

I shall not give you a minute description; it is sufficient to show it to you, and to recall in a few words its principal points and advantages. It consists of a trough in which the thigh rests, allowing the knee to be flexed, the leg being outside the bed and the foot upon a chair.

Counter-extension is made by means of pressure exerted—1st, upon the ischium by a curved pad (I, Fig. 17), attached to the upper part of the trough; 2d, upon the outer iliac fossa by another pad, G; 3d, upon the horizontal ramus of the pubis by another pad, H. The two latter are attached to the rest of the apparatus by two rods sliding through a hinged clasp, E. Counter-extension is made by means of the bracelet represented in Figure 18, which surrounds the thigh, and from which extend two elastic bands, *c d*, *c' d'*, a sort of artificial muscle, which are attached to buttons on the two long lateral parts of the main apparatus.

I shall apply this apparatus about the twelfth or fifteenth day, after the inflammatory period is ended. If things go on as in three other patients upon whom I have had occasion to employ this mode of treatment, you will see that I shall have to change the situation of the pads several times, so as to render them endurable; that the patient will be tormented by the pains caused by extension; that it will be necessary, from time to time, to diminish the traction exerted by the elastic bands; and finally, that the foot and lower part of the leg will become œdematous, notwithstanding the roller bandage which will previously have been placed about them. If the patient is not too sensitive, and if he bears the pain bravely, we shall perhaps succeed in curing him without shortening, or with a shortening of about an inch. But if the pain is intolerable, and if, to diminish it, we are obliged too often to loosen the elastic bands, the result will be less fortunate, and there will remain a shortening of two inches or more. Everything here depends upon the degree of sensibility and energy of the patient; and it is precisely because we find only few who are able to bear the pain caused by this and by every other apparatus for continuous extension, that it cannot be adopted in all cases. Above all, do not try it upon children, women, or old people; for to the pain you might easily add eschars, which would increase the suffering and might be dangerous.

LECTURE XXI.

FRACTURES OF THE NECK OF THE FEMUR.

Two fractures of the neck of the femur in old women—Difficulty of determining upon what point the fall occurred—Functional and physical symptoms—Impossibility and uselessness of the diagnosis between intra- and extra-capsular fractures—Astley Cooper's error as to the influence of age—Obscurity of the authors upon the differential signs—Be satisfied with presumptions upon the seat of the fracture as upon the penetration—Simple treatment in all cases—Indication to avoid pain—Rejection of apparatuses for continuous extension.

GENTLEMEN: We have at this moment in ward Ste. Catherine two old women, one of whom was brought to us the day before yesterday, the other a week ago. Both of them fell while walking, without great violence.

The first (No. 6), 69 years old, slipped in her room, and, after several efforts to keep her balance, fell upon the right side.

The second (No. 20), 71 years old, made a misstep in the street and fell upon her left side.

I asked them particularly what part of their body received the force of the fall; they answered that it was the side, and indicated with the hand, the one more especially the hip, the other the hip and buttocks. But both showed a certain hesitation in it, and said they did not know very well, but that they thought they fell in such or such a way.

However that may be, neither was able to get up and walk, and they were brought here upon stretchers.

On examining them we find in both the following symptoms:—

1st. *Functional Symptoms*.—Both suffer when they try to move in bed. If the hips are raised for the purpose of passing a bed-pan, they cry out; when not moved they suffer little. The one who has been here for a week suffered during the first two nights, but scarcely at all now. The one who was admitted the day before yesterday suffers a great deal, and had a bad night on account of the pain.

I told them to raise the foot from the bed; neither one was able to do so. No. 6 took her thigh in both hands and raised it, but at the same time she bent her knee, and her foot slid along the bed without being raised above it. No. 20, who suffers more, was able to make no movement.

Both of them have an imperfectly circumscribed swelling of the upper part of the thigh; the one who was admitted most recently has an extensive ecchymosis in the trochanteric region.

2d. *Physical Symptoms*.—I called your attention first to the attitude of the patients. They were lying upon the back, and a little on the painful side, and begged earnestly not to have the position changed. The injured limb was rotated outwards, so that the outer edge of the

foot rested upon the bed, and the heel corresponded to the space between the internal malleolus and the heel of the other foot.

The better to appreciate this attitude, I persuaded the two patients to allow themselves to be placed flat upon their backs, and then I showed you that the rotation of the limb outwards persisted, and that there was also a notable lowering of the pelvis. For, stretching a string from one spine of the ilium to the other, I showed you that its direction was oblique with reference to the median line of the body, the end on the injured side being half an inch lower than a line crossing at right angles from the other spine.

Finally, there is in both a shortening which can be seen and measured; it can be seen, because the heel of the injured side is clearly higher than the other; and by measuring the distance between the spine of the ilium and the malleoli on each side, I find a difference of about three-quarters of an inch in No. 6, and one inch in No. 20. I say about; for whatever care you may take, it is difficult to place the measure so accurately upon the different points as to be sure that you do not make a mistake of a line or two. But the important fact is to determine the existence of shortening; now, it certainly exists here, and the measurement shows it to be a little greater than it seems. You understand why; the pelvis is inclined, as it is in almost all painful diseases of the hip and of the upper part of the thigh, and this inclination hides part of the shortening.

I did not look for either mobility or crepitation; for, gentlemen, with the signs which I have just pointed out, doubt is not possible. These two women have fracture of the neck of the femur.

A simple contusion might indeed cause the trouble in the movements and the pain which we find here, but it would not cause rotation outwards and shortening. We could be mistaken only if the contusion happened to a patient who, for a long time previously, had had dry arthritis or *morbis coxae senilis*, which had caused rotation outwards and shortening. It was to guard against this error that you heard me ask if they had limped or suffered in the hip for several years, and it was because they answered negatively that I do not have to believe this is a fresh contusion superadded to an old dry arthritis.

Nor have you reason to think of a traumatic dislocation. For, in addition to the fact that dislocation is rare in old people, and that it is produced by a fall from a high place rather than by causes so slight as those which have intervened here, we do not find the symptoms of the most frequent, the iliac, dislocation, since in it the rotation is inwards, not outwards. Supra-pubic dislocation is the only one which is accompanied by rotation outwards and shortening, and it is easily recognized by the prominence formed by the head of the femur as it lies upon the pubes.

We have decided now the most important point of the diagnosis. These patients have fracture of the neck of the femur.

But there is another point which, if I turn to the descriptions of our best authors, ought also to have a certain clinical importance. Is the fracture *extra capsular*, *intra-capsular*, or *mixed*, that is, both intra- and extra-capsular?

If you read the works of Astley Cooper and Malgaigne you will find different chapters for extra- and intra-capsular; if you read those of Vidal de Cassis and Nélaton you will not find, it is true, a separate description of the two varieties, but they insist so strongly upon the differences and the diagnosis that one ought to conclude in the utility and possibility of a differential diagnosis.

I see, with pleasure, that M. S. Duplay¹ has not followed the same road, and passes over in silence the diagnosis of intra- and extra-capsular fractures. I like to think that this is due to my clinical lessons at La Pitié, in which he heard me develop the idea that a rigorous diagnosis between extra- and intra-capsular fractures is both impossible and useless. Impossible, because the differential signs given by the authors are inexact or cannot be detected upon the living subject. Would you like the proof? Examine any one of the differential points given by A. Cooper and Malgaigne.

Astley Cooper insisted upon one means of diagnosis, which, if it was true, would be very convenient. He said: Almost all fractures of the neck of the femur, after 50 years, are intra-capsular, and before 50 years, extra-capsular; and he adds in proof of this assertion, that of 225 persons over 50 years of age, in whom he found fracture of the neck of the femur, in only two was it extra-capsular; in the 223 others the fracture was intra-capsular. Our two patients, being more than 60 years old, should therefore have intra-capsular fracture.

Astley Cooper here fell into a great mistake, from which he drew, fortunately, an excellent therapeutical conclusion. I explain this error by these two circumstances, that he scarcely found in his autopsies anything except intra-capsular fractures, and that he found them in old people. For, in his time, they did not very well understand fractures with penetration, they did not know that in order to detect them upon the cadaver it is necessary to split the neck of the femur vertically; those who examined the pieces without taking this precaution, failed to recognize extra-capsular fractures. Astley Cooper then reasoned thus: When I make autopsies of fracture in old people, I find only intra-capsular fractures; that is undoubtedly because they are peculiar to old people; and without occupying himself with other differential signs upon the living subject, he thought that age was sufficient to establish the diagnosis.

But facts soon appeared to show that Astley Cooper was mistaken. Bonnet (de Lyon), Rodet, and others after them, found in well-conducted autopsies with vertical section of the neck, extra-capsular fractures with or without penetration, so that to-day it would be difficult to say whether, after 50 years, the intra- or the extra-capsular fractures are most frequent.

A word, now, upon some of the differential signs given by Malgaigne in the table placed at the end of his paragraph upon fractures of the neck of the femur.

¹ Follin & Duplay, *Traité de Pathologie externe*, tome ii.

1st. The intra capsular, he says, is caused by a fall upon the foot, or the knee, or the buttocks; the extra-capsular, by a direct blow upon the great trochanter. But you will not find out from my poor old women, and you will never find out from other old people who have broken the neck of the femur, whether they have fallen upon the great trochanter, or upon the buttocks. These two regions are too near each other for the patient to be able to say whether it was upon the one or the other that he fell; and suppose that he fell upon his feet or knees—as, after such a fall, there is almost always another backwards and sideways—how are you to know whether the fracture was made before or after the fall upon the side?

I should also like to know how often the diagnosis has been verified upon the cadaver. I doubt if it has ever been done. Malgaigne, in writing these lines, was evidently inspired by a work of M. Rodet,¹ who had published this opinion after experiments made upon plaster femurs. A piece of plaster in the shape of a femur does not at all resemble a cancellous bone whose compact tissue has been thinned, and whose cells have been enlarged by senile rarefaction; for it is due to variations of resistance in different points of its length resulting from these anterior lesions, that the femur, after a blow, yields in one point rather than in another.

2d. In the intra-capsular, adds Malgaigne, there is little swelling, no ecchymosis; in the extra-capsular, much ecchymosis. I complain here that the author did not contrast the swelling in the one with the swelling in the other. Undoubtedly he was embarrassed by the difficulty of being precise. As to the ecchymosis, the word *much* is very elastic. Has our second patient much or little? I could not say, and in any case, it is not impossible that intra-capsular fracture should be accompanied either by great contusion of the soft parts, or by a tearing of the bone which might cause considerable ecchymosis.

You see then that the ecchymosis cannot supply a serious element of the diagnosis.

3d. In the intra-capsular, continues Malgaigne, there is pain near the insertion of the psoas; in the extra-capsular, the pain on pressure is over the great trochanter.

Gentlemen, it is not possible to make pain on pressure a means of diagnosis, for two reasons: first, because if the pressure is slight or moderate it causes no pain, even where there is a fracture not far from it, and because if it is great, it may cause pain itself, and not by transmission of a shock to a neighbouring fracture; secondly, because, supposing the pain on pressure to be due to a fracture, it may be caused by fracture at the base as well as in the middle of the neck.

4th. In the intra-capsular, still according to Malgaigne, the shortening is limited to one and a quarter inches at the most; in the extra-capsular, the shortening is from one-quarter of an inch to two and a quarter inches. Well, we have here four-fifths of an inch, and an inch; consequently we are within limits which allow us to believe in one as well as in the other.

¹ Rodet, Des Moyens propres à distinguer les différentes Espèces de Fracture du Col du Fémur (Thèses de Paris, 1844).

I do not wish to carry this critical examination any further. Malgaigne gives us four more differential signs, all of them as difficult to determine as the preceding ones, and from no one of which can the clinician draw a rigorous conclusion, and do not think that by grouping them all you can reach a conclusion. For, in this group you have a certain number which are as much in favour of one as of the other variety.

Furthermore, that which obliges me to retain and allow you to retain no illusion upon this point, is that pathological anatomy has often shown fractures which were at the same time extra-capsular and intra-capsular; by what signs are they to be distinguished? No one has given them, and yet it is not logical to give the means for recognizing the intra- and extra-capsular, and not give the means for recognizing a mixture of the two.

The truth is that upon this part of the diagnosis we may reach presumptions, but never a certainty. Thus, in our first patient, I may presume the fracture is intra-capsular because there has been no ecchymosis and the pain has been moderate. In the other, I may presume that the fracture is extra-capsular, because there is an ecchymosis, the swelling is considerable, and the pain more severe. But, the reasons which I give in favour of these presumptions might be completely contradicted by an autopsy, or the fracture might prove to be a mixed one.

I said also that this rigorous diagnosis between an extra- and an intra-capsular fracture was useless for the prognosis and treatment, and consequently useless from a practical point of view.

I say that it is useless for the prognosis. Here I find myself in the presence of two contestable opinions which were advanced by Astley Cooper, and upon which he established his distinction between extra- and intra-capsular fractures. The first was that intra-capsular fractures did not consolidate, or consolidated only by a very thin fibrous callus; the second was the conclusion, or rather the intimation (for Astley Cooper did not express himself categorically upon this point), that the patients were condemned to an inevitable infirmity by the fact of this entire or partial failure to consolidate. You see the utility which this question of diagnosis would then have for the prognosis.

This one of our patients, who seems to me to have an intra-capsular fracture, would not get consolidation, would henceforth walk only with the aid of crutches, or at least with a cane and with great difficulty, would be, in a word, condemned to an infirmity, while the other one, who seems rather to have an extra-capsular fracture, would, unless I am mistaken in the diagnosis, have bony consolidation and walk very well. And as for the treatment, you see at once the consequence; if intra-capsular fracture does not consolidate, it is useless to treat the patient by confinement to the bed intended to assure the immobility which is a necessary condition to the formation of a regular bony callus.

Gentlemen, it is very true—and the facts invoked by Astley Cooper and before him, it must be admitted, by other authors, especially by J. L. Petit and Boyer, are demonstrative upon this point—it is very

true, I repeat, that intra-capsular fractures sometimes remain without consolidation, or heal only by means of an intermediate fibrous substance, for the following reasons: 1st. Because the upper fragment is short and no longer receives a sufficient quantity of nutritive material, since it is supplied exclusively by small vessels accompanying the round ligament; 2d. Because the materials of the callus are poured out into and lost in the articular cavity, as is the case in fractures of the patella. It is equally true that extra-capsular fractures, especially when accompanied by penetration, consolidate by means of a bony callus.

But besides these facts, which are common, there are many exceptions which do not allow us to establish absolute rules for the prognosis. Thus, certain intra-capsular fractures form a bony callus; Astley Cooper himself distinctly says so. These are the ones in which a considerable part of the periosteum has remained intact about the fragments, and, on the one hand, supports the vessels which feed the upper fragments, and, on the other hand, opposes the escape of the reparative materials into the synovial cavity. These are also the ones in which, notwithstanding the rupture of the periosteum, bony stalactites form at the edge of the fragments and unite them at some points, although inter-fragmentary consolidation is lacking. Furthermore, the interfragmentary fibrous callus, when it forms, is sometimes strong enough to give the neck of the femur as much solidity as if it had been bony. You see then that if, after an intra-capsular fracture, the bony or fibrous callus can be as solid as that of an extra-capsular fracture, there is no reason, so far as the prognosis is concerned, to maintain that the diagnosis would be of any great value. It would be if, to the knowledge of the precise seat of the fracture, we could add that of the other anatomical and physiological conditions, that is, the amount of periosteum that has been preserved, the aptitude for the formation of stalactiform prominences. Now, as to these points, no author has ever claimed to be able to make a rigorous diagnosis.

Moreover, it must not be believed that all extra-capsular fractures consolidate with a bony callus; in some of them also it remains fibrous.

I have seen two positive examples of this, and regret that I did not preserve the specimens. In both cases it was fracture with penetration, and the injury had been received six months before in one case, and eight months in the other. Taking the head of the femur in one hand and the shaft in the other, an abnormal mobility could be found, and one might have supposed that a bony callus united the fragments. But, to examine the mode of reunion, I made with a saw a vertical section through the bone, a section without which it would be impossible to exactly appreciate the condition of the parts. This section having been made, I first noticed the penetration of the upper fragment into the lower one, the complete disappearance of the bony substance that had been crushed, the diminution of the length of the neck in consequence of this loss of substance, and finally an irregular fibrous line of demarcation between the upper and lower fragments. This line was about one-fifth of an inch thick. Its tissue was quite

dense and adhered firmly to the two fragments, so that the femur thus repaired was perfectly able to sustain the weight of the body. It is none the less true that the callus was fibrous as in many intra-capsular fractures. I proved this by macerating the piece for several weeks, at the end of which the fragments separated.

You see then there is nothing absolute, as to the method of consolidation, in one or the other variety, and we are authorized to-day to say that the rigorous diagnosis between them is not useful for the prognosis.

It might be, however, if the method of consolidation was the only means of explaining the ease or the difficulty of walking after fractures of the neck of the femur. For I could understand that one should say: the old man affected with intra-capsular fracture will probably never walk, because his consolidation will be insufficient, and *vice versa* for the extra-capsular. But our anatomico-pathological studies have shown us that the difficulty in walking after this fracture, as after all those which are near articulations, depends greatly upon the consecutive arthritis and the diminished power of the muscles. All patients who have fracture of the neck of the femur have traumatic arthritis almost inevitably when the lesion is wholly or in part intra-articular; it is also very common, if not constant, in extra-articular fractures. How is it possible to prevent the articulation which is so near the solution of continuity from taking part in the consecutive phlegmasia? The intensity and the effects of this arthritis vary according to the subjects, and the varieties depend much more upon their idiosyncrasies than upon the seat of the fracture. At the beginning, then, it may be presumed with certainty that the patient will have an arthritis; it may also be presumed, on account of the age (fracture of the neck of the femur being, as you know, an affection of old people), that this arthritis will become an incurable dry arthritis, or if it does not pass to that state, it will leave for many months a painful rigidity of the synovial membrane. I will admit, if you wish, that these results are more probable after intra-capsular than extra-capsular fractures; I wish to establish, only, that they are possible after both, and that from this point of view also, a perfect diagnosis would not have the value which is claimed for it.

Under the supposition that our second patient has an extra-capsular fracture, I ask myself if this fracture is with or without persistent penetration. For the works of Hervez de Chegoin¹ and Alph. Robert² demonstrated plainly that in fractures of the neck of the femur, and especially in those at the base, or the extra-capsular ones, the upper fragment might penetrate the great trochanter and split it, in which case fracture of the neck is complicated by fracture of the great trochanter. They also showed that, without splitting the great trochanter, the upper fragment might lodge within it, crush its cancellous tissue, and remain implanted there (Fig. 19); an important fact, for it leads

¹ Hervez de Chegoin, Journal Général de Médecine, 1820, tome lxxii. p. 3.

² Alph. Robert, Mémoire sur les Fractures du Col du Fémur accompagnées de pénétration dans le Tissu spongieux du Trochanter (Mémoires de l'Académie de Médecine, 1847, tome xiii. p. 486).