with or without suppuration of the accompanying osteitis. The abscesses will open and become fistulous; perhaps, after an intercurrent acute attack, so much pus will suddenly form within the articular cavity that the synovial membrane will rupture in its upper cul-de-sac and let a considerable quantity of this pus pass under the deep muscles of the thigh, an example of which I have lately shown you. In any case the prolonged suppuration, the inaction to which the patient will be condemned, the necessary confinement to the hospital may lead sooner or later to hecticity or to the tuberculosis to which, as you know, his constitution already predisposes him. Again, the difficult passage of the pus from this large anfractuous cavity, and its consequent stagnation and decomposition, might cause a putrid infection and hasten hecticity. A moment, then, will undoubtedly arrive, when, to preserve the patient from one or the other of these terminations, amputation of the thigh or resection will be the only resource.

In case, however, hecticity should not occur, and if the patient should resist articular suppuration, this white swelling might end by anchylosis, the tibia and femur stripped of their diarthrodial cartilages, uniting by a process analogous to that of the callus. It would then be an anchylosis by fusion after suppuration. I admit that I do not count much upon such a result. But I should count more upon it if the patient was younger, if he was a child, if he was in better hygienic conditions.

Nevertheless, if tardy suppuration is the natural termination of the disease, and if it establishes a capital difference between the fungoid arthritis with which we are now occupied, the plastic arthritis of which I have already spoken, and the dry arthritis of which I shall soon speak, yet it is not inevitable, and you should know that all therapeutical efforts should be directed to prevent it.

What will be the course and the termination of the disease if sup-

puration does not occur? It will not be the return to the normal anatomical and physiological condition. I do not mean that this return is absolutely impossible; it may be that it has taken place in a very few children, but I do not believe that it has in adolescents and adults, and above all in subjects who belong, as this one does, to the poor class and are unable to obtain all the hygienic resources capable of bringing about this very rare result—cure of a white swelling of the knee with preservation of shape and movements.

That is due, gentlemen, to the anatomical and physiological modifications which take place in white swelling. This synovial membrane transformed into fungoid tissue is too profoundly altered to be able to recover its normal structure. It no longer has any epithelium or connective tissue; all the abnormal products which infiltrated it, the serosity, the fusiform and other embryonal cells would have to disappear and be transformed again into connective tissue covered with pavement epithelium, and the necessary condition of such a change would be that the state of the organism under the influence of which the lesion occurred should first disappear. Certainly all that is not impossible, but you must admit that it is very difficult. Bonnet formulated it exactly when he said: "The synovial fungoid tissue is the product of a bad nutrition, and it has no tendency to be reabsorbed." I add that it has a very much greater one to suppurate.

What happens sometimes is a very slow transformation of the synovial membrane into a more or less fibrous, inextensible, and rigid tissue. It is a sort of substitution of anchylosing plastic arthritis for fungoid arthritis threatened with suppuration. The anchylosis also may be incomplete, without bony fusion, and due merely to this fibrous transformation of the synovial membrane; or it may be complete, and by fusion, as I told you that took place sometimes after preliminary suppuration.

But fusion is too often prevented, either by a displacement of the articular surfaces which abandon one another in consequence of the softening of the ligaments and form what is called spontaneous dislocation, or by the nature itself of the osteitis which is not sufficiently plastic in these subjects to furnish the materials for a new bony formation.

This difficulty of establishing a complete anchylosis when there has been no suppuration is unfortunate, for this result would be very desirable after a white swelling of the knee. When this latter appears to terminate in a fibrous transformation and a lack of extensibility of the synovial membrane with preservation of motion, there is always reason to fear the persistence of some fungoid points and the return of the suppurative tendency. When the bones are united and consequently a sprain is no longer possible this return is less to be feared, and the synovial, aided by the immobility, completes little by little its fibrous transformation.

Prognosis.—It is grave and may, in accordance with what I have just said, be stated as follows: A disease of long duration tending towards suppuration, and leading almost inevitably to the destruction of the joint, either because mutilation is rendered necessary by hec-

ticity and threatened death, or because anchylosis is established; a disease which further threatens to be complicated, one day or another, by pulmonary tuberculosis.

Treatment.—You have already comprehended the indications to be met: to prevent suppuration; to favour the formation of an anchylosis, since we can hope for nothing better; to prevent tuberculization. The means which we have at our disposal to meet these indications have this advantage, that if by chance the patient is in the very exceptional category of those who may get well by the return of the synovial membrane to its normal anatomical character, they favour also this return.

Some of these measures are local, others general.

A. *Local measures.*—I told you that we were in presence of one of those fresh inflammatory attacks to which patients affected with white swelling are exposed. This must first be treated by rest in a wire splint and poultices, sprinkled with laudanum if necessary. If the articulation is bent, as sometimes happens, although it is not the case here, it must be straightened.

As soon as the inflammatory attack is over, rest and compression will be the principal local measures to employ. The patient will remain in bed, and I shall apply the cotton wadding bandage, which I described when speaking of hydrarthrosis, and with which we can make forcible compression without, however, interfering with the circulation. You know that for this purpose we wrap the limb in a very thick layer of wadding, about four inches, and roll a band very tightly about it. It is not necessary at first to envelop the foot. I shall do that a few days later if it becomes œdematous. This bandage will be renewed every six or seven days and we shall see if the swelling and local heat diminish, if an effusion of liquid takes place into the articulation, or if by chance, as sometimes happens, an abscess forms outside the joints, in the external layers of the synovial membrane, an abscess belonging in the category of those which Gerdy "called abscesses by proximity."

After six or seven weeks if no inflammation remains, if no considerable amount of hydrarthrosis has been superadded, if we find no tendency to the formation of abscesses by proximity about the upper cul-de-sac, where they appear most frequently, I shall apply an immovable apparatus, made with dextrine or silicate of potash, after having wrapped the limb in wadding. If there should be any tendency to flexion of the knee I would place inside the apparatus, as you have seen me do several times, a posterior wooden splint of the length which we use for fractures of the leg. This precaution would be useless in this case, for the knee is perfectly extended. My object in substituting the immovable for the movable wadding apparatus would be to allow the patient to walk. For confinement to the bed, which is an excellent means to insure immobility of the knee, has the inconvenience, when prolonged for a long time, and especially when the subject is obliged to live in the midst of other patients, of weakening him and favouring the development, already so imminent, of tuberculosis. With the immovable apparatus the patient will be able,

without any danger of the articulation making any injurious movements, and much more safely in this respect than if the limb was in the cotton bandage, to walk with crutches, go into the garden, breathe a better air, perhaps will even be able to leave us and return to his family in the country. Another advantage of the immovable apparatus is that it can remain in place three or four months without the intervention of the surgeon unless new pains and inflammation should occur.

There are patients in whom the immovable apparatus does not prevent pain during walking, whether it be that this pain results from some imperceptible movements of the joint, or whether it is due to the pressure of the articular surfaces against one another in the vertical posture. Of course in such cases rest in bed must be ordered, and continued until new attempts shall have shown that the patient can walk without pain.

It is not impossible also, as I intimated a moment ago, that after walking for a few weeks the patient may be taken with fresh pains, without apparent cause, or after fatigue, or even on account of a change in the weather. For I should tell you, in passing, that lymphatic patients affected with white swelling are not exempt from rheumatism, and this latter influence, when it exists, may be the cause of a return of a pain in the affected joint. In such a case the indication is the same, to keep the patient again in bed for a few weeks until the sensibility disappears.

The objection has been made against immovable apparatuses that they hide the affected region and prevent us from observing the physical signs and making use of other local remedies, especially the revulsives. You know how I reply to this objection: when the apparatus has been dry for some time, and I am satisfied that it is stiff enough to meet the indication of immobility, I cut out a circular cap about ten inches in diameter over the anterior part of the knee, I then remove enough cotton to uncover the knee, examine the sides and front of the joint, put on fresh cotton, put on the cap, and bind it down tightly by means of an ordinary band, so as to combine the advantages of compression with those of immobility.

I have long used this kind of apparatus, to which I gave the name *immovable fenestrated;* we often have in our wards patients who wear it, and from time to time you see others who having returned to their families come back to see us, either to tell us how they are, or to ask if their bandage needs to be changed, for they have to be renewed every three or four months to prevent their deterioration.

Whatever may be the usefulness of this dressing, it does not prevent the long duration of the disease, nor does it inevitably prevent suppuration. Among the old patients who came back to see us this year (1872) I showed you a stout, young man 26 years old, whom I began to treat at the Hôpital de la Pitié in 1866, upon whom I have placed the immovable fenestrated apparatus twelve times for a white swelling of the left knee, who has sometimes been able to walk for several months with a cane, and sometimes has been laid up for several weeks with sharp pains, the seat of which seemed to me to be

in the tibia rather than in the synovial membrane, who, however, has had neither articular nor ossifluent abscesses, and who, in short, has reached the complete anchylosis which we sought and hoped for. I showed you also a young girl 23 years old, in whom I placed ten times, in the space of five years, the immovable fenestrated apparatus, made sometimes with plaster, sometimes with dextrine, sometimes with silicate of potash, and who, notwithstanding an incomplete spontaneous dislocation and slight flexion of the knee, has also reached anchylosis.

On the other hand you doubtless remember two of our patients in whom, notwithstanding the use of the apparatus for two and three years, suppuration and hecticity occurred and necessitated in one resection of the knee, in the other amputation of the thigh, both of which were successful.

I shall then place upon our present patient the immovable fenestrated apparatus. I shall open the fenestra every other day to apply tincture of iodine, and I shall take care each time to renew the apparatus and the compression in the way I indicated. If I always find the knee hot, if I hear of pains which oblige the patient again to keep his bed, I shall make through the fenestra, as you saw me do two weeks ago to the patient in No. 6, a punctate cauterization. If an abundant effusion forms I shall apply blisters, still without removing the bandage. Finally, the apparatus will be removed every three or four months, and each time I shall see if the anchylosis which I desire is forming. We shall continue thus for as many years as may be necessary. Of course if suppuration should set in and should open directly outwards or through the deep muscular interstices, and hecticity should occur, I should consider, after a fresh examination of the chest and determination of its proper condition, the question of amputation or resection, a question which I cannot now discuss.

B. *General treatment.*—It ought to consist in the use of all the tonics which we have at our disposal in the hospital: cod-liver oil, antiscorbutic syrup, quinine, wine, iron, strengthening nourishment, and moderate exercise according to the conditions which I indicated.

If he was a private patient and in a social position which permitted it, we should add the much more powerful resources of a visit to the country, to the seaside, to the bromine and iodine thermal springs, especially those of Salins.[1] Perhaps then we should be more likely to prevent suppuration and obtain anchylosis. I also repeat that perhaps, if it was a child, we might exceptionally, by the combined use of these local and general measures, obtain a cure with preservation of the movements.

[1] See Durand Fardel's Dict. des Eaux minerales, Lebret and Lefort, Paris, 1860.