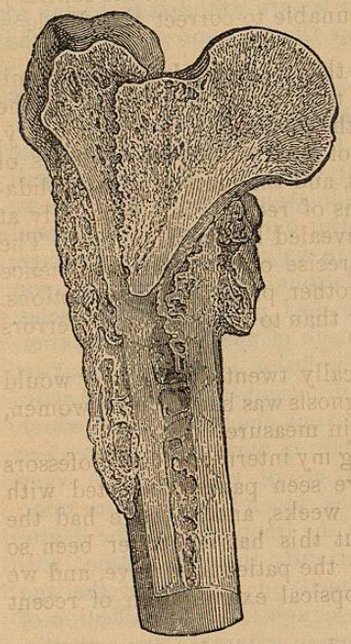
to this conclusion, that there are fractures of the neck of the femur in which attempts at reduction cannot succeed, or if they succeed are followed by a prompt return of the displacement. It is the same here as in fractures with crushing of the lower extremity of the tibia and of the lower extremity of the radius.

Fig. 19.



Extra-capsular fracture of the neck of the left femur with complete penetration of the cancellous tissue of the trochanter.

From the moment when the pressure exerted by one of the fragments has hollowed out the other by crushing it, the resultant gap is necessarily filled by the muscular action which draws the fragments into contact. If they should succeed in re-establishing the natural length and direction of the limb, it would be by removing the fragments from one another and substituting for their contact an empty space which cannot persist, and towards which the pelvi-femoral muscles would very soon draw the lower fragment. Moreover, under such circumstances the interlocking of the fragments is such that our efforts cannot disengage them, and for consolidation their connection is rather advantageous than not.

From this point of view there would be some use in recognizing beforehand the existence of penetration; for the therapeutical corollary would be to make no exaggerated attempt to remedy the shortening and the outward rotation. But here again we reach only presumptions. When the pain and the ecchymosis make us think that the fracture is extra-capsular, we may at the same time suppose that it is with penetration, because it is especially in such cases that penetration is met with.

The presumption becomes greater, if by making an assistant stand at the end of the bed, grasp the limb, and try to lengthen it and rotate it inwards, we see that the two principal displacements (rotation outwards and shortening) do not yield, and that the attempt causes pain. For in fracture without penetration it would seem as if the assistant's hand ought not to encounter the same resistance as in fracture with penetration. I have again to regret that I cannot give you this mode of exploration as one leading to a positive conclusion. For, if the limb lengthens, and the outward rotation is overcome easily, that will be a proof that penetration, or at least irremediable penetration, does not exist. But inability to correct either of these displacements may be due to two causes; either to penetration, or to muscular resistance. Now, to which of these two causes should we attribute it? This is precisely the question which we have to ask in the case of our second patient.

We have not been able by a gentle effort to correct either of the two displacements. I presume, but I am not certain, that this is due to penetration. The question will be cleared up in a few days. If it is only a muscular spasm it will disappear with the pain, and then if there is no penetration we shall be able to correct at least the rotation outwards, and probably also part of the shortening; if, on the contrary, there is penetration we shall remain unable to correct the displacements.

To recapitulate: you see, gentlemen, that if the etiological, anatomical, and physiological studies relative to fracture of the neck of the femur, which have been made since the beginning of this century, have enlightened us upon the mode of production, the varieties of location, the symptoms, the difficulties, and the method of consolidation, the clinic has not found the means of recognizing, especially at first, all the anatomical dispositions revealed by these studies. The diagnosis upon the living subject is precise only as to the existence of the fracture, and is reduced, on the other points, to presumptions. I prefer to admit this before you rather than to transmit to you errors or useless opinions.

Prognosis.—Those who taught clinically twenty years ago, would undoubtedly have told you that the prognosis was bad for both women, and that death was imminent in a certain measure.

At the beginning of my studies, during my internat under Professors Roux and Blandin, I remember to have seen patients affected with fractures of this kind die after a few weeks, and to have had the opportunity to make the autopsy. But this has no longer been so during the last fifteen or twenty years; the patients survive, and we rarely have occasion to make the autopsical examination of recent fractures of the neck of the femur.

Since I have been practising as hospital surgeon, that is, since 1847, I remember only one case of death during the fortnight following the accident. It was at the Hôpital Cochin, a woman, 82 years old, whose fracture was extra-capsular with penetration.

The three or four other autopsies which I have had occasion to make, were upon subjects who had had their fractures for several months, who no longer suffered at all from them, and who died from some other affection.

To what is this change due? I attribute it to one single cause, that at the beginning of this century the surgeons, guided by false ideas upon the indications of treatment, subjected their old people to the pains of continuous extension. Hence insomnia, fever, loss of appetite, and an alteration of the respiratory passages which carried them off. They said the patients died of hypostatic pneumonia due to horizontal decubitus, and they did not see that this pneumonia was the ultimate lesion of a febrile affection consecutive to a painful condition which old people cannot support. These pneumonias have almost disappeared since we have ceased to make our patients suffer.

Does that mean, however, that our patients are exposed to no alteration of their health dependent upon the fracture? Although I have little fear of a fatal termination, still I ought to tell you here that of

all fractures, that of the neck of the femur is the one which has seemed to me to cause the most fever during the first days. You know that after fracture we have a first period, called inflammatory, during which the predominant symptom is pain. I showed you, however, that, during this period, patients affected with fracture of the leg, or of the shaft of the femur, or of the arm or forearm, did not have any marked quickening of the pulse or elevation of temperature, or that, if this elevation took place, it was temporary. In old people who have fractures of the neck of the femur, on the other hand, we often see during three or four days the pulse rise to ninety, the axillary temperature increase two degrees, and in those who are more than 80 years old eschars form rapidly on the sacrum. I asked myself at the time when we saw these fractures terminate quite frequently by death, if this fever was not the consequence of a septicæmia starting from the crushed spongy tissue, and if it did not deserve the name of septicæmic bone fever, and if the death should not be attributed to a peculiar congestion of the bronchi and of the brain in the course of, and by the fact of, this septicæmia. Since the mortality has sensibly diminished I have given up these explanations, or at least I have recognized that, if it is permitted to invoke a septicæmia, we must admit that it is often slight, and that if we do not torment the old people with the pains of apparatuses, it limits itself to a few days of malaise.

Of our two patients, the one who was injured a week ago is entirely without fever; the one whose fracture was received forty-eight hours ago has a pulse of ninety-two, a little headache, loss of appetite, and thirst. But as there is no oppression, no dryness of the tongue, no delirium, no commencing eschar upon the sacrum, I have the right to hope that the fever will be temporary and mild.

If I have no fear for the life of our patients, I am not so certain about the restoration of the shape and functions of the limb.

As for the shape, I hope that the one in No. 6, the one in whom I suspect intra-capsular fracture, will recover without retaining rotation outwards, because in the few movements which I communicated, it seemed to me that this rotation outwards might be corrected.

The other, on the contrary, the one in whom I suspect an extra-capsular fracture with penetration, will undoubtedly retain the deformity resulting from the persistence of the rotation outwards, that is to say, that when standing or walking, she will have the foot turned outwards. This deformity will cause no great inconvenience, it is true, but it is none the less to be mentioned in the prognosis. We shall, moreover, have to direct some of our treatment towards it, for it is possible that we may ultimately correct it, since I do not consider it absolutely irreducible, although I am by no means sure of being able to make it disappear.

On the other hand, these two patients will preserve a shortening of the limb, for two reasons: first, because I shall not try to oppose it; secondly, because if I should try, I should not succeed, the muscles on the one hand, and the interlocking of the fragments on the other, (especially in the second patient), being obstacles against which we

can contend advantageously only by means of excessive tractions, which the patients cannot support, and to which it would be cruel to subject them.

As for the functions, I am obliged to leave you in uncertainty, because their re-establishment depends upon individual conditions which I cannot produce, although all my efforts should be directed towards this end.

After a few weeks of confinement to the bed these women will begin to get up and walk with crutches. How long will that last? If affairs go on fortunately, if bony or strong fibrous consolidation is obtained, if the consecutive arthritis is resolved, if no false anchylosis remains after three or four months, and if the muscles are not too much weakened, the crutches will be replaced by a cane, and the patients will be able to walk quite easily, limping but little.

I know three old people, one of them 69, the other two more than 80 years old, who broke the neck of the femur at 68 and 70 years of age, and who for many years have walked without limping—can even walk several miles easily. It is true that they are men, and vigorous ones.

The old women whom I have known or still know in private practice, with fracture of the neck of the femur, have continued to limp, to suffer, to walk with a crutch or a cane, and for only short distances.

Nevertheless, I saw at the Hôpital de la Pitié, in 1866, a woman 66 years old, whom I had treated for a fracture of the neck of the left femur, by simple rest in bed for three weeks, and who, at the end of this time, had walked with crutches. She left the hospital seven weeks after her admission, using only a cane, not suffering, and able to walk without fatigue for about fifteen minutes. After her departure she continued to walk better and better, still with the aid of a stick, but taking walks of about half an hour without too much fatigue. The patient came to see us several times, and I presented her as an example of good consolidation after a fracture whose extra- or intra-capsular position I had not been able to determine strictly, for the reasons which you know. Seven or eight months later she was received into the service of my colleague and friend, M. Empis, for a disease of which she died. We made the autopsy, and, to my great surprise, I found an intra-capsular fracture which was consolidated neither by bony tissue nor by fibrous tissue. The fragments, held together only by a few pieces of periosteum, slipped upon one another, forming a pseudarthrosis like an arthrodia.

I fear then, because this is a quite frequent termination in both sexes, and still more frequent in women than in men, that our two patients will never walk without crutches, will have pain caused by movements, and, in a word, will remain infirm. But there is no certainty upon this point. For these bad results may depend either upon a non-consolidation, or upon an incurable dry arthritis, or upon muscular weakness, or upon all three causes united. Now, I cannot say definitively whether these causes will intervene; for the patients may not have dry arthritis. They may have a sufficient consolidation;

I have just told you that even with a pseudarthrosis it was not impossible to walk. Let us hope for a good result, let us try to obtain it, but without counting absolutely upon it. Such, in short, ought to be our prognosis.

Treatment.—What shall we do for these two patients?

Certainly it would seem rational to employ apparatuses which correct external rotation and shortening. P. J. Desault[1] formulated this indication perfectly, and invented a splint for continuous extension which still bears his name. Guided by the idea of Desault, Boyer invented another splint supplied with screw which answered the purpose still better, and which had a certain vogue.

It is a remarkable fact, but these apparatuses for continuous extension caused pain, fever, sometimes eschars, always sleeplessness and loss of appetite, and certainly the death of a good number of old people. Those who survived preserved none the less rotation outwards, shortening, and more or less infirmity; nevertheless they were so penetrated with the idea that the surgeon's duty was to oppose the deformity, and that the death was the result of unfortunate conditions in the patient, that they were finally led to abandon apparatuses for continuous extension by false theories rather than by the results of observation.

It is to two great surgeons, Astley Cooper and Dupuytren, that we are indebted for these theories, which, to the great profit of the patients, led to the abandonment of these apparatuses.

You already know Astley Cooper's: fractures are intra-capsular in old people, and intra-capsular fractures do not consolidate. Consequently, whenever the patients are more than 50 years old it is not necessary to subject them to the pains of continuous extension. We now know that in old people fractures are sometimes extra-capsular, and that intra-capsular fractures can consolidate, but we have retained the deduction, because observation has shown us, since Astley Cooper's fortunate modification of the treatment, that fractures of the neck of the femur treated without continuous extension heal just as well as, and even better than, with it.

On his side, Dupuytren, in proposing and employing treatment by means of semi-flexion, had the idea that in the semi-flexed position, counter-extension was made by the weight of the pelvis, and extension by the weight of the limb, and he asserted that as this position gave, without apparatus, continuous extension, it enabled us to obtain a cure without shortening. In this there was an error of interpretation and an error of observation. But the impulse given to the practice by Dupuytren was none the less very salutary, in protecting the unfortunate old people from the pain of continuous extension.

To-day, gentlemen, you may be very sure of two things:—

The first is that in old people apparatuses to make continuous extension cannot stretch sufficiently, and especially for a long enough time to oppose successfully the two causes of shortening of which I spoke a moment ago: muscular action and crushing.

[1] Desault, Cours théorique et pratique de Clinique externe; Paris, an. xii.

The second is that, even while not exceeding certain limits, it produces, by the continuous pain, an alteration of the health which, at this age, is not always compatible with life.

We must then resign ourselves to seeing the shortening persist. We may try to oppose external rotation; but if this opposition is painful we must give it up, and await recovery with the persistence of this symptom also.

Pain is, above all, the thing which should be avoided in old people affected with fracture of the neck of the femur. With this object we leave the patient in No. 6 for the present without any restraining apparatus, and we apply linseed poultices sprinkled with laudanum. We prescribed a soothing potion for the day, and half a grain of the gummy extract of opium to be given if she suffers enough to make a bad night probable.

Furthermore, to avoid or diminish the pains which would be caused by movements, we have placed her upon a mechanical bed by means of which she can be raised for all necessary purposes without movement. If in a few days the patient complains of pain on the sacrum, and if, as her leanness may make us fear, we see an eschar is imminent, we shall place her upon a water mattress. The mechanical bed and water mattress, gentlemen, are the two great means of alleviation and, for a certain number of patients, of the preservation of life after fracture of the neck of the femur.

After the inflammatory period has ended, say in about a week, if the tenderness is greatly diminished, I shall place the limb in semi-flexion. I shall not simply use Dupuytren's two large cushions, one under the thigh, the other under the leg, for these cushions yield promptly and do not keep the limb flexed unless they are raised up two or three times daily, an act which causes pain.

I shall use a double inclined plane of wood, made of two planks united at an angle, upon each of which will be placed a bag of chaff. As soon as the limb has been placed upon it, a sheet rolled about the lower part of the leg, and pinned to the mattress or the side of the bed, will keep the foot in place after correcting its external rotation. I place the limb in semi-flexion because I have noticed, without being able to explain it, that in this position, rotation outwards was sometimes corrected easily, and much better than when the limb was extended. But I shall keep the patient in this position only if she does not suffer.

You will meet with old people in whom the semi-flexion causes prolonged pain either in the calf of the leg or in the groin. If our patient presents this complication, I shall remove the double inclined plane, leave the limb extended, and content myself with placing a cushion under the outer border of the foot to raise it a little. Above all, I seek to avoid pain, and to its dangers I prefer the slight inconvenience of the persistence of the rotation. I have all the more reason to prefer it, because the use of the double inclined plane gives me only the hope but not the certainty of recovery without rotation.

As to the other patient, I found her with a Scultet bandage well applied, and completed by a body band which partly immobilizes the

pelvis. I left her in this apparatus after having examined the limb and applied the mechanical bed. As the rotation of the foot outwards is not very great, and the fracture seems probably to be with penetration, I shall not use the double inclined plane, and I shall continue the Scultet bandage, but remove it if I hear the patient complain that it causes pain.

It goes without saying that the nourishment of the patients will be as strengthening as circumstances will permit, and that the sacral region will be watched so as to prevent, by means of lotions of aromatic wine, starch powder, and cotton pads, the eschars whose approach would be indicated by erythema and excoriations.

I shall not leave the patients in bed very long. The horizontal decubitus weakens old people, and predisposes them to pulmonary engorgements. In about three weeks, if the pain has diminished sufficiently, I shall have them sit up in a chair. They will be lifted out and put back by means of the mechanical bed with great precautions. Experience has shown that these few movements do not prevent repair from going on to the extent to which it is possible.

I shall give them crutches at the end of five or six weeks, and a little later they will make use only of a cane.

LECTURE XXII.

FRACTURES OF THE LOWER EXTREMITY OF THE FEMUR.

I. Simple supra-condyloid fracture—Functional and physical symptoms—Projection forward of the upper fragment—Imperfect reduction—Probable penetration—Concomitant arthritis. Treatment. II. Supra-condyloid and inter-condyloid fracture, its production by a wedge-like mechanism—Influence of age upon this mechanism and upon this diagnosis—Reduction impossible. III. Supra-condyloid and inter-condyloid fracture complicated with a wound and projection of the end of the upper fragment—Amputation—Examination of the piece.

GENTLEMEN: I. *Simple supra-condyloid fracture of the right femur.*—The patient in No. 15, 32 years old, told us that yesterday evening he was knocked down by a wagon, and fell upon his right knee. He thinks he is sure that the wheel did not pass over his limb, and that he simply fell in a false position, although he cannot say in what this false position consisted. This, however, is certain, that after having fallen he was unable to rise, that he felt severe pain in the knee, and was brought on a stretcher to the hospital.

This morning, after having removed the Scultet bandage which was applied yesterday, we found:—

As functional symptoms: 1st. The absolute impossibility for the patient to raise his heel from the bed and to make any movement with his right leg; 2d. Quite sharp pain on pressure above the knee.

As physical symptoms: 1st. A moderate swelling, but with fluctuation indicating an incontestable effusion in the femoro-tibial articulation; 2d. An abnormal prominence, a little irregular, but not pointed, at the anterior part of the thigh three finger-breadths above the patella; 3d. An unusual mobility in the transverse direction when I moved the foot alternately outwards and inwards with one hand whilst holding the centre of the thigh firmly fixed with the other.

I did not feel any crepitation, and, carrying my fingers behind into the hollow of the knee, I did not feel any abnormal prominence formed by a fragment of bone.

From these symptoms I do not hesitate to assert that we are in presence of a fracture of the lower extremity of the femur (*Malgaigne's supra-condyloid*).

Undoubtedly, the functional troubles which I mentioned, and the considerable enlargement of the synovial cavity might have made us suppose it to be a violent contusion of the articulation, a sprain, or a fracture of the patella. I do not admit the latter, because I found neither interfragmentary separation nor abnormal mobility of the upper and lower halves of the patella. I do not absolutely reject the idea of a contusion and a sprain; but if these lesions exist they are only a coincidence.

The main lesion is the fracture. The dominant symptom which proves it is the abnormal mobility in the transverse direction. This does not exist in the simple contusion; it is true it may be found in sprains of the severest kind, with rupture of the lateral ligaments. But the mobility which we find here is not that of a sprain, for two reasons: first, because it is much greater and more easily obtained than is that of a sprain; second, because the centre of these unusual movements is plainly above the articulation. Add to that the abnormal projection forwards of the upper fragment, which makes the diagnosis still more positive.

I shall not try to give you any notions upon the etiology, for I know but little about it. The patient, as is always the case, cannot tell us how he fell. His story permits us to infer that the fracture was not produced by a direct blow. But how did the indirect cause act, to produce a fracture at a point where the bone is so large and so strong? This is what remains problematical. I am disposed to believe that the lesion has been prepared by some alteration in the bone, similar to that which takes place in old people in the cells of the cancellous tissue, and which gives this tissue a fragility greater than at other ages. There may have been in him what I call *premature senile alteration.* But this opinion, which I offer here, as for certain almost spontaneous fractures of the shaft, is not thus far susceptible of demonstration.

One word upon the displacement. Since we feel a projection of the upper fragment forward, we infer the existence of a transverse displacement with projection, which we can attribute either to the direction of the fracture, or to the action of those parts of the triceps