

LECTURE XI.

FRACTURES OF THE LEG.

Fracture by indirect action at the junction of the middle with the lower third of the leg—Examinations made to recognize it—No appreciable displacement. 1st Variety, Clinical—Mobility, Crepitation—The fracture occupies both bones—Search for the direction—Explanation of the absence of displacement. 2d Variety, Clinical—Indirect fracture with transverse displacement—Examination of these three questions—Why this displacement?—Is it reducible and easily maintained?—What is the cause of the phlyctenæ, and what will they become?—Treatment with the wire splint—Description of Scultet's apparatus, mechanical beds, water bed.

GENTLEMEN: I. You have just seen in No. 5, a man 32 years old, of habitually good health, who fell yesterday evening in the street, was unable to rise, and was brought to the hospital on a stretcher. He was put to bed and his left leg placed in a wire trough extending a little above the knee. The patient suffered during most of the night, and has slept but little; this morning we find him in the following condition:—

The left leg, compared with the right, is notably larger, without showing either phlyctenæ or redness. Pressing with one finger upon the inner face of the tibia we feel only a little thickening; there is neither ecchymosis nor phlyctenæ. The finger passed along the anterior border and inner face of the bone, finds nowhere any inequality which could be attributed to a displaced fragment. Pressure with this finger causes pain only at the junction of the middle with the lower third of the leg. This pain on pressure in a fixed point, the suffering experienced during the night, the extensive though moderate swelling, taken together with the difficulty of moving the limb, and the patient's inability to get up and walk, are the rational signs of fracture. But you saw that by raising the limb with my two hands, one of which embraced its middle, the other its lower third, and by trying to move the lower part of the limb alternately outwards and inwards with the hand which held it, while the other held the upper two-thirds firmly, I produced an abnormal movement, the centre of which was at the lower part of the shaft of the tibia. I thus demonstrated mobility, and during the same manoeuvre I also felt crepitation. We have then no doubt upon the first point of the diagnosis. The patient has a fracture.

But is it only a fracture of the tibia, or are both the bones broken? It is again the mobility which enables us to answer this question. If the tibia alone had been fractured, I should have been able to impress only very obscure movements which would have left me in doubt; to establish my diagnosis I should have had to insist upon the pain

on pressure, and to renew the examination for several successive days. I should undoubtedly, after several days, when the swelling and the muscular contractions had diminished, have ended by finding a sufficiently appreciable mobility; perhaps also one day or another, during these examinations, I might have found crepitation. But when the very first day you find a mobility so marked that the hands of the surgeon appreciate it very easily, and that even the assistants can see it, there is no hesitation; it is a simultaneous fracture of the tibia and fibula.

Can I now tell you what is the direction of this fracture, if not in both bones, at least in the more accessible one, and to what anatomopathological conditions the absence of displacement is due? Upon these points I am obliged to maintain the greatest reserve. Before Malgaigne's publications we might have thought that it was a transverse fracture; but since Malgaigne¹ has shown positively that fractures of this kind, especially in adults, do not exist, and that the cases which were supposed to be such were toothed fractures, we may believe that we are in presence of a fracture of this kind, and that the non-displacement is explained by the preservation and interlocking of these irregularities. It is probable at the same time that the periosteum and attachments of the muscles are preserved upon a part of the contour of the solution of continuity, and aid to keep the fragments together.

However that may be, you are in presence of the most favourable clinical variety. The patient will get well without deformity, and in all probability will get well rapidly. At least we foresee no circumstance which would retard consolidation.

II. Not far from this patient is another, at No. 15, who was admitted three days ago, and who presents an example of the second clinical variety of fracture of the leg.

He fell, like the preceding one, and was not able to get up or walk. It was the left leg which was injured. The functional and physical symptoms are the same. But in addition, by passing the finger along the anterior border of the tibia we felt at the lower part of the inferior third an abnormal projection which raised and distended the skin and was painful on pressure. Furthermore, there were two quite large phlyctenæ, one of which was filled with yellowish serosity, and the other with sanguinolent serosity, and a few smaller ones. Let us consider for a moment these two particularities.

1st. What is this abnormal projection? It is evidently formed by the upper fragment of the tibia, and is due to the fact that this fragment, pushed forward by the impulsion which was communicated to it at the moment of the accident, is at the same time drawn up and held by the traction of the quadriceps femoris upon the point where the ligamentum patella is attached. This displacement, the most frequent of those which you will see in fractures of the leg, belongs to the category of transverse displacements. When you meet with it, you will ask yourselves two questions: one theoretical, To what is it due? the other essentially practical, Is it reducible?

¹ Malgaigne, *Traité des Fractures*, p. 66.

To what is it due? I told you a moment ago that it was due to an impulsion forwards by the cause of the injury, and to the action of the quadriceps femoris. But the anatomical condition which really explains it is the principal direction of the line of fracture. This direction, instead of being nearly horizontal as in the preceding case, represents an oblique direction downwards and forwards, a section so disposed that the upper fragment terminates in a more or less pointed extremity. This disposition has received the name of oblique fracture, and you understand that it is very favourable for the displacement which we see here. It is sufficient that at the time of the accident an impulsion be communicated to this fragment, so that, drawn up by the action of the quadriceps, it forms the projection which you saw.

Are there not, also, in the manner in which the fracture is produced, in its mechanism, as they say, reasons which explain the displacement? I do not think so, or at least if the reasons exist, they escape us entirely. For I learn from the information given by the patient that, as in the preceding case, the fracture was produced without the intervention of any more or less heavy vulnerant body. It is not then a fracture by direct action, but by indirect action. But in fractures of this kind which we are unable, on account of the resistance of the tibia, to reproduce upon the cadaver, the solution of continuity is the result both of irregular muscular actions, some of which tend to give the bone an unusual curve, and the others to twist it, and the pressure of the weight of the body upon this bone, already a little bent and twisted. But it is impossible for us to analyze strictly the muscular phenomena which are produced at the moment of the fall; and as it is also impossible to study them by experiments upon the cadaver and upon living animals, I am unable to tell you how and why, in consequence of this complex intervention of muscular action and the weight of the body, there is obliquity of the fracture and propulsion forwards of the upper fragment of the tibia.

Content yourselves, then, with knowing and remembering this capital fact; the most frequent displacement in fractures of the leg is the one you see here, a transverse displacement in which the extremity of the upper fragment projects forwards.

Let us now consider the practical question: Can this displacement be reduced, and will it be possible for us to keep it reduced, so that the patient may get well without a deformity due to the persistence of a transverse displacement? This problem is in great part solved for this patient. For yesterday I reduced the displacement in the following manner: I raised the leg from the wire splint in which it had been placed the evening before. With one hand I held the upper fragment; with the other, grasping the two malleoli, I drew them downwards, exerting what, in classical language, is called extension. As I felt a little resistance I asked an assistant standing at the end of the bed to help me make extension, grasping the instep with one hand, with the fingers upon the dorsum and the thumb upon the sole of the foot, and the calcaneum with the other. I asked him to

draw on the foot while I myself exerted traction with the left hand and made counter extension with the right. The projection having disappeared, we replaced the limb in the trough well lined with cotton; I satisfied myself that the coaptation continued; and, fearing lest in the manœuvre an angular displacement might have been substituted for the transverse one which we had just corrected, I looked to see if the foot was in a good position, drawing an imaginary line from the middle of the first metatarsal bone to the inner border of the patella. When the foot is in a proper position, this line is parallel to the axis of the leg.

As this condition existed, I concluded from it that the reduction had been well made. I asked the patient if he felt any painful pressure on the heel; he said he did not. For greater security I placed a supplementary pad of cotton behind the tendo Achillis above the posterior projection of the calcaneum, so as to diminish pressure on the latter—pressure which is the cause of the severe pain so much complained of by many patients with fracture of the leg. I completed the dressing with a bag filled with oat chaff placed upon the front of the leg, an anterior splint, and some straps with buckles. I examined the leg yesterday and this morning, and found, by passing my finger along the inner face and the anterior border of the tibia, that the fragments were kept in place. I have now no doubt that they will remain so until the end of the treatment. You will then have seen upon this patient one of the most frequent forms of fracture of the leg, that is, fracture with transverse displacement, reducible and easily kept reduced.

3d. What are we to think of the phlyctenæ and of the influence which they may have upon the course of the disease?

In themselves they indicate nothing bad. They are due to a singular modification of nutrition which follows traumatic perturbations. More frequent perhaps when the fracture is direct, they occur also, as you see in this patient, after the intervention of indirect causes. They accompany fractures of the leg much more frequently than those of other parts of the body. Why? It is absolutely impossible for me to tell you.

As to the influence which these phlyctenæ will have upon the course of the disease, I consider it very simple. I cut them open with the scissors, let out the serosity, and placed upon each of them a small piece of perforated linen; and, as the surface of the derm is neither very much bruised nor sloughy, I presume that they will dry promptly, without suppurating, and that in a few days they will be healed.

You will sometimes see phlyctenæ of the leg followed by suppuration of the derm for ten or fifteen days. You may also find under the raised epidermis an eschar, not comprising the whole thickness of the derm, but which nevertheless will have to be eliminated; hence a suppuration which may last long enough to necessitate a special dressing every morning and to oppose the application of the immovable apparatus. This suppuration of phlyctenæ, with or without eschar, is

seldom seen except in cases where there has been intervention of a direct cause and more or less violent contusion of the skin.

In short, the prognosis in this patient, as in the other, is favourable in this sense, that the cure will take place without persistent deformity. But it has this disadvantage, that, whatever we may do, the patient will be obliged to keep the bed for about sixty days, walk with crutches for from four to eight weeks, and then with a cane, slowly and limping, for a certain time. The most favoured adults, after a fracture of the leg, do not walk in a perfectly satisfactory manner before the end of four months.¹ Perhaps ours will not be such. Many conditions which we cannot foresee, but which nevertheless may easily intervene, may perhaps ultimately appear. Thus I advance the opinion that the callus will be solid and that mobility will have disappeared after 45 days. But who knows whether in them, as happens from time to time, and without our being able to know very well or foresee the reasons, 60, 75, and even 80 days, instead of 45, may not be necessary to obtain this result? Who knows also whether the tibio-tarsal and tarsal articulations will not remain painful and stiff for many months? I do not think so, because the patients are still young, and are neither gouty nor rheumatic, and because I have no reason to suppose the existence of a fissure extending into the articulation; but, whatever may be the favourable presumptions, you should know that in many cases fracture of the lower third of the leg is followed by an arthritis ending in a semi-ankylosis which long remains rebellious and painful during walking.

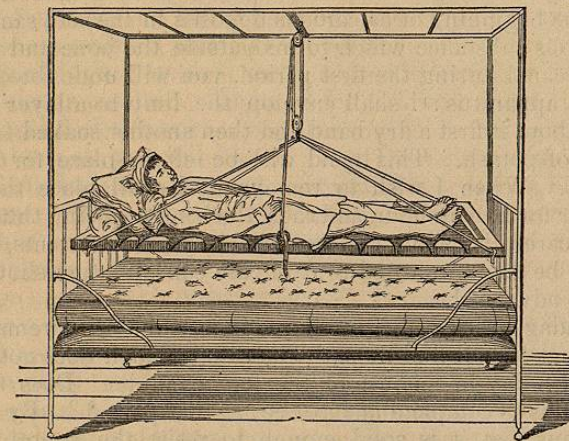
You have seen in what the *treatment* has thus far consisted. The leg is kept quiet in the wire trough by means of three canvas bands which are properly tightened and buckled in front over a splint, behind which is a chaff-bag. The foot is also fixed to the sole of the frame by a figure-of-eight bandage, the loops of which surround the apparatus, one opposite the lower part of the leg, the other opposite the foot.

Immobility is assured by means of the mechanical bed which we use for all fractures of the leg and thigh, and even for all painful diseases of the lower limb. The one which we use in the hospital is more simple but a little less convenient than those which we make use of in private practice, and it has the advantage of being easily arranged everywhere, even in the country. It is composed of a rectangular oak frame, the length and breadth of which are the same as those of the mattress. At about 18 inches from the upper end is fastened, by means of a hinge on each side, another smaller frame, intended to hold the pillow, and capable of being fixed at any angle. This smaller frame has but three sides, the one between the two hinges is lacking, and is covered with a stout piece of canvas. The corners of the large frame are furnished with stout hooks, and smaller ones are placed at intervals along the sides, by means of which sheets or strong sail-cloth bands, 6 to 8 inches wide, can be fastened upon the frame. Two

¹ In children consolidation takes place more rapidly. The muscles and articulations resume their functions sooner, so that they have scarcely any need of crutches, and at the end of two months walk quite easily.

cords, the four ends of which are attached to the corners of the frame, and a pulley, whose hook receives their loops, complete the apparatus. The upper pulley is attached to the ceiling, or to the frame of the bed in our hospitals.

Fig. 4.



Hospital Bed.

The patient is placed in the middle of the frame, which has previously been arranged with five or six bands. By means of the small frame his head can be raised for the purpose of eating or drinking, without causing the least sudden movement. If the bands are not properly placed, new ones can be easily substituted by raising the frame a little or by passing them under the patient as he lies, and attaching them to the hooks. By raising the frame with the cord and pulley, the wants of nature can be attended to, proper cleanliness observed, and the bed and bedclothes changed, all without giving the slightest injurious movement to the limb.

As our patients are young and healthy enough to endure without pain the prolonged pressure of the sacrum upon the bed, I do not use the water-bed, which, however, I should make haste to employ if, after a little while, they should complain of pain and sores in that region. I should have recourse to it at once if the patients were weakened by age or by anterior diseases.

The beds occupied by these two patients are in a well-lighted part of the ward. That is a point which should always be seen to. Light is necessary to the maintenance of good health, and good health favours the formation of the callus.

I saw at the Hôtel-Dieu, in 1847 and 1849, two patients who had been lying for six weeks in the darkest part of ward Sainte Marthe, and in whom a fracture of the leg was not at all consolidated. I had these two men placed in better lighted beds in the centre of the ward, and consolidation took place at once.

It is unnecessary to say that the patients will be nourished as well as possible, and that the limb will be examined from time to time to