

I shall undoubtedly not apply the silicated apparatus before the thirtieth day, and even if I then find marked mobility I shall not apply it at all, and shall continue to use the ordinary apparatus, examining it often, until the end of the treatment.

I have not thus far spoken of section of the tendo Achillis as part of the treatment of fractures of the leg with displacement difficult to correct, because this operation, proposed long ago by Laugier, seems to me useless in the transverse displacements to which I have called your attention. For of two things, one: either these displacements can be reduced and maintained by the aid of the measures which I have mentioned, in which case tenotomy would only add to the consecutive muscular weakness of the limb; or the displacement cannot be corrected, which is due, as I have told you, rather to certain peculiarities of the fracture than to contraction of the gastrocnemius; tenotomy, therefore, would be useless.

But in angular displacements forward which are so easily reproduced, it is allowable to think that the contraction of this muscle has a great influence, and that consequently division of the tendo Achillis by temporarily suppressing the cause would also suppress the effect. But I can support by no personal experience the advantages of this operation, for I have had no occasion to perform it, and the examples published by Laugier, who, according to Malgaigne, introduced this modification of the treatment, and by M. Meynier d'Ornans, are not numerous enough to bring conviction.

In a word, the procedure is not generalized in practice; is it because it has not been considered good, or because the particular class of cases to which it is appropriate, the one which now occupies us, has not been clearly indicated? I do not know; but it is for this reason, and also because I expect to succeed without it, that I have not had recourse to it. On one occasion, however, I keenly regretted not having employed it, for, notwithstanding all my care, my patient got well with an infirmity and a shortening which tenotomy would undoubtedly have avoided.

V. *Fracture with engagement of the point of the fragment in the thickness of the skin.*—Finally, gentlemen, I wish you to notice, in passing, the patient in No. 7, who presents a singular fracture of the tibia.

The point of the upper fragment is implanted in front in the under portion of the skin, that is to say, has *spitted* it without traversing its entire thickness. This case establishes the transition between fractures without wound and fractures with wound. You saw that I tried at once to withdraw the bony point from the skin, and in this case I succeeded quite easily with my hands alone and by the ordinary manoeuvres of reduction.

It is not always so, and once I had to draw the skin downwards with a double hook implanted on the sides of the point.

In another case all my efforts to disengage the point were unsuccessful. I then treated the fracture without occupying myself any further with this incident, and had the satisfaction of seeing that little by little the depression of the skin diminished; at the end of the treatment it was no longer adherent, the point had been reduced spon-

taneously. Remember this peculiarity if ever you have to treat a case of this kind. Try to disengage the point, and if you do not succeed, treat your patient as for an ordinary fracture.

LECTURE XIII.

COMPOUND FRACTURES OF THE LOWER THIRD OF THE LEG.

- I. Small wound. Diagnosis completed by the flow of blood and drops of oil. Possible termination without suppuration. After mild suppurating osteitis, and necrosis. After putrid and infecting osteo-myelitis. Importance of occlusion. Methods of practising it. Imbricated strips of diachylon plaster. Bands dipped in collodion. II. Large wound. Suppuration more difficult to avoid.

GENTLEMEN: We visited this morning, at No. 41, a man about 40 years old, who broke his left leg by a fall upon the ice. When he was picked up his stocking was found to be wet with blood; and after we had undressed him, and cut off this stocking, we found at the anterior portion of the leg, near the junction of the lower and middle thirds, a wound nearly half an inch long, through which a bony point projected slightly. Blood, mixed with drops of oil, flowed from the wound. There is also an abnormal mobility which leaves no doubt as to the existence of a fracture of both bones. But this fracture is complicated by a small wound with issue of the upper fragment.

This patient reminds you of two others whom we have seen during the year, and in whom you did not have the opportunity of seeing the projection of the upper fragment. In one of them the reduction had been made by the interne on duty the evening before our first visit. In the other the dressing was also made in the evening. The interne had not found the bone projecting, but as he saw a considerable quantity of blood escaping, and as by passing a probe carefully into the wound, he felt the denuded extremity of the fragment, he was convinced, and I shared the conviction, that the wound communicated with the fracture. But had this wound been made, like the two preceding ones, from within outwards by the fragment itself, or, on the contrary, from without inwards by some external vulnerant body? There we had to deal only with probabilities, and it is so in most cases of this kind; certainty almost never exists. The probability that the bone was the vulnerant body is based upon the narrowness of the wound, and the absence of a severe contusion, such as would have been produced by a blow. Still, this question is not of capital importance. The wound was not quite half an inch long, its edges were not bruised, and its condition was favourable for immediate union, which is the essential point. Let us here recall the case of another patient.

Toward the end of last year I called your attention to a patient, who, with a fracture, probably toothed, at the junction of the middle and lower thirds of the leg, had on the anterior and outer portion of the limb a wound through which no one had seen a fragment project, and through which a probe, passed with all the precautions indicated in such a case, had not reached the fragments or the intervals between them. Was the wound in communication with the fracture, or was it independent? We had two reasons to think that it communicated: the first was that from the information furnished us, and from the quantity of blood that had soaked into the dressing during the fifteen hours that had elapsed between the patient's admission to the hospital and our visit, we saw that the wound, although small, had bled a great deal, but without the interrupted spirt and the bright colour which characterize arterial hemorrhage. Wounds occupying the soft parts do not bleed so freely and for so long a time, unless an artery is wounded, and that, I repeat, is not the case here. On the other hand, when the wounds communicate with a fracture the fragments always furnish a large quantity of blood which comes from the capillaries of the periosteum, from the bone itself, from the marrow, and from the nutrient arteries. It is this abundance of blood which causes the effusions and infiltrations of the first days, the extensive ecchymoses which you see increase during the first two or three weeks, and which disappear so slowly.

The second reason for believing in the communication was the presence of drops of oil in the blood which flowed the first day. I admit that this is not a pathognomonic sign; I know, and I should warn you that the fat of the subcutaneous cellular tissue can supply drops of oil to the blood of a recent wound interesting only the soft parts; but these drops appear only in small quantity and for a short time, especially when the wound is small. On the other hand, the marrow of the bone, the fat of which is more liquid, furnishes more and for a longer time when it has been torn. That is why the appearance of oily drops in the blood of small wounds coinciding with a fracture, ten, twelve, or fifteen hours after the accident, is a strong presumption in favor of the opinion that the fracture is compound, that the wound communicates with it. When the flow of blood is moderate, and the oily drops are not found, we have to remain in doubt, and incline towards the opinion which involves the treatment most favourable to the patient. Admit, in such a case, communication, rather than not. There is no disadvantage, if the wound is independent, in treating it as if it communicated, and there are very great ones in treating it as independent if by chance it communicates.

But to return to our patient: I reduced the fracture very easily, and was able to replace the point of the upper fragment which is on the anterior border, and does not indicate a V fracture. Here, then, is a patient with a nearly transverse wound one-quarter of an inch long, about which the skin is probably loosened for a certain distance, and which communicates with the seat of the fracture, a sort of accidental cavity limited by the fragments, and filled with liquid

and coagulated blood. What would happen if we should leave the wound in the state in which it now is, and occupy ourselves only with the ordinary treatment of the fracture? One of the four following things:—

Either the wound, being narrow and but slightly bruised, would heal promptly and without suppuration. In three or four days the fracture would be no longer *exposed*, and would advance to a cure like any other simple fracture.

Or the wound would not heal by first intention; it would suppurate, but the suppuration would be limited to its edges and would not extend inwards to the seat of the fracture, the deeper layers of the soft parts having united immediately and opposed a barrier to the extension of the suppuration towards the deep parts. In this case the fracture would also heal like a simple one.

Or the suppurative inflammation starting from the wound, immediate union of which had not taken place, would extend further and further towards the seat of the fracture, that is to say, to the bones, and especially the tibia, whose greater size renders its suppuration more important and more dangerous; the suppurative inflammation would invade, in all probability, all the constituent parts of the bone; periosteum, compact substance, and medullary substance. In a word, osteitis would supervene, or rather—uncomplicated, mild, suppurating osteo-myelitis of acute or subacute form; we should have as local symptoms of this disease:—

1st. During the first few days a diffuse and painful swelling of the limb, and the development of a more or less intense fever which we have called, since Dupuytren,¹ *traumatic fever*.

2d. A little later, and for a long time, an abundant suppuration following subcutaneous or intermuscular diffuse phlegmons, a necrosis keeping up fistulæ until elimination of the mortified parts has taken place, and finally cure with one of those more or less considerable hyperostoses, of which I shall have occasion to show you examples.

Or finally, the suppurative inflammation extending to the bones would there take on the form which I call putrid or infecting osteo-myelitis, which differs from the preceding one by two capital characteristics:—

1st. By the formation of eschars and the putrid decomposition of the blood upon the soft parts of the wound, and especially by the gangrene and the decomposition of the medullary substance and the extravasated blood in the medullary canal, and in all the canaliculi which have been opened by the solution of continuity.

2d. By the coincidence, with this putrid decomposition, of an intense fever during the first few days, with a pulse of 120 or 130, and an axillary temperature of 104°, headache, thirst, sometimes delirium, and, later, purulent infection.

Do not forget, gentlemen, that by the very fact that a patient is exposed to suppuration of the bone, he is exposed to this putrid and

¹ Dupuytren, *Leçons orales*, tome vi.

malignant variety of acute osteitis and the consequences I mentioned, especially to death by purulent infection, which happens more often than death by traumatic fever, the latter being really primitive putrid infection, while the other is consecutive or secondary putrid infection, and the hecticcy, which sometimes occurs still later, may be considered as a tertiary putrid or septic infection.

But perhaps you would ask me the following question: If this man is threatened with an acute suppuration of the bones, have you any reasons for hoping that this suppuration will take on the mild rather than the malignant form, or for believing rather in the development of the latter, and of one of the varieties of dangerous septi-cæmia which you attribute to it? I can reply only with presumptions.

If the patient was in the country, if he was not in a hospital, if I was sure that he was not given to drink, I would reply: Yes, his wound, in itself, exposes him to acute suppurating osteo-myelitis, but there are, in the circumstances mentioned, reasons for hoping that this suppuration will not take place, or that, if it does, it will remain simple and mild, or, if you prefer, non-putrid and non-infecting. But, on the one hand, the atmospherical conditions in which he now finds himself, and on the other, his previous life in a great city, his exhaustion by fatiguing labour, his alcoholic habits, his present position in a ward charged with nosocomial emanations, are so many unfavourable circumstances which predispose him to suppuration of the bone and to the putrid and gangrenous form of this suppuration. It is true, that this predisposition exists only in a certain measure, and I cannot tell you just what that measure is. For above all these causes one other is needed which is purely individual, and which is inherent to the constitution and to its aptitudes. Multiple as are the causes of which I have spoken, it may be, nevertheless, that the constitution does not favour suppuration of the bone and especially putrid suppuration. On the other hand, moderate as may be all the occasional causes, the constitution may be one of those which engender pus and putridity easily, notwithstanding all that is done to prevent, and it is because we are in the most absolute ignorance upon these individual aptitudes which annihilate or fortify the action of all the other causes, that I cannot say what will happen. I tell you what is possible, but I cannot tell you in what degree it is possible.

The only thing which I wish to fix in your minds is that a wound, even a small one, which complicates a fracture of the leg, exposes it to suppuration and all its possible consequences; dangerous traumatic fever, suppurative, acute osteo-myelitis, purulent infection, hecticcy, or necrosis, and slow cure with a deformed and painful callus.

But there is one circumstance which diminishes the gravity of the prognosis in the case of our patient. All that I have just said is under the inexact supposition that we should not try to do anything for the wound. But, on the contrary, we shall treat it with great care, and I hope that our efforts will meet with success, and that we shall prevent suppuration of the bones and its consequences. I have the more reason to expect this result because the wound is small, its edges are not bruised, and there are no eschars to be eliminated. Under such

conditions I have every reason to hope for immediate union and a cure without suppuration.

The means by which to obtain it are very simple, and yet it is only within the last twenty years that they have been well understood, formulated, and applied.

The surgeons of the seventeenth and eighteenth centuries advised, it is true, that the wound should be closed by means of agglutinatives, but they devoted themselves above all to the reduction of the fracture, as Boyer's article on compound fractures¹ will show you. They thought little about the wound, they indicated neither the mode of application nor the length of time during which the agglutinatives should be kept on, and, furthermore, they possessed only insufficient ones which softened in contact with the blood and became loose the first or second day after their application, and did not keep the edges together long enough to prevent suppuration. Consequently the surgeons of the beginning of the nineteenth century did not comprehend the precept sufficiently to apply it vigorously. Led away by the ideas which ruled at that time about inflammation, they tried to moderate it by various topical applications, hoping thereby to prevent it from becoming suppurative. Poultrices, leeches, upon the injured limb, systemic bleeding, diet, in a word all that constituted antiphlogistic treatment, was recommended, and the dressing of the wound was made of secondary importance, consisting in the application of a piece of diachylon or court-plaster, which met only temporarily and incompletely the main indication, that of keeping the edges of the solution of continuity together, and protecting them as long as possible from contact with the air.

It was still with the hope of moderating the inflammation that A. Bérard, Breschet, and many others after them, had recourse to continuous irrigations of cold water, and Baudens to refrigeration by means of ice. Undoubtedly they sometimes succeeded with these means when the wound was a small one; but they often failed, while, on the contrary, with the dressings which we have at our disposal today, success, that is to say, non-suppuration, is the rule, and failure the exception.

To M. Chassaignac² belongs the merit of distinctly formulating this surgical point under the name of *occludent dressing*. This dressing consisted, when its author recommended it, of small strips of diachylon overlapping and crossing one another over the wound, the edges of which had previously been brought as well together as possible. He placed several layers, one over the other, so as to form a sort of cuirass, and left it all in place for ten or twelve days.

But the occludent dressing has been singularly improved by the use of collodion. With this substance we make an apparatus which dries rapidly and remains firmly attached to the skin without becoming soft or wet by contact with organic liquids. The pieces may

¹ Boyer, tome iii., 1st edition, p. 68.

² Chassaignac. Des Opérations applicables aux Fractures compliquées de Plaie. Thèse de Concours pour la Chaire d'Opérations et Appareils, Paris, 1850, and *Traité de la Suppuration et du Drainage*, tome i. p. 514.