

no other word than interlocking. This is not exactly the case to-day; for the projecting portion of the upper fragment is so voluminous that it has evidently abandoned, at least in great part, the lower fragment after having split it. It may be, however, that the posterior portion of the first is adherent by some irregular points, and by means of adjoining fragments, and that these prevent reduction. It is probable that the principal obstacle is caused by muscular resistance, as in a certain number of fractures of the shaft of the femur, while the obliquity of the main line of the fracture, and the pulverization and packing of the cancellous tissue of both fragments, favor and render irremediable the shortening produced by this muscular action.

I do not mean to say that all supra- and inter-condyloid fractures are as irreducible as this one is. I say only that it is quite frequent, and that in our present patient it is as marked as possible.

You understand the prognosis: the patient will recover with considerable shortening, and the arthritis will be all the more severe, prolonged, and likely to end in ankylosis, because, on the one hand, the fracture communicates with the articulation, and on the other, the age of the patient predisposes to prolonged arthritis and ankylosis.

As to the treatment, it will consist of repeated attempts to make reduction, and of the application of a Scultet bandage which I shall maintain so long as the abnormal mobility lasts. I fear the consolidation will be slow, because only a small part of the upper fragment is in contact with the lower one, and this disposition is not favourable to the formation of a callus.

III. *Supra- and inter-condyloid fracture with wound and projection of the end of the upper fragment. Amputation of the thigh.*—The patient whom we saw at No. 25, and who is 51 years old, was caught yesterday by the caving in of some earth, and, after a moment's struggle, was overthrown, feeling at the same time severe pain in his left knee, but without knowing how or in what position the knee was injured.

We find the parts in the following condition:—

Through a wound in the anterior portion of the thigh above the patella, projects the upper fragment of the femur, which ends in a hard point. About this wound there is no ecchymosis and no effusion of blood. The articulation is swollen and fluctuating. There is very marked lateral mobility, and an enlargement of the transverse diameter of the knee, with inability to move each condyle separately, backwards and forwards.

We have evidently here, a compound supra-condyloid fracture with issue of the upper fragment. I add, that for the moment this fragment is irreducible, for I have made fruitless attempts to return it to its place. It is also very probable that the fracture is at the same time inter-condyloid, and that consequently the external wound communicates both with the seat of this fracture and the cavity of the articulation. My reasons for thinking so are, the broadening of the knee, the abundant and rapidly formed effusion within the articulation, the form of the upper fragment which is well fitted to penetrate and act like a wedge, and finally the age of the patient. This diagnosis leads to a very serious prognosis.

A large wound like this will inevitably suppurate, and it is also inevitable that the suppuration will extend to the fragments of bone and the articular cavity. Now this suppuration in a hospital, upon a man who is quite old, has every possible chance of terminating in putrid infection during the first few days (grave traumatic fever), or in purulent infection, and in any case by death. Although amputation of the thigh is also dangerous, and although amputation for a traumatic cause especially yields only rare successes, yet I consider that this operation is a little less likely to be followed by death than an attempt to preserve the limb would be. That is why I prefer amputation: the patient accepted it, and we shall now perform it.

This will be an amputation of the kind which M. Hip. Larrey called *primitive*, that is, one which is performed before the development of the traumatic fever. If we should wait until this evening or tomorrow, this fever would undoubtedly be established, and the patient would be in a much less favourable condition.

(We found on examining the piece, that the fracture was inter-condyloid as well as supra-condyloid, and that consequently the wound and the seat of the fracture communicated with the articulation. The patient succumbed on the twelfth day, to a purulent infection which succeeded a very intense traumatic fever.)

LECTURE XXIII.

SPONTANEOUS FRACTURES, AND ITERATIVE FRACTURES OF THE SHAFT OF THE FEMUR.

- I. Considerations upon spontaneous fractures—They are due to an abnormal fragility—This is caused sometimes by a cancer, sometimes by a rarefying osteitis, sometimes by premature senile rarefaction—Case of a patient affected with spontaneous sub-trochanteric fracture of the femur—Robert's analogous case—Another case in the Hôpital Cochin. II. Iterative fracture of the left femur, due to not keeping the bed long enough—Means of avoiding this accident.

GENTLEMEN: I. *Spontaneous fractures.*—We have the habit of giving the name *spontaneous* to fractures which are produced so easily that they seem to occur without the intervention of any appreciable cause. Notwithstanding our habit, this designation of spontaneous is not absolutely exact, for in reality we can always attribute the solution of continuity to muscular contraction or the weight of the body. But when it is a question of a bone so voluminous and so strong as the femur, of a bone which serves for the attachment of powerful muscles, and to support the body when standing or walking, you will admit that it is allowable to consider as almost spontaneous

fractures which have no other cause than the accomplishment of the functions of this bone.

It is sufficient to consider the physiological resistance of the femur to understand that if in certain exceptional cases it yields so easily, it is because this resistance has been weakened by a modification of its structure.

This is very evident when the fracture is consecutive to an osteo-sarcoma.

I saw, for example, at the Hôpital Cochin, in 1857, a woman 60 years old, who had been admitted for a tumour, larger than the fist, occupying the entire circumference of the right femur, and which we had recognized as a cancer of this bone. A few weeks after her admission to the hospital, they told me, one morning, that she had complained during the night, after a movement to turn in bed, of a very sharp pain, and that since then the pain had not ceased. On reaching her bed I found her with the foot and leg in outward rotation, and with very marked mobility at the point occupied by the tumour. There was no doubt that the cancer had gradually destroyed the bone, and that at last the femur was no longer strong enough to bear without breaking even a movement in bed.

I saw a similar case at the Hôpital des Cliniques, in 1848, in a man 65 years old, who had broken his left femur while getting out of bed, without any other accident, and in whom the fracture took place at the seat of an old cancerous tumour which occupied the femur and had been indolent up to that time.

But the explanation of the loss of strength by the femur at some point in its length is more difficult to give in cases like the one before us, in No. 10, Ward St. Louis (Hôpital de la Pitié).

The patient, 30 years old, of vigorous appearance, has been under treatment here for more than 80 days, and in another fortnight will leave us to go to Vincennes.¹

When we first saw him he was in a medical ward where he had been placed because they had no reason to suspect the existence of a surgical lesion. He told us that while walking tranquilly across the Grenelle bridge, and without having made any false step, he felt a sharp pain at the upper part of his left thigh. He then sank down gently, and waited until two passers-by came to help him.

Finding himself unable to walk, he was carried to the Central Bureau, and thence forwarded to a medical service for this pain which was supposed to be rheumatic.

Having been asked to examine him, I found rotation outwards, shortening of the limb to the extent of an inch, and abnormal mobility with crepitation in the upper third of the thigh below the trochanters. The patient was then brought to my ward, later examinations confirmed the first impression, and it became more and more evident that this man (who before this time had not been lame, and had a well-formed limb) had suffered while walking, without falling,

¹ A succinct account of this case was published in the Gazette des Hôpitaux, 5th April, 1862, p. 158.

and without having received any external violence, a sub-trochanteric fracture. He assured us, moreover, and those who brought him here confirmed the statement, that he was not intoxicated at the time of the accident, and that he was perfectly aware of all that took place. We were then justified in believing that this was a spontaneous fracture. But was not this fracture the consequence of a cancer? We felt no appreciable tumour. If there was a cancer, it was one of those hidden ones of the medullary canal which it is permitted to suspect, but the existence of which can be demonstrated by no physical sign.

Moreover, the age of the patient and his vigorous constitution dismissed the idea of a cancerous affection. But if it was not a cancer which had weakened the femur, it must have been another lesion; what was it? Search through the records left by our authors does not enable me to give you a precise answer; for they have not attempted to explain the cause of the fragility of certain bones, and they were not able to do so, for the simple reason that examples of it are very rare. In those which have been presented, no autopsy has been made; it was necessary to be satisfied with the clinical fact which, in itself alone, as in our present case, did not clear up the pathogenic question.

Malgaigne spoke of a peculiar osteitis which causes fragility of the bones, and explains these fractures which are so easily produced. But, as I shall have occasion to tell you when speaking of other fractures by muscular contraction, I would believe in the intervention of this osteitis if our patient had suffered for any length of time. Malgaigne appears to have observed these spontaneous fractures in patients who had had these sufferings, and that is what justifies the expression of the opinion. I was able to attribute the fracture to an osteitis in the case of a patient of whom Alph. Robert spoke in his lectures,¹ and whom I treated at the Hôpital Cochin, because this patient had had for two years continual pains in his lower limbs.

But when, as in our present patient, there has been no pain of this kind, must we admit, nevertheless, rarefying osteitis? I think not. For if I understand rarefaction of bony tissue coinciding with an osteitis, I also understand, very well, rarefaction without osteitis, and by a peculiar vice of nutrition analogous to that caused by age, whence the name *premature senile rarefaction* or *alteration* which you have heard me use quite often.

Is there not, at least in this patient, some constitutional cause which might explain the rarefaction? I know none. I have given particular attention to the possibility of constitutional syphilis. Now, on the one hand, it is claimed by nobody that syphilis causes fragility of the bony tissue; on the contrary, it rather increases their solidity by producing hyperostosis and exostosis; on the other hand, our patient shows no trace of syphilis, and says he has never had it. It was the same with the case at the Hôpital Cochin. It is true that I gave him the iodide of potassium; but I administered it as a forti-

¹ Robert, Conférences de Clinique Chirurgicale, 1860, p. 498.

fyng and not as an antisyphilitic measure. It was the same in Robert's case.

I call your attention to another point.

This fracture occupies the upper third of the shaft, and deserves the name of sub-trochanteric.

It occupied the same place in my patient at the Hôpital Cochin, and also in Robert's patient. Has the upper portion of the shaft of the femur a special predisposition to this singular alteration of nutrition which causes fragility? Three cases are not enough to give us any certainty upon this point, but it is allowable, at least, to mention the peculiarity.

Prognosis.—When I began the treatment, I did not know if we should get consolidation. For if the fragility had been due to a hidden cancer, the callus undoubtedly would not have formed, and in case of premature senile alteration, there was also reason to fear that materials for the callus would not be furnished, or would not be properly elaborated at this affected portion of the skeleton.

Still, as the callus had formed in my patient at the Hôpital Cochin and in Robert's, and as this patient was of a vigorous constitution, I had no reason to despair.

The fact is that the consolidation was obtained in the ordinary length of time, and that to-day, three months afterwards, not only do I no longer find abnormal mobility, but I feel a large strong callus, which makes me think that at the place occupied by the bony alteration, the traumatic inflammation excited a nutritive movement, and restored, perhaps even in excess, the normal strength of the bone,¹ that is, notwithstanding the presumed pre-existing rarefaction, this traumatic osteitis has taken on the condensing form which we see so often after fractures of the long bones.

The fears which I might have had on the subject of non-consolidation have been justified by the case of a patient whom I have since seen at the Hôpital de la Charité.

It was a woman 52 years old, much more feeble and broken down than is usual at that age. A few months before her admission to the hospital she had broken her right humerus by a very simple fall from a standing posture, and had recovered; a little later she had broken the shaft of the left femur below the trochanters, as in the three patients of whom I have spoken, and so easily that she did not know exactly to what accident to attribute it. For she had fallen three months before in her room while walking slowly towards the window, and a few weeks afterwards, while turning in bed, she had felt very sharp pain in her thigh, and she was unable to say whether it had been broken by this latter movement or by the antecedent fall. However that may be, the thigh presented shortening, rotation outwards, and very marked abnormal mobility, symptoms either of a fracture still too recent to have become consolidated, or of an old non-consolidated fracture. This woman died of exhaustion in May, 1868.

¹ This patient came to see us two months afterwards at the consultation; he walked with a cane and still had a very solid callus.

We found at the autopsy, below the trochanters, a false articulation, consisting of a fibrous sleeve, quite thick but not ossified, in the cavity of which the two fragments were found at a certain distance from one another.

It is evident that the fracture dated from the first accident of which she had told us, and that it had not consolidated. Above and below the vacuoli of the cancellous tissue of the femur were very notably enlarged, the compact tissue was thinned, and a moderate pressure was sufficient to split the bone which was remarkably fragile in consequence of the absorption of a part of its bony substance. There was no trace of cancer of the bone. The right humerus, which had a solid callus with obliteration of the medullary canal, was nevertheless very fragile below the fracture.

We had then, in this case, the example of two almost spontaneous fractures; one of the humerus which had been followed by consolidation; the other of the femur which was not consolidated; hence the conclusion that in cases of this kind consolidation is possible, but may also fail.

II. *Iterative fracture of the left femur.*—I called your attention to No. 2, a young man 19 years old, who has been under treatment here for 50 days, for fracture of the shaft of the femur below its centre. As the callus seemed to be very solid on the 45th day, and as I no longer found any abnormal mobility, and as, furthermore, I did not wish to keep his knee immovable for too long a time, I removed the Scultet bandage. But I had expressly told the patient not to get up, intending to keep him in bed until the 70th or 75th day, and then to make him begin with crutches. But this is what happened: the day before yesterday, the 48th day since the accident, he got up and walked a short distance, supporting himself on the adjoining beds. He slipped, fell, and broke the callus. The next morning we found abnormal mobility and crepitation as at the beginning, and the patient was again unable to raise his heel from the bed. I reapplied the Scultet bandage, prescribed 30 grains of the phosphate of lime to be taken twice a day, and told the patient he would have to remain in bed for three months.

This is not the first time I have seen this rupture of the callus, or iterative fracture; I saw two other examples of it a few years ago; one at Cochin, the other at Beaujon, and both of them were young men whose apparatuses I had removed about the 50th day, forbidding them to leave the bed, but both had disobeyed and had fallen in the wards.

The first thing to be remembered from these facts is that the callus may acquire by the 45th to the 55th day, sufficient solidity to prevent communication by our hands of the movements which are pathognomic of the persistence of the fracture, but nevertheless not be solid enough to bear either the weight of the body or an inflection during a fall.

For you observe that I do not know if, in my three patients, the fracture was produced by the fall, or if the fall was the consequence of the rupture of the callus under the influence of the weight of the

body. However that may be, the practical conclusion is that the patients must not be allowed to get up as soon as we find immobility, and we must wait for at least the 70th day before allowing them to leave the bed. Until that time, the callus, although it no longer shows abnormal mobility, is still too fibrous or too little bony to resist an unexpected impulse or inflection. For it is only peripheral and not interfragmentary.

Let us remember another fact, that these iterative fractures are to be feared, especially in young people (and it would undoubtedly be the same for children). The callus certainly forms a little more rapidly at this age than in adults, but it needs, none the less, from eight to twelve weeks to obtain the solidity necessary for walking. Now, we can easily persuade an adult to remain in bed a fortnight after the apparatus has been taken off. During this time, we use friction, massage, and, communicated movements, to correct the stiffness of the knee and foot.

But it is much more difficult to keep a young man in bed after he has been relieved of the restraint of his apparatus, and you must not expect them to obey your instructions upon this point. Consequently the wisest plan in their case is to leave the apparatus in place until the 65th or 70th day, while in adults upon whose reasonableness you can place more reliance, you may remove the apparatus from the 50th to the 60th day, and let them walk a fortnight afterwards. The disadvantage of the more prolonged immobility in young people is compensated for by their lesser aptitude for ankylosis and the prolonged stiffness of the concomitant traumatic arthritis.

In children, until the age of fifteen years, I advise you not to leave the apparatus on longer than the 45th day, because consolidation goes on more rapidly; but it is still prudent, in order to avoid iterative fracture, not to let them walk, even upon crutches, before the 60th day.

You will not often have occasion to see the callus break a second and a third time, because, warned by the first rupture, you will take care to recommend sufficient rest in bed and phosphate of lime, which will ensure a solid recovery. If, however, the patient does not obey your instructions, the fracture of the femur may be reproduced three or four times.

I was consulted in 1864 by a young man from Saint-Pierre-Calais, 25 years old, who had broken his left femur six times in the course of twenty months. A remarkable fact in the case was that the fracture did not occur when he began to walk, but from the 8th to the 15th day afterwards, and generally in consequence of a slight effort, either to save himself from falling, or to run. Once, indeed, the fracture took place while he was dancing. Each time the patient had been allowed to get up on the 45th day. He had reached the 40th day of his sixth and last accident, when his father came to Paris to consult me upon the means of preventing these iterative fractures. I told him to keep on the Scultet apparatus, which had been applied, for two entire months, and not to allow the young man to leave his bed until the end of the third month, and to give phosphate of lime

during the whole time. These prescriptions were followed and the fracture was not repeated.

I saw the young man himself in November, 1869, at Saint-Pierre, where I had been called to see another patient. He had remained perfectly well, but with a shortening of $2\frac{1}{4}$ inches, a limp, and the necessity of using a cane, all of which did not prevent him from walking a great deal, even for several leagues at a time, without difficulty.

LECTURE XXIV.

FRACTURES OF THE LOWER EXTREMITY OF THE RADIUS.

Consecutive and late phenomena. I. First patient on the fiftieth day of the fracture—Study of the shape and functions—Rigidity of the articular synovial membranes, due to arthritis by proximity in the wrist, and arthritis by immobility in the fingers—Rigidity of the tendinous synovial membranes. II. Another patient (woman 69 years old, ninetieth day)—Slower and perhaps impossible recovery from the same rigidities on account of her advanced age.

GENTLEMEN: I have brought to the amphitheatre, that you may all see them better, two patients who have been treated in our wards for fractures of the lower extremity of the radius. One of them is a man 38 years old, the other a woman 69 years old.

I. The first has reached the fiftieth day of his accident. I treated him for five days with poultices, and at the end of that time applied Malgaigne's apparatus, which you often see me use, with a cotton cushion upon the posterior part of the lower fragment, and another upon the anterior portion of the upper fragment; over these a graduated compress, and a splint upon the palmar surface of the forearm and hand, and graduated compress and splint upon the dorsal surface; the whole kept in place by means of three bands of diachylon a yard and a quarter long and an inch wide. Of course before applying this apparatus I had done my best to make reduction by the manoeuvres of extension, counter-extension, and coaptation. You remember the bandage was removed a fortnight after its application, that is, the twenty-first day after the accident, and that the patient left us three or four days afterwards.

He returns to-day, the fiftieth day after the fall, to consult us for persistent trouble in the hand. I call your attention to two principal points; the shape and the functions.

1. *The shape of the wrist and forearm.*—At the wrist our eyes detect no irregularity and no trace of the characteristic silver-fork deformity which existed at the beginning. But by comparing this region with that of the other side, we find it is a little larger, and if we then feel