

THE TREATMENT OF FRACTURES

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49. INJURIES OF THE HIP

The following injuries may occur in the hip region:

1. Fracture of the acetabulum without displacement;
2. Fracture of the acetabulum with central dislocation of the femoral head;
3. Posterior dislocation or fracture-dislocation of the hip;
4. Anterior dislocation or fracture-dislocation of the hip;
5. Separation of the proximal femoral epiphysis (head);
6. Fracture of the femoral neck;
7. Fracture in the trochanteric region;
8. Sprain of the hip joint;
9. Contusion of the hip region;
10. Wounds of various areas and depths.

Examination in Recent Injuries of the Hip. The basic essentials for adequate treatment are the earliest and most accurate possible recognition of the local morbid process together with particular awareness of the patient's general condition. Therefore, all patients must first be examined clinically and then, if possible, roentgenologically.

Previous History. The patient's name, age, profession, address, body height and weight are recorded. The mode of injury is determined and is usually found to have been a fall, or an accident in which something has fallen upon or caved in upon the patient (or one in which he has been run over). He then had pain, was unable to walk, and the involved limb fell into external rotation or was flexed at the hip with either adduction and internal rotation or abduction and external rotation.

Inspection. One determines whether the patient is pale or is in shock and whether he complains of pain. Without removing the patient's clothing or shoes one notes whether hip and knee joints are extended or flexed and whether and to what extent the limb is rotated internally or externally.

Flexion of hip and knee with internal rotation and adduction of the thigh suggests a posterior dislocation of the hip; flexion of hip and knee with external rotation and abduction of the thigh suggests an anteroinferior dislocation of the hip. External rotation of the thigh of 50° to 60° with flexed hip and knee suggests a central dislocation of the hip; 50° to 60° external rotation with extended hip and knee suggests an intracapsular fracture of the femoral neck. A 90° external rotation of the limb with the knee and hip extended indicates an anterolateral dislocation of the hip or a fracture through the trochanteric region. The limb is lengthened only in the anteroinferior dislocation of the hip; the limb is shortened in all the other types of injuries.

After these observations have been made, the patient is stripped of his clothes and shoes in a warm room so that both lower limbs and the pelvis can be examined. *During this the patient must be protected from chilling.* After having recorded the patient's general condition, one determines the position of the limb relative to the pelvis (extension or flexion, adduction or abduction, external or internal rotation, shortening or lengthening). One determines whether the pelvis lies straight or oblique; whether the hip region is

swollen, broadened or sunken; whether there is any unusual prominence anteriorly or posteriorly and whether excoriation or discoloration of the skin or a hematoma is present. Then one examines the color of the limb and the condition of the muscles.

Then the dorsalis pedis and posterior tibial pulses are taken bilaterally, after which the patellar tendon reflex on the sound side is tested. The form and diameter of the pupils are noted and their reactions to light and accommodation are tested.

The patient is told to move the toes, the subtalar and ankle joints, the knee and the hip joints of the sound side through their full range of motion. Then he is told to move the joints on the injured side as much as possible, and then for comparison to move both sides at once. He should then try to raise the extended limb and to flex and extend the knee.

Palpation. Only after having recorded all results of the inspection should one touch the patient. By striking rather gently against the heel one examines for impingement pain, and by slight torsion one attempts to elicit rotation pain. Then one palpates the trochanteric and the femoral neck regions. In the case of fracture there will be pain on pressure; in the case of dislocation one may be able to palpate the empty acetabulum and the femoral head anterior or posterior to it. For a short while after the accident one can usually even see the prominence caused by the dislocated femoral head. Passive motion is next tested. In dislocations the joint shows a "springy fixation" in an abnormal position. In fractures some range of painful passive movement is found. Lastly, the length of each lower limb is measured from the antero-superior iliac spine to the tip of the medial malleolus with both hips and knees in the same degrees of abduction and flexion. The patient is then covered with a blanket and warmed with a "baker" if necessary.

X-ray Examination. Only after we have made as exact a diagnosis as possible on the basis of the thorough clinical examination do we have antero-posterior and lateral roentgenograms made to allow us to confirm the diagnosis and to recognize details such as fracture-dislocation. With dislocations it is best to make also an anteroposterior scout roentgenogram of the whole pelvis including the hip joints and the proximal parts of both femora.

50. DISLOCATION OF THE HIP

GENERAL

Etiology of Dislocation of the Hip

It results from (1) leverage and rotation; (2) thrust; (3) thrust and leverage; or (4) leverage or thrust with continuing force.

Because of the depth of the acetabulum and the strength of the ligaments and muscles supporting the hip, dislocation of the hip is comparatively rare but is more common than dislocation of the knee.

1. Dislocation of the Hip Caused by Leverage and Rotation. It results from the action of considerable force on the femoral shaft, as for example when one is buried by collapsing walls or is injured in a fall from great height or a

fall when moving at high speed, as in a motorcycle or skiing accident, or when one is run over. In only one of our 79 cases did dislocation result from mere slipping on the street. Posterior dislocation results from abnormal adduction, flexion and internal rotation. Anterior dislocation results from abnormal abduction and external rotation. The shaft and the neck of the femur then lever the femoral head over the fulcrum of the acetabular margin. Sometimes the thigh moves away from the more-or-less fixed pelvis; often the pelvis moves away from the more-or-less fixed thigh. This leads to simple dislocation of the hip (figs. 1528 and 1529/I a—d, 1530/I a—d, 1531 and 1532) or dislocation with avulsion fracture of ligamentous insertions (fig. 1530/II).

2. *Fracture-Dislocation of the Hip Caused by Thrust.* It most frequently results from automobile collision when the car is abruptly stopped. Knees and legs then hit against the dashboard or front seats and are stopped there, whereas the pelvis and the other parts of the body tend to keep moving. The dorsal or superoposterior wall of the acetabulum is thus thrust forwards against the fixed femoral head and is sheared off by it (figs. 1530/III—IV, 1532 c—g, 1546 b—c, 1547—1556). If the hip joint is flexed to a right or acute angle the dorsal edge of the acetabulum is sheared off. With adduction of the thigh (as, for example, with crossed legs) the fragment will be smaller; with abduction of the thigh the fragment will be larger (figs. 1530/III and 1546 a). If the trunk is inclined backwards at the moment of collision and the hip joint is therefore in semiextension, a big dorsosuperior bone wedge is sheared off (figs. 1530/IV and 1546 b). In this type of accident (dashboard dislocation), injuries to the front of the knee are often associated, ranging from simple contusion and laceration up to compound fracture of the patella, of the tibial head and/or of the distal end of the femur.

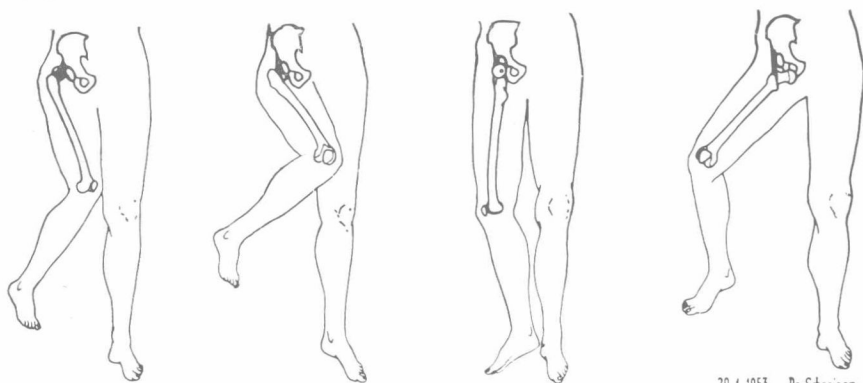
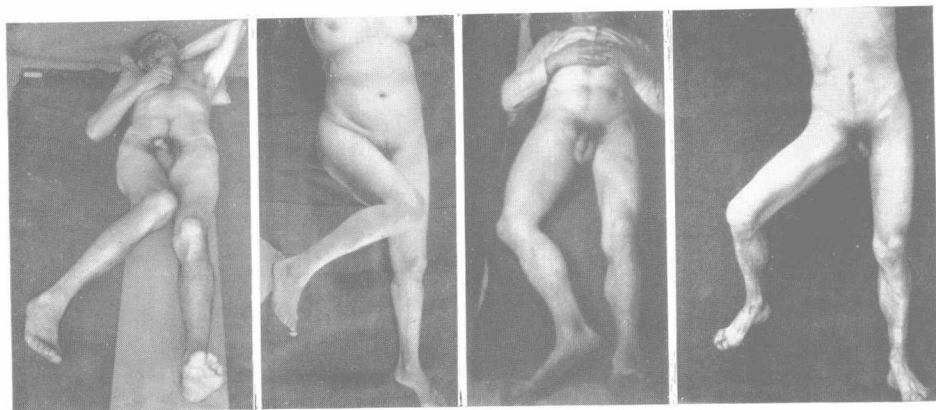
3. *Fracture-dislocation Caused by Thrust and Leverage.* This occurs when a thrust applied against the greater trochanter in the long axis of the femoral neck fractures the acetabulum. Then the femoral head is levered out of the acetabulum (fig. 1530/V).

A marginal fragment of the femoral head is sheared off (fig. 1530/VI) if a thrust is applied in the long axis of the femoral shaft prior to the dislocation of the femoral head.

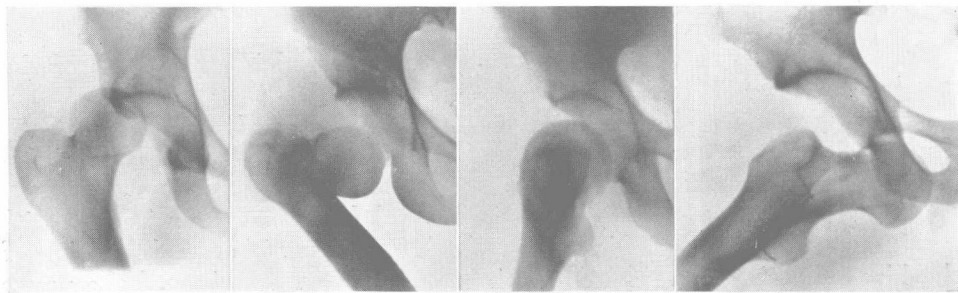
4. *Fracture-dislocation of the Hip Caused by Leverage or Thrust with Persistence of the Force Which Has Led to Dislocation.* If after dislocation of the hip the acting force continues, it may lead to separation of the upper femoral epiphysis (fig. 1530/VII), to fracture of the femoral neck (fig. 1530/VIII and fig. 1557) or to fracture of the femoral shaft (fig. 1530/IX).

Classification of the Dislocations of the Hip According to the Position of the Femoral Head

According to the position of the femoral head in relation to the pelvis we differentiate between anterior and posterior, and within these two groups we again differentiate between superior and inferior, dislocations. There are also dislocations in which the femoral head lies exactly anterior or posterior to the acetabulum. They can easily be missed in a frontal roentgenogram (figs. 1532 a, 1538, 1542, 1547). Posterior dislocations occur five times as



29.1.1953 Dr. Schrizer



1528/Ia

1528/Ib

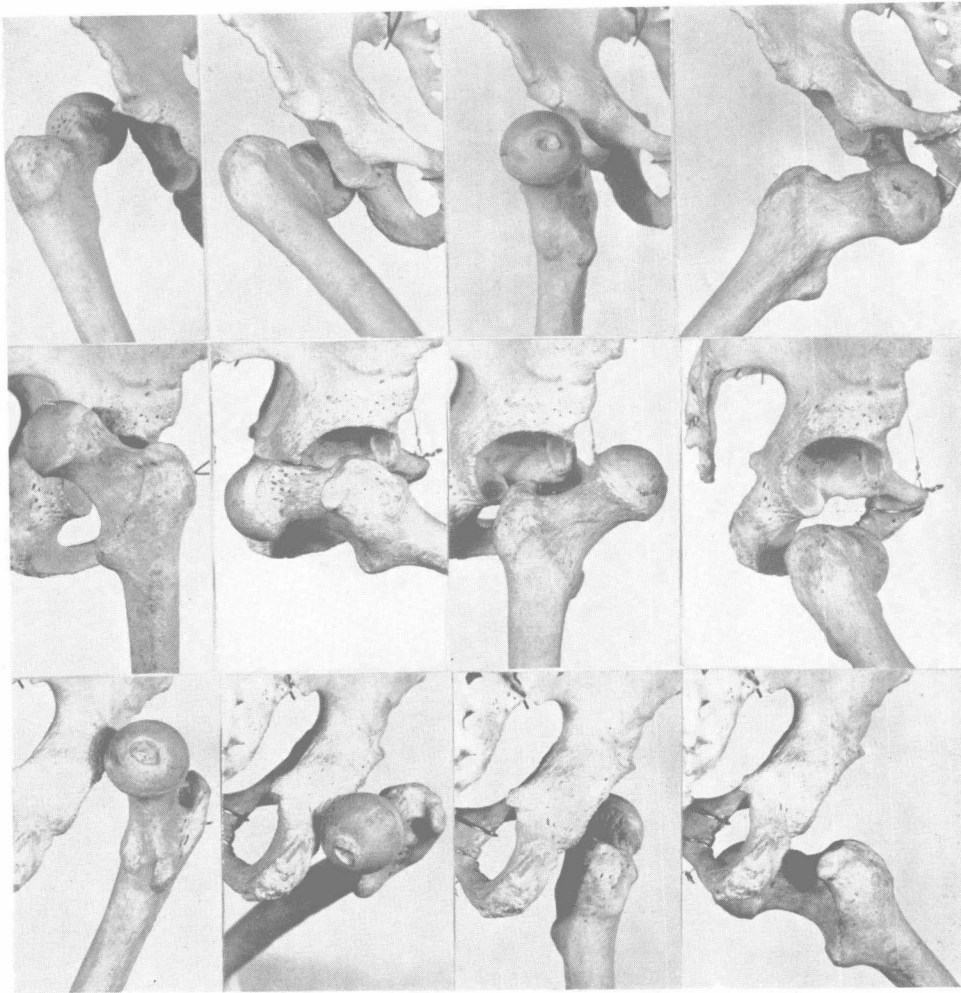
1528/Ic

1528/I d, July 15, 1952

FIG. 1528/Ia.—Luxatio iliaca. The dislocated limb is internally rotated, slightly flexed at the hip and adducted so far that the knee of the injured side lies close to the other knee. In the roentgenogram and the skeletal drawing the femoral head is seen to be dorsal, superior and lateral to the acetabulum. The lesser trochanter is not seen—a sign of internal rotation.

often as do anterior ones. Posterior dislocations there are more often superior, while anterior dislocations are more often inferior.

Among the *posterior dislocations of the hip*, the superior is called luxatio iliaca (figs. 1528/Ia, 1529/Ia and 1531) and the inferior is called luxatio ischiadica (figs. 1528/Ib, 1529/Ib and 1532).



1529/Ia

1529/Ib

1529/Ic

1529/I d, August 1, 1952

FIG. 1528/Ib.—Luxatio ischiadica. The dislocated limb is in a position of extreme internal rotation, flexion and adduction. The knee of the injured side lies on the sound thigh. Radiologically and diagrammatically the femoral head is shown to be dorsal, inferior and lateral to the acetabulum. The lesser trochanter is not seen because of the marked internal rotation, and the findings simulate those of a coxa vara.

FIG. 1528/Ic.—So-called luxatio pubica or ileopectinea. 90° external rotation, extension and approximately 15° abduction of the limb. The femoral head can be seen and palpated as a ball-like swelling in the inguinal region. Radiologically and diagrammatically the femoral head is shown to be caudal, lateral and anterior to the acetabulum. The entire lesser trochanter is seen in profile; the greater trochanter lies behind the femoral head in the acetabulum.

FIG. 1528/I d.—Luxatio obturatoria. Approximately 40° external rotation, 40° flexion and 50° abduction of the dislocated limb. Radiologically and diagrammatically the femoral head is shown to be in front of, below and medial to the acetabulum and in front of the obturator foramen. The entire lesser trochanter is seen in profile.

FIG. 1529/Ia—d.—Luxatio iliaca, ischiadica, pubica or ileopectinea and obturatoria. Top row shows anterior view, middle row shows lateral view, bottom row shows posterior view.

Among the *anterior dislocations of the hip*, the superolateral is called luxatio publica or iliopectinea (fig. 1528/I c) and the inferomedial one is called luxatio obturatoria (fig. 1528/I d).

The clinical features of the four different types of dislocations can be studied in figures 1528 and 1529 a—d.

Concomitant dislocations of both hips may also occur. They may be of the same or of different types. We have seen one bilateral case.

Pathologic Anatomy of Dislocation of the Hip Joint

Injuries to the Capsule and the Ligaments. The femoral head can leave the acetabulum only if the ligamentum teres has been torn or avulsed from the femoral head. In autopsies I have seen it torn off at its proximal or distal extremity. The head dislocates either anteriorly medial to the iliofemoral ligament or posteriorly where strong ligaments are lacking and where the acetabular lip is somewhat low. Posterior dislocations occur through the greater sciatic notch, anterior ones through the acetabular notch. There the capsule tears. The iliofemoral ligament is generally preserved. If it is torn there is no "springy fixation" of the joint. The result is a strikingly high or strikingly lateral position of the femoral head.

Injuries to the Muscles. In posterior dislocations the short rotators, especially the quadratus femoris and the gemelli, are more or less torn. The glutei are only bulged out.

In anterior dislocations, extensive tears of the adductors are the rule. In one of our cases, described by Wittmoser,¹ the pectineus and the adductors minimus and brevis had been torn completely through and the ileopsoas had been torn two-thirds through. The medial femoral circumflex artery had been torn and thrombosed. The posterior short rotators, specifically the piriformis, the obturator internus and the gemelli, had not been injured.

Injuries to the Acetabulum. In dislocations of group II, localized avulsions of ligamentous attachments occur at the superior or inferior lip of the acetabulum (fig. 1530/II). After reduction the joint is invariably stable.

In dislocations of group III, minor and sometimes major parts of the posterior lip of the acetabulum are sheared off (fig. 1530/III). The joint will generally be stable after reduction. Prognosis is good: we have never seen any avascular necrosis among our cases.

In dislocations of group IV, one or more big bone wedges are sheared off from the posterior part of the acetabular roof (fig. 1530/IV). The joint will invariably be unstable. Prognosis is grave: avascular necrosis has occurred in every second case we have seen and arthrotic changes have developed in all the rest.

In dislocations of group V, the floor of the acetabulum is broken (fig. 1530/V) and the fragments are generally displaced. The joint will be unstable after reduction. Fractures of the acetabulum of groups II—V (figs. 1530/II—V) occur in superoposterior dislocations.

¹ Wittmoser, R.: "Eine ungewöhnliche Hüftgelenksverrenkung." Beitr. klin. Chir. 176: 583—600, 1947.

Injuries to the Femoral Head and Neck. In some of the fracture-dislocations of groups III (fig. 1530/III) and V (fig. 1530/V) and more often in those of group IV (fig. 1530/IV), the cartilaginous coat of the femoral head will show fissures and detached fragments. They are, of course, not visible in the roentgenograms. Arthrotic changes may result later on.

In fracture-dislocations of group IV (fig. 1530/IV), a large upper posterior bone wedge is sheared off from the acetabular roof. The upper part of the femoral head is probably compressed and crushed during the accident. After the violent force has ceased, the head regains its former shape (Jörg Böhler¹). Changes in the structure of the trabeculae are not recognizable in our present-day roentgenograms.

Sometimes not only a part of the articular cartilage but also a large marginal fragment of the femoral head is sheared off (fig. 1530/IV). Dislocations of this kind are generally stable after reduction.

In children up to the age of 16, an upper femoral epiphysis loosened during dislocation may become displaced if the violent force continues after dislocation (fig. 1530/VII). Fracture-dislocations of this kind cannot be reduced without open operation.

In adults, continuance of the force after dislocation may cause a fracture of the femoral neck (fig. 1530/VIII) or of the femoral shaft (fig. 1530/IX). Fracture-dislocations of this kind, too, must be treated by open operation.

Marginal fragments of the femoral head (group VI, fig. 1530/VI) are sheared off in superoposterior and inferoanterior dislocations.

Our experience with displacements of the upper femoral epiphysis (group VII, fig. 1530/VII) has been limited to old dislocations of the superoposterior type.

We have seen fractures of the femoral neck (group VIII, fig. 1530/VIII) in superoposterior and anterolateral dislocations.

We have seen fractures of the femoral shaft (group IX, fig. 1530/IX) in posterior and anterior dislocations.

Injuries to the nerves with paralysis of the sciatic nerve or of the peroneal nerve occur mostly in those posterior fracture-dislocations in which reduction has been delayed. Femoral nerve lesions occur in anterolateral dislocations only.²

Injuries to the Vessels. Ruptures of the femoral artery occur in open dislocations of the anterolateral type. In closed anterolateral dislocations the femoral head may press on the artery and displace it laterally.

Classification of Dislocations of the Hip according to the Concomitant Injuries to the Hip Joint and to the Prognosis in those Injuries

The general classification of anterior and posterior, superior and inferior dislocations of the hip concerns diagnosis only. It indicates nothing about prognosis, which depends upon:

¹ Böhler, Jörg: Experimentelle Untersuchungen über die Kompression von Schenkelköpfen. *Der Chirurg* 24: 344, 1953.

² Trojan, E.: Ischiadicus- und Peroneuslähmungen nach traumatischen Hüftverrenkungen und Hüftverrenkungsbrüchen. *Schweiz. med. Wchnschr.* 83: 734, 1953.

(1) the mechanism of injury and the resulting concomitant injuries in the region of the acetabulum and the thigh, and

(2) the nature of the treatment.

As in dislocations of the elbow (see Vol. I/p. 694), there are two main groups of dislocations of the hip, viz., pure dislocations of the hip (DH) and fracture-dislocations of the hip (F-DH) with major or minor marginal fractures of the acetabulum, of the femoral head, or of the femoral neck.

In dislocations caused by leverage, prognosis is much better than in those caused by thrust, the latter involving sometimes grave injuries to the acetabulum or the femoral head. Prognosis depends also on the treatment. The earlier the dislocation is recognized and carefully reduced, and the simpler the postreduction treatment is, the better the prognosis. Special care should be taken to protect the joint from the irritation of postreduction massage and passive motion. Prognosis is grave in dislocations with a fracture of a marginal fragment of the femoral head or in dislocations with a simultaneous fracture of the femoral neck.

We have classified our 79 recent cases according to the following scheme:

A. <i>Pure Dislocations of the Hip (DH).</i>		43 cases (54.43%)
Group I.	Pure Dislocations without injury to the bones, subdivided as follows:	
	a) Pure superoposterior DH	
	Luxatio coxae iliaca	24 cases (30.38%)
	b) Pure inferoposterior DH	
	Luxatio coxae ischiadica	9 cases (11.39%)
	c) Pure anterolateral DH	
	Luxatio coxae publica or iliopectinea	1 case (1.27%)
	d) Pure antero-inferomedial DH	
	Luxatio coxae obturatoria	9 cases (11.39%)
B. <i>Dislocations of the Hip with Fracture of the Acetabular Region Without Central Dislocation (F-DH).</i>		28 cases (35.44%)
Group II.	Superoposterior fracture-dislocation (F-DH) with chip fractures of capsular insertion	7 cases (8.86%)
Group III.	Superoposterior F-DH with shearing off of the lip of the acetabulum	10 cases (12.65%)
Group IV.	Superoposterior F-DH with fracture of one or more bone wedges at the superoposterior part of the acetabulum (roof of the acetabulum)	8 cases (10.13%)
Group V.	Posterior F-DH with fracture of the acetabular floor with or without displacement.	3 cases (3.80%)
C. <i>Dislocations of the Hip with Fractures of the Femur (F-HD)</i>		8 cases (10.13%)
Group VI.	Dislocation of the hip with a marginal fragment from the femoral head	3 cases (3.80%)