

the upper fragment would no longer project so much forwards? I ask the question, but I do not yet possess any fact upon which I could support the use of this little operation.

(The patient recovered without eschar and without suppuration, by the aid of the trough and compression distributed all along the upper fragment. There remained an abduction and a deviation backwards of the foot, with marked false ankylosis of the tibio-tarsal articulation.)

LECTURE XVI.

CONSECUTIVE AND LATE PHENOMENA OF SIMPLE FRACTURES OF THE LEG.

- I. Fracture of the leg eight years before—Complete restoration of shape and function—Slight persistent muscular atrophy—Considerations upon this atrophy. II. Another fracture dating from eighteen months—Deformity due to the persistence of the projection of the upper fragment. III. Old fracture with hyperostosis of the tibia. IV. Consolidation since a year ago—Persistence of neuralgic pains (osteo-neuralgia). V. Fracture with persistence of tibio-tarsal arthritis. VI. Recovery with outward rotation of the upper fragment.

GENTLEMEN: Chance has permitted us during the week to see here five patients who had been treated for simple fractures of the leg, either by myself or by other surgeons. This is an opportunity to call your attention once more to the remote consequences of these fractures, consequences of which I have often spoken to you without having any examples to show you.

I. The first is a young man of 25 years, admitted for a wound of the left arm, who had his right leg broken in the lower third at the age of seventeen years (eight years ago). You saw that the conformation of the bones was excellent, that there was no pain along them, that all the articulations of the foot had their normal suppleness and motions, and that his walk was free, and without limping. Here is, then, an excellent recovery with restoration of shape and of functions. It is due to the fact that the fracture was without displacement, or that, if the displacement existed, it was easy to reduce and keep reduced, and it has appeared early because the subject was young, for at this period of life, when the constitution is not scrofulous, the tendinous and articular synovial membranes quickly recover the suppleness and extensibility which are destroyed in cases of fracture by the neighbouring synovites and the lesions caused by the immobility. I showed you only that the muscles in front and behind were smaller than those of the opposite side. We recognized it: 1st, with our eyes, when the patient was lying down and when he was standing;

2d, with the hands, by comparing the two calves. There is, then, in this patient, a little atrophy of all the muscles of the leg.

Do not wonder at it; this atrophy is very common after fractures of the leg.

It was twenty years ago that I discovered it for the first time, and showed it to the students at the Hôpital Cochin. I also told you that Dr. Lejeune,¹ by my advice, chose this atrophy for the subject of his inaugural thesis. Since then, I have noticed it very often, and have produced it artificially in animals, especially in guinea-pigs whose thighs or legs I had broken. It would be difficult for me to say what parts of the muscles this atrophy specially affects. Is it the muscular fibre itself, or is it the interfibrillary connective tissue? In the studies which I made upon guinea-pigs, not having had occasion to make them upon men, it seemed to me that both parts were diminished. Having weighed, immediately after death, the principal muscles of the thigh, and found a difference between their weight and that of the corresponding muscles of the opposite side, I macerated both in ether, taking care to renew the liquid often; at the end of seven months the muscles were freed of almost all their fat, those of the fractured side had lost as much of their weight as had those of the other, and there remained the same difference between the almost exclusively muscular parts which remained. Thence I concluded that the diminution of weight was made in both the constituent parts of the muscles, but more especially in their contractile part. I should, however, say that it was impossible for me to thoroughly appreciate the new anatomical condition of this contractile part; with the naked eye I saw that it was less red and less vascular than on the unaffected side, and M. Lejeune remarked the same fact. On microscopical examination, I found the usual longitudinal and transverse striæ. Upon some of the fibres of the guinea-pig, it seemed to me that the transverse striæ were a little less apparent or masked by fatty granulations, but it was not so evident that I could affirm the chief lesion of the muscular fibre to be a granulo-fatty transformation. It is probable, but thus far I have not been able to determine it rigorously with the aid of the microscope, that this capital lesion is a diminution of the volume of the fibrillæ, and that the general atrophy of the muscle is the result of the atrophy of each one of its fibrillæ, which, however, have lost neither their normal structure nor their function of contractility.

Notice, gentlemen, that although the diminution of volume is appreciable by the eye through the skin, the contractile power seems to be as well developed as that of the opposite side. Examination with the dynamometer would perhaps be necessary to form a precise opinion upon this subject. I have never made it, because I did not think it would lead to any important practical results. What you ought to know is, that after fractures in general, and those of the leg in particular, the muscles diminish in size, without diminution of their functions, so far as the patients can tell. You should know this fact

¹ Lejeune, see page 71.

and forewarn the patient and his friends of it, for otherwise they would not fail to say that the diminution of the size of the limb was the result of bad therapeutics.

I shall have said everything that should be said upon this subject, after having reminded you that muscular atrophy, after fractures, is inevitable and irremediable. Inevitable, because, whatever you may do, it will always result; it seems to me to be the consequence, both of the immobility and of the irregular distribution of the nutritive materials which go in excess to the bone before and after repair, and in less quantity to the other parts; now, you are not able to prevent this irregularity of distribution, which, moreover, is necessary for the formation of the callus. Irremediable, for I have often prescribed gymnastic exercises and electrization, and I have not brought the muscles to their original volume. Still it is evident that if anything can be obtained and if they wish to try, it is to these two means that recourse must be had. But you must expect to succeed very imperfectly.

II. The second patient is a man, thirty-five years old, who was treated nearly eighteen months ago, in another hospital, for a simple fracture of the right leg. He walks very well, and seldom has any pain, feeling only a little when the weather changes. There is the same muscular atrophy as in the preceding case. But he has, in the lower third of his leg, an abnormal bony prominence, which ends in a point, and still has the form of a V. You know this prominence. It is that which is so often formed by the upper fragment. It could not be corrected, undoubtedly because the transverse displacement was irreducible. Consequently, this patient has a deformity without functional trouble. The patient, of course, thinks that his fracture was badly set. Do not believe it, and never criticize your *confrères* by attributing this imperfect result to them. Undoubtedly, it might be due to carelessness, but much more probably to that irreducibility to which I have already, on different occasions, called your attention.

III. The third patient is forty years old, and had his leg broken three years ago. He has recovered well; has no projection of the upper fragment, and since the sixth month, has been able to walk quite easily, and is free from any articular or tendinous stiffness. But the tibia has remained voluminous about, above, and below, the line of fracture. It is not the peripheral callus alone which causes this excess of volume, as it sometimes does, from the sixth to the twelfth week after the accident. No, if the callus (the one which Dupuytren called provisional) has at any time been very large, it is no longer so to-day, for, as is usual, it has been absorbed. But the tibia has been hypertrophied, and has remained so since the end of the treatment, that is to say, the osteitis, which was developed during, and for the purpose of the consolidation, has surpassed, though we cannot say why, the limits which were necessary for the formation of the callus; it has extended to nearly the whole of the shaft, and has there assumed the characters of hypertrophying osteitis, while about the fracture it has preserved those of reparatory osteitis. To-day it

is no longer an osteitis, since there are no longer any continuous pains; it is what we call hyperostosis, and this lesion, which, however, causes no trouble, is absolutely irremediable.

IV. *Fracture consolidated since a year ago; persistence of neuralgic pains (osteo neuralgia of the tibia).*—We have recently seen at our consultation (Pitié, 1866) a woman, 32 years old, whom I treated a year ago for a fracture of the left leg below its centre. The displacement was slight. I first used the Scultet apparatus, and then the plaster bandage. We noticed, during the treatment, more prolonged and continuous pains than in other patients. She complained every morning of having slept badly and of having had throbbings and shooting pains about the fracture. You know that these pains are very common during the first eight or ten days. You know that, ordinarily, they grow weaker and weaker, and cease about the twelfth day, or only reappear if the patients move too much or sit up in bed; in any case, they are temporary. Well, in this patient the pains continued until the end of the treatment. They appeared without any previous movement, were almost continuous, but became much worse at night. Furthermore, when I removed the plaster apparatus on the forty-fifth day, the consolidation was not finished; I had to keep the limb immovable upon the cushion-trough of which I have sometimes spoken, and I prescribed from 30 to 60 grains of the phosphate of lime daily; it was only at the end of three months that abnormal mobility could no longer be found. Ordinarily, this delay coincides with a painful consolidation. I attribute it to this that the reparatory osteitis is troubled, and assumes this continuously painful form with which the slow organization of the callus coincides.

This woman left us a year ago; she walks without crutches, but with difficulty, and has come to consult us for the pain which she still feels in the leg. This pain is much more endurable than it was during the treatment; it is moderate while the patient is seated, but becomes notably intense after she has walked for from twenty to thirty minutes. She has then to sit down that it may diminish. It reappears sometimes during the night without appreciable cause. The slightest blow causes fresh intensity.

We examined this leg together. You saw a very regular callus, and with the exception of a very slight swelling about the fracture, to which I cannot give the name of hyperostosis, the conformation is excellent. But pressure at this point causes pain. What is this persistent pain? I cannot locate it elsewhere than in the tibia, and as we have agreed to explain by an osteitis all the anatomo-physiological phenomena which occur in the bone after fractures, and during their consolidation, I have to say that this woman has had an osteitis, like all those who have had a fracture; but that this osteitis, without having taken on the suppurative form and without showing any tendency towards it, has differed from those which we see in similar cases by the intensity and the continuance of the pain. For a long time I have made use of the expression, *osteitis of neuralgic form*, to indicate this variety, which we also see sometimes independently of

fractures, and of which it is impossible for me to give you a satisfactory anatomical or physiological explanation.

As for the prognosis, I hope, basing the hope upon some similar cases, that this abnormal sensibility will disappear in time. But will it need one, two, or three years? I cannot say.

I advised friction with the chloroform liniment, and the use of a roller bandage or cotton wadding. I have sometimes seen this compression lessen the pain sensibly, and the apparatus has the other advantage of protecting the limb from those slight shocks which cause pain, the repetition of which undoubtedly aids to keep up the painful condition.

This fact reminds me of two analogous ones.

I saw the first in 1857 and 1858, at the Hôpital Cochin, upon a mechanic, 41 years old, named Pierre D. His fracture, which was of the left leg, kept him in the hospital from the 18th September, 1857, until the 20th March, 1858 (six months). At the end of this time it was not yet consolidated. The patient, wearied of the hospital, wished to leave with a new plaster apparatus which I removed three weeks afterwards, the 8th April. It was then that, finding mobility no longer, I considered the consolidation made. Seven months, less ten days, were needed to obtain this result. Well, during all this time the patient, who was neither pusillanimous nor a deceiver, did not cease to complain of daily and nocturnal pains, sometimes with cramps, sometimes without them, which resisted opium or were only slightly diminished by it, and of sleep broken by these sufferings.

We might have supposed a deep abscess of the tibia, but there was none. Nothing in his constitution or antecedents could explain these rebellious pains; he was not even nervous. Like the woman previously mentioned, he had never had syphilis. I questioned and examined him on this subject a number of times, and obtained a negative result. Nor was there anything in the wound to explain the problem. There had been little displacement, and reduction was very easy. We remarked only that the fracture had been produced by direct action. A large wooden gate which he was helping to raise had slipped, and its edge had struck his left leg obliquely. But how many fractures by direct action do we not see recover without this prolongation of the suffering!

I saw this patient for more than a year, for he continued to suffer, less and less, it is true, but always very notably, while walking. I prescribed the rolled cotton dressing, frictions with the chloroform liniment, and iodide of potassium and valerianate of ammonia internally. I cannot say that one of these measures was more efficacious than the others; I only know that little by little the pains diminished. Since then I have not seen the patient, and suppose that finally the sensibility disappeared.

The other patient was a lady, 39 years old, impressionable, and very nervous, who suffered cruelly for three months, during which, the fracture, a very simple one of the right leg, did not consolidate. It was only during the course of the fourth month that the mobility disappeared. Three years have passed since then, and the patient

still walks with pain and with the help of a cane. Every movement, every touch, awakens suffering, and yet there has been no abscess, and syphilis cannot be for a moment supposed.

What other name than that of *osteitis of neuralgic form* for the first period of the disease, and *osteo-neuralgia* for the later period, in which it is difficult to believe in the persistence of an inflammatory process in the absence of suppuration and fresh swelling; what other name, I ask, can we find to indicate these unusual painful forms?

V. *Fracture consolidated since six months ago; persistence of painful arthritis.*—This patient is a woman, 58 years old, whom I treated for simple fracture of both bones of the right leg, in the lower third, six months ago. Consolidation was neither very painful nor slow. At the end of two months and a half, the patient left the hospital, unable to walk without crutches, and evidently suffering in the tibio-tarsal articulation. I then expressed the fear that the arthritis would last for a long time, that perhaps it would never disappear, for the age of the patient and the rheumatic pains which she had often felt, made me think her arthritis might take on the chronic and incurable form of the dry arthritis of old people. To-day, six months after the accident, the lower part of the tibia and the internal malleolus are hypertrophied, there is also a notable swelling of the ankle; the spontaneous movements of the articulation are very limited; communicated movements also are limited, cause pain, and are accompanied by some crackling. There is then, here, a persistent arthritis which seems to me to belong to the category of dry arthritis. The patient will be kept quiet, with soothing frictions and poultices for two or three weeks. I shall also give her some douches and sulphur baths. We shall thus obtain an amelioration; but I do not dare to hope for an entire cure, which, however, I should consider possible if the patient were younger. I fear that this woman is condemned to walk always with crutches, and very slowly, and that admission to La Salpêtrière¹ is the only useful thing we can offer her.

VI. *Fracture of the leg cured with rotation outwards of the upper fragment (consecutive displacement).*—I have again called your attention to a patient whom I treated here for a V fracture of the left leg, a simple fracture, but one which I could not reduce completely, as indeed happens quite often in V fractures. I placed the leg in a wire trough, and established compression all along the upper fragment, except at its point, where an eschar might have been produced. This patient, who is only forty years old, still suffers in walking, and as there is a notable swelling of the ankle, I consider him still affected with the remains of arthritis "by proximity," which we see after fractures, and especially after those which have a fissure extending to the articulation, as often happens in the V fracture. I have admitted him to let him rest for a few days, and to show you a deformity left by the fracture, deformity which I have seen several times, but which is not very frequent. When the patient is lying down and is asked to place his feet side by side, he does it easily, but by turning his thigh and

¹ An Asylum for Incurable and Indigent Old Women.

knee outwards. If asked to place his knees in the same position, we see the foot and lower part of the leg turn inwards, that is to say, consolidation has taken place in this patient, not only with the slight projection of the upper fragment which you see, but with a rotary displacement, the upper fragment having turned about its axis from within outwards, and the lower one, with the foot, from without inwards.

This is a deformity, but it causes no trouble in walking. As soon as he gets rid of his arthritis he will walk, but with his foot turned inwards; and after all, when dressed, the deformity will not amount to much.

It was more than ten years ago that I first noticed this variety of deformity, which, so far as I know, has not been pointed out by our authors, and since then I have seen it five or six times.

I should like to be able to tell you what causes it, how it happens, and how it can be prevented, but I don't know much about it.

The rotary displacement does not exist at the beginning, or if it does exist, it is so easily corrected that we do not pay much attention to it. It appears especially in fractures with transverse displacement of the upper fragment difficult to reduce and to keep reduced. Thus far, I have seen it only in V fractures. It appears from the eighteenth to the twenty-fifth day, after the patients have been long under treatment, and all has been done that should have been done, and care has been taken to place the inner border of the foot and of the patella in the relations which I have indicated. If the surgeon continues, while watching the patient, to occupy himself only with the position of the foot, all seems to be going on well, but if, at the period of which I speak, he compares the position of the foot with that of the patella, he sees that the latter is turned outward. He then removes the apparatus to make sure of the fact, and finds that, the foot being kept in place, it is the upper fragment, and the femur with it, which have turned outwards. It takes place little by little, without pain; the patient does not notice it, and when the surgeon discovers it the effect is irremediable; for it is useless for you to try to correct this consecutive displacement.

For me, at least, whatever plan I have tried has failed; and it is easy to understand. The consolidation is already too far advanced to permit the deformity to be corrected. We might make the callus yield by violent manœuvres, but we might also fail, and even if we did succeed, the consecutive displacement might be reproduced during the new consolidation. Perhaps also the exaggerated osteitis thus produced might cause dangerous suppuration. I have, therefore, considered it prudent to confine myself to moderate attempts at reduction, and they have not succeeded.

From the notions which I have given you, you should draw this conclusion, that, notwithstanding all possible attention, deformities, which could not be prevented, are possible after fracture of the leg, and instead of attributing them to the carelessness of the surgeon, as non-professional people are so prompt to do, we must consider them due to peculiar and inevitable conditions which our authors have not

made sufficiently prominent. I shall add this other conclusion, that we cannot, in these cases of difficult fractures, give too much care and watchfulness during the first two or three weeks to the situation of the foot, with reference to that of the patella and knee. Perhaps, if you recognized this rotation from the beginning, you might remedy it, at least in part, and be more fortunate than I have been, for thus far I have only discovered it when it was too late to correct it.

LECTURE XVII.

FRACTURES OF THE LEG.

- I. Fracture of the left leg more than a month old—Obliteration of the veins. II. Consolidation retarded. III. Pseudarthrosis with angular displacement; suture of the tibia; purulent infection.

GENTLEMEN: I. I called your attention during the visit to the patient, in No. 39, who has been treated for more than a month now in the wire trough for a fracture of the right leg. I could not apply an immovable apparatus on account of the numerous phlyctenæ and two small superficial eschars, the dressing of which required the leg to be left uncovered. The patient has had considerable œdematous swelling of the leg and foot for several days. This swelling, which occurred without pain, is not very rare in the course of fractures of the leg. You will find it rather upon adults and old men than in young people. What does it mean, and what will it become? It means that the venous circulation is obstructed in consequence of the coagulation of the blood. I do not think there is thrombosis of the femoral vein, for I did not feel a hard cord along its course, and pressure upon it did not cause the pain which is rarely absent in such a case. It is rather a thrombosis of the anterior and posterior tibial veins. We do not here find the pains which spontaneous phlebitis, with coagulation, often causes; but this pain is generally absent when only veins of the second order are involved. We cannot feel the hard cord because the veins are too deeply placed to be reached by our fingers, and the existing œdema increases the difficulty. I cannot, therefore, prove the existence of the thrombosis by physical signs; but I admit it because I know it has sometimes been demonstrated in autopsies after fracture, and also because I cannot otherwise explain the œdema. Notice that this is not an inflammatory swelling of the first period, for the tumefaction did not appear until towards the 27th day, long after the inflammatory phenomena had disappeared. On the other hand, we cannot attribute it to a disease of the liver, nor of the heart, nor to albuminuria, for the other foot is not œdematous, and the patient presents no symptoms of these different