

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

of it, so as to better appreciate the difference, we find under the skin a superficial and general induration which can be due to nothing else than the swollen radius. We have then here another example of that variety of bone lesion which so often follows suppurative or non-suppurative osteitis, and which we find especially in non-scorfulous subjects, that is, hyperostosis. I next compare the relative positions of the two styloid processes, and find them the same upon both sides. I therefore infer that the styloid process of the radius, which underwent a slight ascension at the time of the accident, has been restored to its place by our manœuvres to make reduction, and has remained there. I am pleased with this result; for in many cases, after fracture of the lower extremity of the radius, the styloid process remains higher up the arm, so that its point is upon the same transverse line with that of the ulnar. The reason of this is that, the fracture being with penetration, the two fragments cannot be separated from one another at the moment of reduction, or else that, reduction having been made, absorption of that part of the spongy tissue which was most crushed at the time of the accident has taken place between the fragments before consolidation. I suppose that in our patient, who is still young, the spongy tissue had not undergone before the accident the rarefaction which predisposes both to reciprocal penetration in cases of fracture and to considerable attrition. That is why the radius has recovered almost its normal length. I find in this condition of affairs the advantage that the articular surfaces of the lower radio-ulnar articulation are not so much deformed as when there is permanent ascension of the lower fragment and diminution of the length of the radius. This condition is favourable to the ultimate restoration of the movements of this articulation.

Finally, to finish with the shape, I ask you to compare the volume of the two forearms. The left one is a little smaller than the right, and the difference is due to the smaller size of the muscles. This then is another example of the slight and unimportant, but still real, muscular atrophy which follows almost all fractures of the long bones, and of which I so often have occasion to speak.

2. *The functions.*—As for the functions, you see that this man can execute without pain the movements of flexion and extension of the wrist and fingers. But you also see that these movements, especially those of flexion, are more limited than in the normal condition, and that in this respect they are far from being what we desire. The patient also says that he has but little strength in his hand, can carry nothing with it, and uses it very little, even in dressing himself. I now ask him to make the rotary movements which give pronation and supination, and you see that they are incomplete, that they scarcely take place at all in the lower radio-ulnar articulation, and that they are executed almost exclusively at the shoulder.

How can we explain this diminution of the movements and the weakness of the limb which is the consequence? It is not due to the insufficiency of the muscles; for, on the one hand, the atrophy of which I have spoken is slight, and, on the other, we often see atrophy of this kind, and we know that it does not diminish the extent of the

movements, since the muscular fibres continue to receive from their nerves, which have remained intact, the impulse necessary for their contraction. That which explains this functional trouble is especially the rigidity and the insufficient extensibility of the articular and tendinous synovial membranes. As for the first, those placed near the rest of the fracture have participated in the inflammatory process, and have lost, in consequence of the traumatic inflammation of which they have become the seat, a part of their extensibility and suppleness. These are the radio-carpal, the carpal, and lower radio-ulnar synovial membranes. The others, placed further from the fracture (I refer to those of the fingers), have not been inflamed in consequence of their proximity; but we have the right to believe that they have become altered and modified as a result of their immobility. You remember that M. Teissier, of Lyons,¹ published a work upon the effects of prolonged immobility of the joints. But he did not make a distinction between the large and small articulations. Now, the first may remain immovable for several weeks, and even for several months, without losing the natural suppleness and extensibility of their synovial membranes. Notice patients who have had a fracture of the leg or of the thigh: the knee-joint in the first, and the hip in the other have remained immovable for a long time, and yet the moment you cease the treatment you can communicate extended movements to them, and without finding much resistance. The large articulations become rigid only when consecutive inflammation has invaded them, as takes place quite often in the tibio-tarsal articulations after fractures of the leg, and always in those of the knee after fractures of the thigh.

It is not the same for the small articulations of the fingers. They are too far from the radius (and, moreover, the same thing follows fracture of the shaft of the forearm or of the humerus) for us to admit the propagation to them of the phlegmasia developed at the seat of the fracture. If they become rigid, it is the immobility alone which is the cause. In consequence of their inaction, their synovial membranes have become dry and shrunken, and have lost their suppleness. That is why they oppose flexion of the fingers; and if a little force is used, the stretching to which they are subjected causes pain.

As for the other synovial membranes, those of the tendons, it is probable that that of the extensor tendons behind, and the great carpal one of the flexors in front, have been attacked in consequence of their proximity to, and by propagation of the phlegmasia which is developed at the fracture, and that, consequently, they have become rigid. I do not deny that the immobility may have contributed to a certain extent to this result. But basing the opinion upon the fact that immobility alone does not cause rigidity of the large tendinous synovial membranes when a centre of irritation, like a fracture or dislocation, is not near them, I am inclined to believe that most of the rigidity is due to synovites by propagation.

Do not be surprised at these results, gentlemen; they are very com-

¹ Teissier, Gazette Médicale, 1841.

mon, and you will often meet with them in practice; indeed, you must even take care to forewarn your patients of them, that they may know that the difficult movements of which they will have to complain for a long time after fracture of the lower extremity of the radius, are not due to insufficient or unskilful treatment, but are a consequence of the disease itself.

Moreover, I tell them not to worry, for all these functional troubles will disappear in time. The articular and tendinous synovials will recover their polish and then their suppleness by use, and it is very probable, if I may judge by the facts of the same kind which I have observed, that in three or four months the movements will have recovered their natural extent and ease. Those of pronation and supination will be the slowest to return, but I expect their perfect return all the more confidently, because the radio-ulnar articular surfaces are not notably deformed. This relatively favourable prognosis is further justified by the fact that the patient is young and not rheumatic; you remember that those are favourable conditions.

As for therapeutical advice, I shall tell the patient to communicate moderate movements with the other hand to the fingers and wrist, and to apply friction every morning and evening with pure lard, or lard mixed with alcohol, and to take two sulphur baths every week.

II. The other patient is a woman 69 years old. Her fracture was received three months ago, and you can see that notwithstanding the length of time that has elapsed, the shape and functions leave much more to be desired than in the preceding case.

First, the silver-fork deformity is still quite marked, although at the time of the accident I made the manœuvres of extension, counter-extension, and coaptation, and employed the same apparatus as for the other. Moreover, the styloid process of the radius is higher than it should be. Its summit is on the same transverse line as that of the styloid process of the ulna. What is the reason of this faulty conformation? It is due to two causes: first, to this that the age of the patient having caused rarefaction of the cancellous tissue of the lower extremity of the radius, this tissue was crushed by a fall upon the hand, and then, as described in the excellent study of this accident by M. Voillemier,¹ the fragments penetrated one another, and became so interlocked, that my efforts were powerless to change their reciprocal positions. Second, it is probable that part of the crushed bony tissue was afterwards reabsorbed, which would diminish the chances of a permanent return of the lower fragment to its proper place. Consolidation, nevertheless, took place, because, as I have often told you, consolidation goes on well and rapidly in the cancellous tissue of most long bones (I except intra-capsular fracture of the neck of the femur); but the callus has remained irregular for the reasons which I have just given.

As for the functions, you heard this woman complain of pains which she feels when at rest, and which increase when she tries to move the wrist and the fingers. Voluntary movements are very

¹ Voillemier, Archives Générales de Médecine, 1842, tome xiii. p. 261.

limited, as much on account of the pain which they provoke as by insufficiency of the muscles. I try to communicate movements, and I find that they have but little extent, and are stopped by an obstacle which cannot be overcome. It is very probable that this obstacle is the painful rigidity of the articular and tendinous fibro-synovial tissues. This is already very marked in the radio-carpal articulation, and is still more so in the phalangeal and metacarpo-phalangeal articulations. Pronation and supination are also much hindered. In short, this patient cannot use her hand for any of the ordinary purposes, although it is evident that the muscles are not paralyzed.

Why this powerlessness? How long will it last? What can we do to suppress or diminish it?

I have already given the explanation. There has been arthritis of the radio-carpal and inferior radio-ulnar articulations near the fracture. This arthritis has passed to the chronic condition, leading to the retraction of the synovial membrane and of the surrounding fibrous tissues, retraction which is the consequence of most prolonged arthritis when they do not take on the fungous form or white swelling. The articulations of the fingers have become inflamed and rigid, in consequence of prolonged immobility. Two causes which did not exist in the preceding patient have contributed in this one, not to the development, but to the long duration of these arthritides; these are her advanced age, and the rheumatism from which she has been suffering for many years.

This union of disadvantageous conditions—the traumatism, immobility, age, and rheumatism—makes me fear that the powerlessness will last much longer than in the man. I advise the same treatment, friction, massage, and sulphur baths. But I am not sure that they will lead to a complete recovery. The movements will undoubtedly recover a little of the extent which they have lost, but will never recover it entirely, and there will always remain some pain. In a word, the condition which you see, instead of being temporary as in the other patient, will undoubtedly be permanent, and will constitute an infirmity.