

antero-posterior diameter of the joint, point to *dislocation of a phalanx*. The outline of the bones can be so plainly felt that there is no difficulty in deciding upon the direction of the displacement. All phalanges are most frequently dislocated backwards; those of the thumb may be dislocated forwards.

#### CHAPTER XIV.

##### THE DIAGNOSIS OF THE SPECIAL INJURIES OF THE LOWER LIMB.

A LARGE proportion of the fractures and dislocations of the lower limb are at once rendered apparent by the obvious deformity they occasion; in others the seat of pain marks the position of the injury, and the ready detection of crepitus enables the surgeon at once to diagnose a fracture; only in a small minority of cases is there grave difficulty in arriving at a conclusion as to whether a patient has sustained a fracture or a dislocation, and these are mainly met with in injuries of the hip-joint where the difficulty arises from the thickness of the soft parts overlying the articulation. In examining an injured limb, the surgeon should first of all expose the two limbs thoroughly, and look carefully to see if there be any deformity, an alteration in the axis or position of the limb or of any of its parts, an unusual prominence or depression or obvious alteration in its length, the existence of which will indicate both the fact of a lesion of the skeleton of the part, its situation, and in many cases its nature. Next, the limb should be examined by the hand, and here again it should be compared with the sound member. One hand should

be placed on the outer side of each hip just below the crest of the ilium, and the top of the great trochanter of the femur felt for. In this way any marked alteration in the position and shape of this process will be detected. The fingers should be passed round behind it towards the buttock to explore that region, and to note any difference between the two sides, and particularly whether the head of the femur can be felt there. Next, the fingers should be gently pressed into the hollow of the groin, and any difference in the resistance encountered on the two sides, or any marked pain produced, noticed. The hands run down along the thighs will detect any great deformity in the shafts of the femurs, but in muscular persons these bones are so thickly covered that a slight alteration in the contour of the bone may readily escape notice. The marked local tenderness, which has been often before referred to in connection with fractures, will in this case, too, be of considerable value in this manipulation in arresting the surgeon's attention in cases where there is no obvious deformity. The bones of the knee, being more subcutaneous, can be more thoroughly examined. The joint should first be grasped laterally to determine whether there is any increase in its width, and then the hand may be passed down from the femur to the tibia, and the relative position of these two bones carefully compared on the two sides for the purpose of deciding whether the tibia is displaced forwards, backwards, or laterally upon the femur, or rotated upon its own axis. Then the patella should be felt for, and as this bone is wholly subcutaneous, its surface is easily felt and its position noticed. It may then be grasped above and below, and an attempt made to move one part independently of the other. Failing this, a similar attempt may be made upon the lateral halves of the bone. The head of the fibula resting against the outer tuberosity of

the tibia should then be examined. And now the surgeon will pass his fingers down along the crest and subcutaneous inner surface of the tibia, and notice carefully any irregularity in the bone, or marked tenderness. By somewhat firmer pressure the outline of the fibula can be similarly explored. At the ankle joint the bones again become wholly subcutaneous, and the breadth of the malleoli and their outline can be easily compared on the two sides. The skeleton of the foot is readily felt from the dorsum, and any displacement of the bones either at the joints or elsewhere can be determined. The bony points to be specially felt for are the prominence of the heel, the tubercle of the scaphoid, and the projection of the base of the fifth metatarsal bone.

The examination of the general conformation and relations of the bones by the hand will add much to the knowledge obtained by the eye alone. Where such examination has led the surgeon to suspect the existence of a fracture, he will seek to determine this point at once by trying to obtain mobility or crepitus in the length of the bone. As in all other cases, so here, the utmost gentleness should be observed in making the necessary manipulations. The limb should be firmly grasped close above and below the suspected spot, and at first an attempt should be made to obtain movement or crepitus with quite slight force; this may be gradually increased when it is found that the bone resists, or at once discontinued as soon as any crepitus is felt. In some places the manipulation is a little different. At the upper part of the thigh it is impossible to grasp the limb in this way, and the plan adopted is for the surgeon to place his hand flat over the trochanter, and for an assistant to seize the foot and gently rotate the whole limb, the surgeon observing whether there is any crepitus, and also whether the trochanter moves with the shaft

of the femur, simply rolls around its own axis, or moves in a circle as large as that on the sound side. This manipulation, too, must be carefully and gently executed, lest an impacted fracture should be unimpacted. At the knee, when the bone is broken, the parts of the patella may be separately taken hold of, and moved one upon the other, or either condyle of the femur may be movable in an antero-posterior direction upon the rest of the bone. At the ankle either malleolus may be moved in a similar manner. And I may here pause to point out that fractures of the malleoli are often overlooked from want of care in this manipulation, the injury being attributed to a sprain. Whenever there is marked local pain over either malleolus, and especially when to this is added acute tenderness to pressure at the same spot, the part of the bone below this spot should be seized, and a careful attempt made to move it upon the rest of the bone; failing that, the limb should be grasped with the thumb or fingers firmly pressed upon the painful spot, and with the other hand the foot should be flexed and extended and rocked laterally; by one or other of these manipulations crepitus will be obtained if there is a fracture.

The examination by the hand also gives other valuable information. Thus, in the thigh, it will determine the tension of the strong outer band of the fascia lata (ilio-tibial band). At the knee, the position, tension, or continuity of the ligamentum patellæ, and the state and position of the hamstring tendons will be noticed; while at the ankle the tendons behind each malleolus will be felt for, as these are liable to be displaced forwards. Having done this, or before attempting to elicit crepitus where fracture is not suspected, the surgeon will proceed to compare the two limbs by *measurement*. This is a most important part of the examination, and

should never be omitted, unless the diagnosis is absolutely certain without it, as in transverse fracture of the patella, for example; and at the same time great care must be taken that the measurements are really between the same points on the two sides, or the surgeon may be seriously misled instead of being helped by his results. It is necessary also to place the two limbs in the same position when measuring them, and for this purpose the sound limb, which can be moved without occasioning pain, must be brought into the position assumed by the injured member. The best position for taking these measurements is the patient lying flat on his back, with the limbs extended straight and parallel, and the pelvis so placed that a line drawn from one anterior superior iliac spine to the other cuts a median vertical line at right angles. This latter line can be easily obtained by having one end of a piece of string held between the patient's central incisors and drawing the other end down so that the thread lies over the umbilicus and the symphysis pubis.

The following measurements will be found of use :

1. **The length of the limb from the anterior superior iliac spinous process to the tip of either malleolus.**—This gives the length of the entire limb, and alterations in it afford no guide as to the site of the deforming lesion, which may be in the hip, thigh, knee, or leg; it, of course, affords no information as regards the foot. When the measurement differs on the two sides, the surgeon must then proceed, by other sectional measurements of the limb, to determine where the deformity actually exists. It has of late years been shown as a normal occurrence that a good many people have the lower extremities unequal in length, and generally without any knowledge of the fact on

their part, and this inequality may amount to as much as an inch, or even more. But sectional measurements always show that this want of symmetry is not limited to any one section of the limb, but is shared by both the thigh and the leg. Therefore it is not enough to find simply that one lower extremity is longer or shorter than the sound one; it is necessary further to show that this inequality exists in one particular section of the limb. It must also be borne in mind that if one limb is an inch longer than the other, and it receives an injury (a fracture, for instance), it may be shortened by just so much, and the tape would then show the two limbs to be of the same length. This would be a circumstance of very exceptional character, but its mere possibility must arm the surgeon against being misled by it. It must also be remembered that previous injuries, diseases, or operations may have altered the length of a segment of the limb. In conclusion, then, although this measurement is of great general value, by itself it is not conclusive, and must always be corrected by vertical measurements of the thigh and of the leg separately, and by enquiry into the history. It is necessary to remind the surgeon to be very careful to take the measurement from exactly the same point of the spine of the ilium on the two sides. Mistakes in this may easily be made in fat persons, and the best safeguard is for an assistant to mark the spot from which the measurement is to be taken with the forefinger of each hand; in this way it is easier to fix upon exactly the same point on each side.

2. **Determine the position of the great trochanter of the femur,** both as to its vertical and horizontal situation. This is to be done by the following methods :

(a) **Nelaton's line.**—Draw a line from the anterior superior iliac spine over the outer side of the

hip to the prominence of the ischial tuberosity. The top of the great trochanter should just touch this line in every position of the joint. This line is of use to determine whether the trochanter is above or below its normal position. The length of the line in front of the trochanter gives roughly the horizontal position of the bone. It is a measurement easily taken; but possesses the drawback of requiring the patient to be rolled over towards the sound side, a movement which may be painful and injurious.

(b) **Bryant's line.**—With the patient lying flat on his back, draw a line vertically down to the bed from the anterior superior iliac spine, and then draw a second line from the top of the great trochanter up to join the first line at right angles; the length of the second line marks the vertical distance of the top of the great trochanter below the front of the iliac crest. This measurement, therefore, gives us the same information as Nelaton's line, but is greatly to be preferred to it, as it is obtained without any movement of the patient, and therefore without inflicting any pain or damage.

If a third line be drawn from the front of the iliac crest to the trochanter, it forms a triangle, and this third line gives roughly the horizontal position of the trochanter.

(c) The horizontal position of the trochanter may be measured by a tape passing from its tip to the middle line; but Mr. Henry Morris employs a more exact and trustworthy method. He places a straight rod on the pelvis, resting on the two anterior superior iliac spines, with the centre of the rod exactly over the middle line of the body. On each end of the rod he has a sliding vertical pointer, which is to be placed with its tip just resting on the outer side of the trochanter, the distance between the pointer and the centre of the rod, which is marked off in inches, can

then be read off and at once compared on the two sides.

These measurements are of great value, as they are modified in all cases of dislocation of the hip joint, fracture of the acetabulum with displacement of the head of the femur into the pelvis, impacted fracture of the neck of the femur, many cases of unimpacted fracture of that part of the bone, and in cases of fracture and detachment of the great trochanter itself. Disease also modifies the position of the trochanter, for it may lead to dislocation of the bone or to shortening of the head and neck in morbus coxarius, or to shortening of the neck of the bone with depression of the head in chronic rheumatic arthritis; and it is here noteworthy that both these morbid states may be excited by injuries to the hip. It is doubtful if the great trochanter be ever depressed below its normal position, though it has been stated to occupy such a position in thyroid dislocation of the hip. With this doubtful exception, all injuries and diseases which affect its position in the vertical direction cause it to be raised, or, in other words, they make it pass above Nelaton's line, or shorten Bryant's line. A result of this displacement, which has been stated to be diagnostic of fracture of the neck of the femur, is lessened tension of the fascia lata of the outer side of the thigh, which can be detected by pressing the fingers horizontally inwards just above the great trochanter, or above the outer condyle of the femur. This relaxation of the ilio-tibial band of the fascia lata may be produced by any injury causing shortening of the thigh and approximation of its two attachments, and may be of use as a measure of this shortening, but must not be regarded as pathognomonic of fracture of the neck of the femur.

3. **The length of the thigh** is ascertained by taking the distance from the anterior superior spine of

the ilium to the upper border of the patella; or from the pubic spine to the adductor tubercle of the femur. Some prefer to take the lower border of the patella as the lowest point. If the patella be taken, great care must be used to ensure that the knee joint is in the same position in the two limbs, and the bone should be pushed up to its full extent. This measurement is affected by all those conditions modifying the vertical position of the trochanter, and, in addition, by fracture of the shaft of the femur with over-riding of the fragments, and by dislocation upwards of the patella, or, when the top of the patella is taken as the lower point, by transverse fracture of the patella, with separation of the fragments. The result may therefore be the same as that obtained by taking Nelaton's or Bryant's line; but when these lines show the head and neck of the femur to be uninjured and in their normal position, and yet the whole length of the thigh diminished, it indicates that the shaft of the femur is broken and shortened or the patella displaced.

4. **The length of the leg** is to be measured from the upper edge of either tibial condyle to the tip of the malleolus on the same side; these are the best points to take, but the lower edge of the patella or the tubercle of the tibia are also used as the upper points.

5. **The distance between the front of the head of the fibula and the tubercle of the tibia** will show whether the head of the fibula is occupying its right position on the outer tuberosity of the tibia.

6. **The relation of the malleoli to the tarsus** is a point of great importance in the diagnosis of many injuries of the foot. It may be ascertained by measuring in three directions:

(a) *From the tip of either malleolus to the point of the heel.*—If this measurement be shortened on each

side of the foot it shows that the os calcis, with or without the astragalus, is displaced forwards upon the leg; similarly, if lengthened on each side it shows displacement of that bone backwards. A lateral displacement of the os calcis will increase the distance between the point of the heel and the malleolus from which it is removed, while the similar measurement on the side of the foot towards which the foot is displaced may be shortened or lengthened, but in the latter case will not be affected to the same extent as on the other side. These lateral displacements of the foot are so obvious that the surgeon is not likely to be led into any error by the fact that they modify the measurements in question, and so confound the lateral with the antero-posterior displacements of the foot, in the detection and correction of which these measurements are of great importance.

(b) *From the tip of the internal malleolus to the tubercle of scaphoid or point of great toe, and from the tip of the external malleolus to the tubercle of fifth metatarsal bone, or point of little toe.*—These measurements are lengthened when the foot is displaced forwards, and shortened when it is displaced backwards, and in all pure antero-posterior displacements of the foot correspond to the measurements from the malleoli to the heel. Where, however, the anterior measurements are different only in the two feet it shows that the injury is in the front part of the foot, and then it is of value to have taken the length not only to the point of the toe, but also to the scaphoid or fifth metatarsal bone, as it enables the surgeon to decide whether the deformity is in front of or behind these two bony points; displacement of a single bone, as *e.g.* the cuboid or the cuneiform, will affect the measurement on one side of the foot only.

(c) *From the tip of either malleolus to the sole.*—This is obtained by placing a book or flat board against the

sole of the foot and then measuring the distance from it to each malleolus. This measurement may be shortened on the inner side by Dupuytren's fracture, and on both sides by dislocation of the astragalus, and may be lengthened by subastragaloid dislocation of the foot.

The seat and character of the pain the patient suffers, the functional disturbance in the limb, the resistance to passive motion at the various joints, and the history of the accident, with the age of the patient, are all of them points which may give important aid in diagnosis. In reference to the last two points, it may be mentioned that children are very liable to fracture of the shaft of the femur, which is frequently transverse in direction, as well as to separation of epiphyses and to greenstick fracture, which is, however, much rarer in the lower limb than the upper. Elderly women are predisposed to intracapsular fracture of the neck of the femur from slight indirect violence. Twists of the foot, as in slipping off the edge of the kerb, are the common cause of Pott's and Dupuytren's fractures. In missing a step, or in other attempts to prevent a fall, the patella may be broken; the neck of the femur is snapped by slight indirect violence, as in catching the foot against a mat, while from severe direct violence to the hip (falling on it, heavy blows upon it) impacted fracture of the neck is produced. Dislocations of the foot or of its individual bones are caused by falls from a height on to the foot, especially when the toes are pointed. The knee is dislocated by severe and sudden wrenches; and Mr. Morris has shown that the hip joint is only dislocated when in a position of abduction either by the limb being drawn away from its fellow, or, what comes to the same thing, by the trunk being forced over to the same side, and that the form of dislocation depends upon the amount of flexion of the joint and the direction in which rotation

occurs. The severest fractures and injuries are those produced by direct crushing force.

By this examination the surgeon will have no difficulty in deciding what part of the skeleton of the limb, if any, is injured. We will now pass on to consider the diagnosis of the various injuries of the different regions, which we will group as follows:

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|----------------------------------|------------------------------|
| A. Injuries about the hip joint. | D. Injuries of the leg.      |
| B. Injuries of the thigh.        | E. Injuries about the ankle. |
| C. Injuries about the knee.      | F. Injuries of the foot.     |

**A. Injuries about the hip joint.**—When the history of the case, the seat of pain and possibly also of bruising and swelling, the loss of function, as well as obvious deformity and exact measurement, show that there is an injury to the bones of the hip, it is necessary to distinguish, as far as possible, between the numerous and important fractures and dislocations of this region. Deformity is the great symptom of all dislocations, and combined with it is marked fixedness of the joint; in fractures the deformity is, as a rule, less marked, and the simple helplessness of the patient, the loss of power, with pain, are the two most striking phenomena. The first grouping of these cases may be made according to the position of the limb, whether it is inverted or everted, and in any case in which the surgeon is in doubt as to which of these groups a case rightly belongs, the fact that the patient is unable to invert his limb may be taken as indicating that the limb is everted.

(1) **The limb is inverted**, or rotated in. The injuries that are attended with this deformity are:

- Dislocation backwards.
- Impacted fracture of the neck of the femur.

Press the fingers into the hollow of Scarpa's triangle and try to feel the head of the femur in its socket; if,

however, this space be found deeper than usual, and the fingers meet with no bony resistance just below the brim of the pelvis, there is a *dislocation*; while if the space be normal, and the same bony resistance is felt as on the uninjured side, the joint is not dislocated. If the joint be much flexed it clearly indicates a *dislocation*, while if quite extended, dislocation is excluded. Lastly, an attempt must be made to find the head of the femur in its new position on the buttock by firmly pressing the fingers into the mass of muscle of this region and at the same time gently rotating the limb inwards.

(a) If the limb be found inverted, flexed upon the pelvis, and adducted, shortened to the extent of one to two inches, the great trochanter being raised to this amount and anterior to its normal position, while the groin is found hollow and the rounded head of the femur is to be made out under the gluteal muscles on the buttock, it is a *dislocation on to the dorsum ilii*. There will be considerable rigidity of the part, and while passive flexion, adduction, and further rotation in will be possible, the attempt to extend, abduct, or rotate out the limb will cause great pain and meet with great resistance. If in manipulating the bone into its place crepitus be met with, and especially if the head of the bone at once or quickly slip out of its socket again, the case is one of *dislocation with fracture of the rim of the acetabulum*.

(b) If the limb be much inverted and flexed, adducted, slightly shortened, the trochanter being raised half an inch, or, at the most, an inch above its normal height, and the groin be hollow, the joint very rigid, flexion being the only movement possible, and the fingers fail to feel the head of the femur on the buttock, or feel it but indistinctly on the lower and back part of that region, there is a *dislocation on to the ischium*, or what is called "*into the sciatic notch*."

The head of the bone is farther back, but lower down than in the former variety, and hence the actual shortening of the limb is less, although in some cases the apparent shortening may be greater, and the knee be found some inches above the sound knee; it is further noteworthy that the flexion of the joint becomes much more marked when the patient lies down than when he stands up. If the thigh be a little shortened and strongly inverted, and also adducted and behind its fellow, it indicates that the head of the bone is "*strapped down by the great sciatic nerve*."

(c) If the limb be greatly flexed, adducted, and inverted, the thigh even being in contact with the belly, the groin very hollow, and the head of the bone felt above the prominence of the ischial tuberosity, there is a *dislocation on to the tuber ischii*. This is a very rare form of the dislocation backwards; the trochanter may be found a little below or a little above its normal situation, according to the distance the head of the femur has passed back.

(d) If, in the absence of the signs of dislocation just enumerated, the limb be found extended and inverted, Bryant's line shortened from half an inch to an inch, the great trochanter approximated to the middle line, and there be pain and tenderness over the trochanter, while the joint can be moved passively in all directions, it is an *impacted fracture of the neck of the femur*. It is unusual for such a fracture to give rise to inversion of the limb, and the surgeon will therefore be careful to assure himself that the head of the bone is in its socket, by observing the usual fulness and resistance in the groin, its absence from the buttock, and the ability to obtain passive motion in all directions; but these movements must be made with all gentleness, lest the fracture be unimpacted; it is the directions and not the extent of the passive movements that are characteristic.

(2) **The limb is everted**, or rotated out. The injury may be either of the following:

Contusion of the hip.	Fracture of the neck of the
Dislocation of the hip.	femur.
	Fracture of the acetabulum.

Place the patient flat on his back, and notice whether the injured limb is flexed or extended upon the pelvis; as a flexed hip may, by spinal lordosis, appear extended, bend up the opposite thigh to its full extent, until it lie against the belly and chest; if there be flexion of the injured hip, the thigh will be raised from the bed by this movement; if the joint be extended it will lie flat along the bed. In this way this large group of injuries may be subdivided.

**The hip is flexed.**—(a) If the prominence of hip be greatly flattened, the trochanter being considerably adducted towards the middle line and slightly raised towards the iliac crest, and the thigh abducted from its fellow, while the adductor muscles are found to be tense, and the rounded head of the femur is felt deep down under these muscles, it is a *dislocation of the head of the femur into the thyroid foramen*. If the patient be examined from behind, the fold of the buttock is found to be lowered on the injured side. The limb has been described as lengthened in this injury; but probably this is an error, arising from the tilting of the pelvis downwards to relax the psoas and iliacus muscles; should it occur, however, Bryant's line will, of course, be found lengthened, not shortened.

(b) If the thigh be strongly abducted from its fellow, and flexed, and the trochanter greatly adducted to the middle line, and the head of the femur be plainly felt in the perinæum much more superficial than in the previous case, it is a *dislocation of the head of the femur into the perinæum*; this is a much

rarer variety of the injury, but the signs are very characteristic.

(c) If the great trochanter be raised by an inch or more from its normal position, and adducted, the hip being flexed, and the hollow of the groin lost, being filled out by the rounded head of the femur resting on the pelvis beneath Poupart's ligament, it is an *ilio-pubic dislocation* or *dislocation on to the pubes*. The femoral vessels should be felt for, and they will usually be found internal to the head of the bone.

(d) If the hip be greatly flattened, the trochanter being adducted, and Bryant's line considerably shortened (two inches), and the eversion of the limb be extreme, while the abduction and flexion are but slight, the head of the femur will be found resting on the pelvis below the outer part of Poupart's ligament close to the anterior inferior spine of the ilium; the injury is a *subspinous dislocation*.

(e) If the limb be shortened to the extent of two or three inches (the trochanter being raised to that extent) a little abducted as well as everted, and the head of the femur be plainly felt just below the anterior superior spine of the ilium, it is a *supraspinous dislocation*. The great trochanter is behind and outside the head of the bone, and is to be felt with difficulty, owing to the mass of muscle covering it.

(r) If the thigh be adducted, shortened, and everted, and the groin be hollow, and wanting in its normal resistance, and the head of the femur be felt on the dorsum of the ilium under the glutæi muscles, with the trochanter behind it, the injury is an *everted dorsal dislocation*. In this dislocation the limb may be extended. These last three are among the rarest forms of dislocation of the hip. It is useful to remember, as Bigelow has pointed out, that when the femur is unbroken, the direction of the internal condyle and of the head is always the same, and, therefore, in



dislocations the direction of the head of the bone can with certainty be determined by noticing that of the internal condyle.

(g) If the limb be everted, shortened to a slight extent (half an inch or so), and the head of the femur be felt under the iliacus muscle below the anterior inferior spine of the ilium, and rotation of the thigh elicit crepitus, there is a *dislocation with fracture of the acetabulum*.

(3) **The limb is extended.**—(a) If the limb be extended, everted, powerless, but admitting of passive movement in all directions, shortened, the great trochanter being raised and adducted, and if gentle rotation elicit crepitus, and the trochanter which is not deformed be found to rotate around a very small circle, there is an *unimpacted fracture of the neck of the femur*. This accident is usually met with in old people, particularly in women, and as the result of indirect violence; there may be little or no bruising of the hip, or, what is still more characteristic, the bruising may only appear after some days, when the effused blood has had time to reach the surface. The limb is powerless, but admits of passive movement in all directions. The amount of shortening is generally slight (about half an inch, it may be more), and it is not uncommon for it to increase to an inch or more, either suddenly under manipulation, or gradually.

(b) If the limb be powerless, everted, extended, shortened, and the trochanter is adducted, and rolls around a circle only little smaller than the normal, and without crepitus, it is an *impacted fracture of the neck of the femur*. This injury results from direct injury to the hip, and is attended with greater bruising of the part. The shortening may be much greater than in the unimpacted variety, even two inches, or more; when the line of fracture implicates the trochanter or

the extracapsular part of the neck of the bone, the surgeon may be able to detect some deformity about the bone. Great care must be taken in these manipulations not to unimpact the fracture.

(c) If there be eversion of the limb, loss of power, bruising, pain, and tenderness over the great trochanter, which may be found raised and drawn back, while the length of the thigh is unaltered, and on seizing the trochanter it is found to be movable, with or without crepitus, there is a *fracture of the great trochanter*; if these signs are found in a child under sixteen years of age, they indicate a *diastasis of the great trochanter*. This injury is very rare.

(d) If there be eversion of the limb, with shortening, and the tip of the trochanter is found raised, and perhaps displaced backwards as well, while rotation of the limb occasions crepitus, but the tip of the trochanter is found not to move with the shaft of the femur, the accident may be diagnosed to be a *fracture through the neck and great trochanter of the femur*. The patient will be unable to sit, and any attempt to rise or to flex the hip will cause great pain. It is a very rare injury.

(e) If after a fall upon the hip the patient be unable to stand, and complain of great pain in the joint, but the various measurements of the limb are unaltered, and movement do not occasion crepitus, but pressure upon the pubic spine elicit sharp pain, the signs were said by B. Travers to indicate a *fissure of the acetabulum*; but this diagnosis is always open to grave doubt.

(f) If, however, after a direct injury to the hip, the limb be found of its normal length, the trochanter neither raised nor lowered, abducted nor adducted, and the trochanter is found to rotate normally, and yet on moving the hip joint pain and crepitus are produced, a *fracture of the acetabulum* may be diagnosed. When

the head of the bone is displaced towards the pelvis, being forced through the acetabulum, the diagnosis becomes more difficult, as the limb is shortened, the trochanter adducted and raised, there may be either eversion or inversion, and fracture or dislocation may be simulated. Failure to find the displaced head of the bone would eliminate dislocation. Examination of the interior of the pelvis *per rectum* and *per vaginam*, as well as the pain elicited by pressure upon the pubes and ilium, would probably enable the surgeon to distinguish this injury from a fracture of the neck of the femur. (See page 165.)

(g) If after a direct injury to the hip the limb be found everted, and (possibly) bruised, and the patient complain of pain in it, and is unable to move it, but the surgeon finds no alteration in its length, no displacement of the trochanter, no limitation of movement, no crepitus, no want of proper resistance in the groin, no obliteration of the depression behind the trochanter, he may diagnose a *contusion of the hip*. This injury may be followed by slow gradual shortening of the limb and raising of the trochanter from absorption of the neck of the bone. The great pain, the loss of power, and the eversion of the limb make this injury simulate a fracture, and the subsequent shortening makes the resemblance still closer. When the patient is already the subject of *rheumatoid arthritis*, which has led to shortening of the limb and some deformity of the trochanter, it is impossible to diagnose a contusion of the soft parts from an impacted fracture of the neck of the bone, unless the surgeon is aware of the previous condition of the joint.

**B. Injuries of the thigh.**—The diagnosis of a fracture of the femur is usually to be easily made from the obvious deformity, marked shortening, loss of power in the limb, mobility in the length of the bone,

and crepitus. But several of these signs may be absent. Where, then, as the result of an accident, or, rarely, of sudden muscular effort, a patient complain of pain in the thigh, and inability to stand upon it, or to move it at all, inspect the limb, and if there be eversion of the foot and knee, with obvious angular deformity of the thigh below the great trochanter, with shortening of the thigh (the position of the trochanter being normal), there is a *fracture of the femur*. The deformity is usually a curve of the bone outwards and forwards. To detect the abnormal mobility and crepitus, it may be sufficient to place the hand beneath the deformed part of the thigh, and to raise it gently, or the limb may be extended, and gently rotated, when the surgeon will notice crepitus, a lessening of the deformity and of the shortening, and want of rotation of the trochanter with the foot. Where there is this angular deformity of the thigh, if crepitus be obtained without extension of the limb, it shows that the fracture is oblique, with overriding of the fragments. When, however, crepitus is only obtained after extension and correction of the deformity, it shows that the fracture is transverse, with complete displacement of the fragments.

Where, however, on examining the limb there is found eversion of the knee and foot, but no shortening and no obvious deformity, the surgeon should pass his fingers down along the thigh, pressing in upon the bone until he comes upon a very tender spot, where he will probably find some swelling; while he grasps the thigh above this spot, his assistant should gently rotate the leg and knee, and if the surgeon feel crepitus, or notice that the upper part of the thigh does not move with the knee, he diagnoses a *fracture of the femur without displacement* of the fragments. This injury is most common in children; in such cases the periosteum is usually incompletely ruptured. In