Figs 5.14A to C: (A) X-ray of pelvis with both hips, anteroposterior view showing an acetabular fracture (with Matta's angle > 45°) managed conservatively with lateral traction; (B) X-ray of pelvis with both hips showing T type fracture of acetabulum; and (C) its ORIF with plate and screws

HIGH-YIELD POINTS

- Corona Mortis is a vascular communication between external (inferior epigastric artery) and internal iliac (obturator artery) systems that is present just behind superior pubic rami in 85% of patients. Injury to the corona can lead to a dangerous hemorrhage in patients with pelvi-acetabular injuries.
- Some important radiographic signs seen in acetabular fractures are:
  - *Gull wing sign**: Seen in the anterior column plus posterior hemitransverse fracture of the acetabulum.
  - *Secondary congruence and Spur sign*: Seen in both column acetabular fractures.
- Kocher-Langenbeck approach is most commonly used surgical approach to fix acetabular fracture.

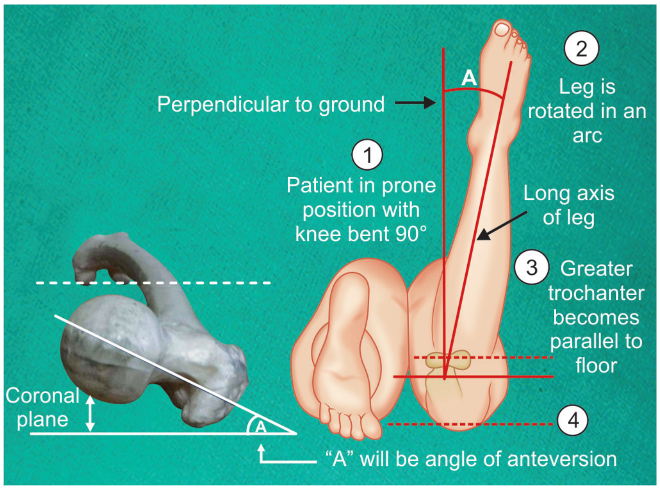


Fig. 5.15: Craige's test for estimation of angle of anteversion

BIOMECHANICS, GAIT ANALYSIS AND CLINICAL EXAMINATION OF THE HIP JOINT

RELEVANT ANATOMY

The hip joint is a synovial ball and socket joint between the acetabulum and head of femur. A fibrocartilaginous labrum is attached to the periphery of the acetabular rim to deepen its cavity. Articular cartilage is present at the center of the acetabulum and covers most of the head of femur. Ball and socket nature of joint, neck-shaft angle of the femur, and the presence of articular cartilage beyond the reach of the acetabular rim allows for a wide range of motion possible at the hip joint. Normal femoral neck is rotated 15°–20° anterior to the coronal plane. This is referred to as femoral anteversion **(Fig. 5.15)** and can be estimated clinically by Craige's test (*see* **Fig. 5.15**). Femoral anteversion decreases from 40° at birth to 15°–20° in adults. Acetabulum also has 15°–20° anteversion and 45° inferior inclination. The neck shaft angle is deduced by measuring the angle between a line in the center of the femoral neck and a line in the center of femoral shaft **(Fig. 5.16)**. The normal neck shaft angle decreases from 140° at birth to 125° ± 5° in adult. Increase in neck-shaft angle greater than 130° is called coxa valga (as distal to the hip the limb moves

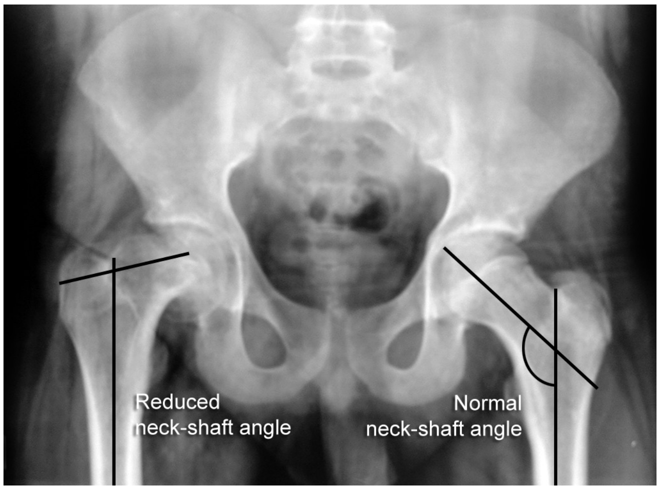


Fig. 5.16: Normal neck shaft angle and coxa vara

*Gull wing sign is also described for osteoarthritis changes in hand X-rays. See Chapter 16 for details.

laterally, *see* Page 6) and reduced neck-shaft angle less than 120° is known as coxa vara (as distal to the hip the limb moves medially, *see* Page 6).

Stability of hip joint depends upon the following factors:

- The depth of the acetabular cup and presence of labrum.
- Ligaments on both anterior (iliofemoral, pubofemoral) and posterior side (ischiofemoral). Iliofemoral ligament of Bigelow is the strongest ligament in the body. It prevents the pelvis from tilting posteriorly and limits adduction.
- The length and orientation of the neck of the femur.
- *Ligament of head of femur*: This band is called the ligamentum teres. It is implanted into the noncartilaginous area bearing fovea centralis on the head of the femur. A small artery runs along it to the head of the femur.
- Thick joint capsule and muscle cover.

Trabecular System of Femoral Neck (Fig. 5.17)

On radiographs, femoral neck can be observed to display two types of trabeculae. Horizontal set of tensile trabeculae is formed due to abductor muscle forces and vertical compressive trabeculae result of weight-bearing forces in the femoral head, both crossing each other at right angles. The knowledge of the trabecular anatomy is sometimes useful to decipher an impacted femoral neck fracture on a radiograph. Also, a special index (Singh's index) grades osteoporosis on the basis of this trabecular system.

Vascularity of Femoral Head and Neck (Fig. 5.18)

It can be divided into three main sources:

1. *Capsular vessels*: These arise from the medial circumflex femoral artery (MCFA) and lateral circumflex femoral artery (LCFA) which are in turn branches of profunda femoris artery. Branches from MCFA and LCFA form an extracapsular arterial ring at base of the femoral neck. Ascending cervical or retinacular vessels arise from extracapsular arterial ring and form a subsynovial intra-articular arterial ring at base of head. Epiphyseal arteries arise from the subsynovial arterial ring. Lateral epiphyseal vessels through lateral ascending cervical arteries (branches of MCFA) are the most important source of blood supply to the head and neck.
2. *Artery of ligamentum teres (medial epiphyseal artery)*: It is a branch of obturator artery. It makes a small contribution to the blood supply of the head.
3. *Intramedullary metaphyseal blood supply*: It makes least contribution to blood supply to the head.

HIP BIOMECHANICS AND ABNORMAL GAIT PATTERNS

When we stand on two legs the weight of the body is equally borne on both legs, the center of gravity (COG) is centered between the two hips (generally lying around 5 cm anterior to S2 vertebra) and the weight of the body (minus the weight of both legs) is equally distributed on the femoral heads. In single leg stance the COG is shifted distal and away from the supporting/loaded hip due to swing leg being considered as part of the body. As a result the supporting hip is subjected to the following three forces **(Fig. 5.19A):**

1. Body weight
2. Abductor muscle force
3. Joint reaction force.

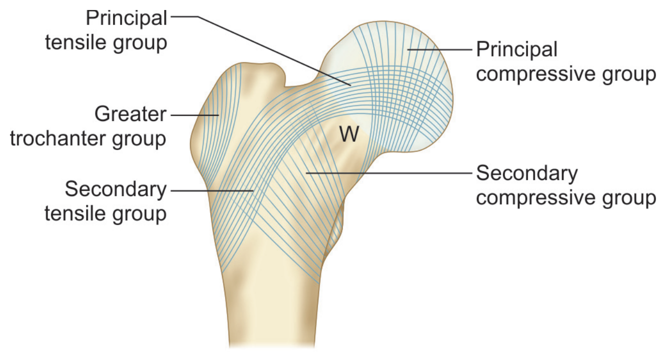


Fig. 5.17: Schematic representation of the trabecular system of femoral neck (W-Ward's triangle, a triangular shadow in trabecular system)

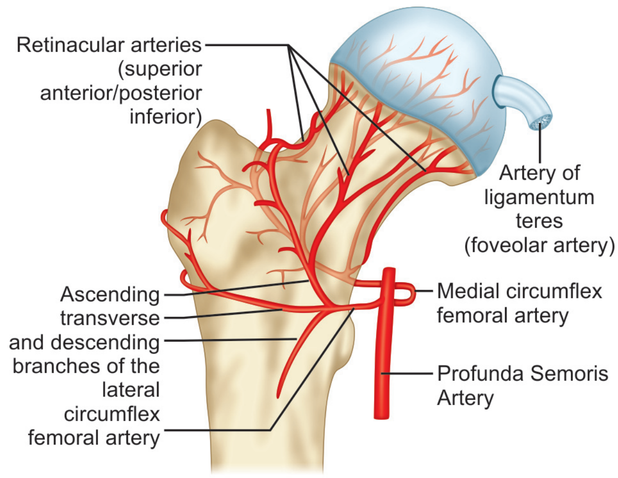


Fig. 5.18: Vascularity of femoral head

Joint reaction force is the force that generates within a joint in response to forces acting on the joint. In the hip joint these forces are body weight and abductor muscle force. To maintain a stable hip, torque produced by body weight should be countered by torque that abductor muscles can generate **(Fig. 5.19B)** with the femoral head acting as a fulcrum in this lever system.

How Does a Cane or Limp Help to Reduce the Hip Pain?

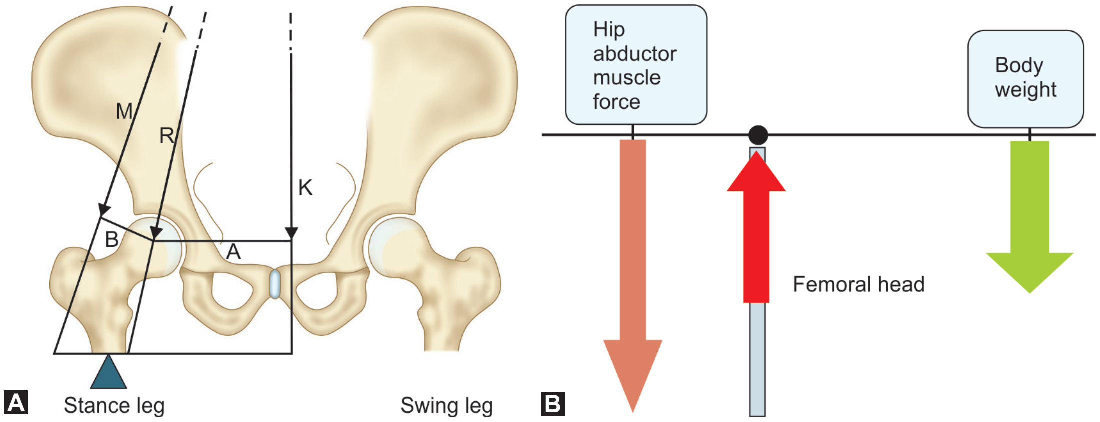
The joint reaction force across a painful hip can be reduced by either reducing the body weight (K) or its moment arm (A), or by increasing the abductor force (M) or its moment arm (B).

Cane in the opposite hand transmits part of body weight to ground and thus reducing the body weight (K) that needs to be countered by abductor muscle force (M). Hence, a cane is always prescribed in the opposite hand.

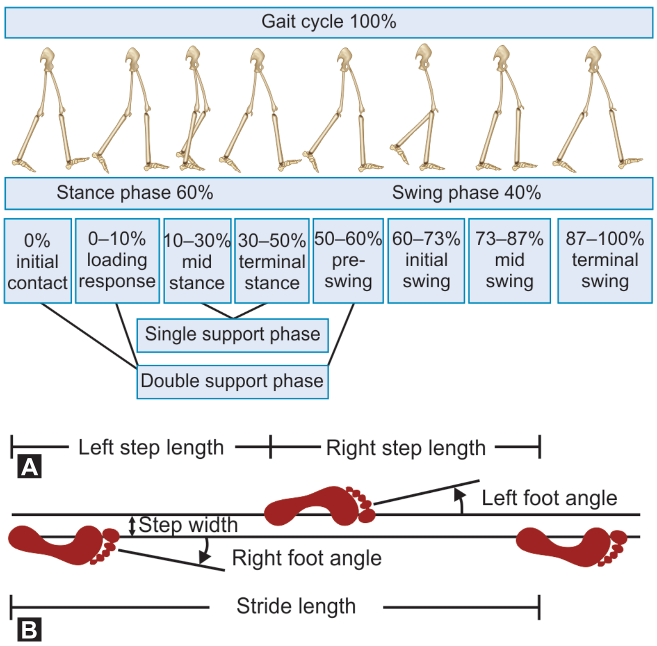
Limp toward the same side (of pathology) reduces the body lever arm (A) by shifting the COG toward loaded hip. Hence, when the abductors are paralyzed (from any cause) one bends toward the side of paralyzed abductors to shift the COG toward affected hip in an attempt to decrease joint reaction force in the hip.

Normal Gait Pattern

Normal gait comprises a series of rhythmical alternating movements of limb and trunk which result in forward progression of the COG of the body. Normal gait requires adequate muscle strength,



Figs 5.19A and B: (A) Free-body diagram for the calculation of the hip joint force while walking, where K is the body weight (minus the weight-bearing leg), M is the abductor muscle force, and R is the joint reaction force; (B) Hip joint is Class I lever with femoral head acting as a fulcrum in the center and forces (load or effort) distributed on either side. For a stable hip, load produced by body weight should be countered by abductor muscle effort



Figs 5.20A and B: (A) Normal gait cycle and (B) Various parameters of gait

full range of motion of all involved joints, good proprioception, and balance (alignment and length of the limbs). Identification of abnormal gait requires understanding of a normal gait cycle.

A "gait cycle" is defined as the time interval or a sequence of motions occurring between two consecutive initial contacts (heel strikes) of the same foot; each cycle lasting for 1–2 seconds. Gait cycle is divided into stance and swing phases **(Figs 5.20A and B)**. Stance phase is the period during which the foot is in contact with the ground while in the swing phase, the foot remains in the air. The stance phase usually accounts for 60% of the cycle and the swing phase accounts for 40% of the cycle.

The stance phase is subdivided into:
- Initial contact (heel strike)
- Loading response (flat foot)
- Mid stance (single leg support)
- Terminal stance (heel off), and
- Preswing (toe off).

The swing phase is subdivided into:
- Initial swing (acceleration)
- Mid-swing, and
- Terminal swing (deacceleration).

In a gait cycle there are two periods of single (60%) and two periods of double (40%) leg support. In single leg support phase only one foot is in contact with the ground. Double support is the period in normal gait cycle when both feet are in contact with the ground. With increasing speed the swing phase and single leg support becomes proportionately longer and the stance phase and double support phase becomes shorter. In running, the period of double support is absent (i.e. during no time are two feet simultaneously in contact with ground). Rather running is characterized by a phase called "double float", a period in which neither foot is in contact with the ground.

*Various Parameters of Gait **(Fig. 5.20B)***
- Cadence is the number of steps taken per minute. Usually a person takes 90–120 steps/min that provides a comfortable walking speed of around 1.4 m/s or 5 km/h.
- The stride length is the linear distance between points of heel contact of the same foot. It is equal to sum of two step lengths, left and right. Its average value is about 150 cm.
- Step length is the linear distance between points of heel contact of the contralateral feet. Its average value is about 75 cm.
- Base of gait or step width is the distance between the medial aspect of the heels. Normally it is 6–8 cm.
- Angle of foot (syn. foot progression angle) is an angle between an imaginary line from heel to second toe and the line of progression. On an average it is 10°.

Abnormal Gait Patterns

Any deficiency or deviation from normal gait produces an abnormal gait pattern which is usually adapted to compensate for that deficiency.

Antalgic Gait

This is the most common pattern seen with painful hip (or presence of pain anywhere in the lower limb). It is characterized by slow walking speed, reduced stance phase on the painful limb, reduced joint excursion, and a limp toward the painful hip to reduce the moment arm of the body weight and thereby reduce the joint reaction force in the affected hip.

Trendelenburg Test and Gait (Duchenne de Boulogne)

Trendelenburg gait (syn. gluteus medius gait) is seen in weak abductor mechanism due to any cause. For an effective abductor mechanism one requires, an intact fulcrum (hip joint proper), lever arm (head and neck), and power (abductors). During one legged stance of the gait cycle, when one stands on a single leg (for instance left leg), the right side pelvis is lifted up to clear the ground. This is done by contraction of abductors on the left side (mainly gluteus medius that is running between ilium and the greater trochanter on the lateral aspect of the hip) acting via an intact lever arm and fulcrum. If the left side abductor mechanism is defective, the opposite side of the pelvis will dip down by virtue of gravity (positive Trendelenburg sign/test, **Fig. 5.21**). In this case, while walking, patient lurches to the same side, i.e. he shifts all his weight to the left side to prevent the right pelvis from dipping down and keep the pelvis leveled (Trendelenburg gait). When a patient lurches on both sides (positive Trendelenburg sign on both hips), it is known as "waddling gait".

Common causes of Trendelenburg gait are:

- *Defect in fulcrum:* Hip dislocation, advanced cases of TB hip and septic arthritis of hip joint, developmental dysplasia of the hip, Perthes disease, advanced cases of AVN hip.
- *Defect in lever arm*: Fracture head or neck of femur, coxa vara, and trochanteric fractures.
- *Defect in power*: Abductor paralysis due to poliomyelitis or superior gluteal nerve injury, tensor fascia lata and iliotibial tract palsy and L5 radiculopathy.

Short Limb Gait

The patient walks on toes of shortened limb by keeping a foot in equinus or may maintain flexion of the hip and knee of the lengthened limb to level the limbs. Often it is confused with Trendelenburg gait. The two can be differentiated by the fact that in short limb gait the "shoulders drop down" as patient walks, but the lurch (sway) toward the affected side is absent.

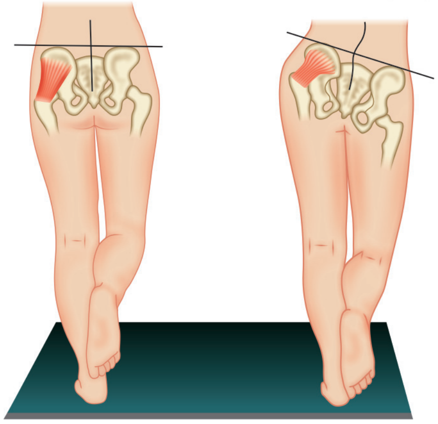


Fig. 5.21: Trendelenburg test

Foot Drop Gait (High-Stepping Gait)

It is seen in common peroneal palsy or sciatic nerve palsy where there is paralysis of the dorsiflexors. Patient lifts his leg more to clear the ground and he keeps his forefoot first than heel on the ground.

Stiff Knee Gait

It is characterized by decreased knee flexion (for instance, in tuberculosis of knee) in swing phase. Patient circumducts (excessively abducts) and brings the leg forwards to clear the ground.

Stiff Hip Gait

Here pelvis is lifted to bring the leg forward as in cases of tuberculosis of hip with ankylosed hip.

Crouch Gait

Patients walk with hip and knee flexion and ankle equinus. It is seen in cerebral palsy and polio.

Gluteus Maximus Lurch Gait

It is seen in polio, inferior gluteal nerve palsy, etc. Patients lurch backwards with every step to compensate for lack of hip extension.

Scissoring Gait

It is seen in cerebral palsy due to adductors spasm of both hip joints.

Hand-to-Knee Gait

It is seen in polio due to quadriceps weakness with inability to lock the knee while walking. The patient puts his hand on the knee to prevent it from buckling.

HIGH-YIELD POINTS

- Limp and Lurch are two interchangeably used terms. Ideally, "limp" is a symptom (usually pain) described by the patient that is causing change in his normal gait mechanics while "lurch" is an observation made by the clinician where he finds a sway of the patient's trunk or pelvis during the gait cycle.
- The head is never higher during normal gait than it is, when a person is standing.
- During normal gait body's COG describes vertical and horizontal displacements that simulate "figure of 8", confined within a square of 5 cm.
- Preswing is the only phase in the gait cycle where all muscle groups are silent.
- Phase with maximum kinetic energy is heel strike/loading response while the phase with maximum potential energy is mid stance.
- Cane in the opposite hand or limp toward the same side are an effective way to reduce the pain in ipsilateral hip or knee joint. So prescribe a cane always in the opposite hand, may the problem be in the hip or the leg.

EXAMINATION OF THE HIP JOINT

Hip examination starts from the point patient enters the clinician's room. Look at the gait pattern and attitude of patient in standing and lying position. This gives an idea about the part of the lower limb which is diseased. Inspection should be done from the front, back, and side to see any wasting, swelling, deformity, and abnormal skin conditions. Palpate the all relevant bony points [GT, anterior superior iliac spine (ASIS)] and look for tenderness at base of Scarpa's triangle (syn. femoral triangle). Anteriorly femoral head can be located 1 cm below and out to the mid-inguinal point (located at the midpoint of a line between the ASIS and pubic symphysis). Palpate the inguinal group of lymph nodes and record range of motion at hip joint.

Understanding the fundamentals of hip examination require the reader to know two important concepts:

1. The concept of a fixed deformity
2. The concept behind true and apparent shortening.

Assessment of Fixed Deformity

Normally in the movements of the hip, the pelvis remains stable as movement occurs between femoral head and the acetabulum. A fixed deformity of the hip is one where the movement of the hip joint is lost in a particular direction either due to joint destruction or due to soft tissue contractures. Now on attempting that movement, the pelvis moves as a whole, rather than the movement occurring in the joint.

Pathological fixation of the hip joint in a fixed position of joint is one from where the limb can be moved further in the same plane but cannot be moved in the opposite direction as this moves the pelvis. So in a hip fixed in 15° adduction, abduction will not be possible as on abducting pelvis will tilt but further adduction may be possible.

Patients with fixed deformities of the hip joint, usually adopt compensatory postures to hide the deformity. The compensation depends on the type of fixed deformity as explained below.

- In fixed flexion deformity patient compensates for by excessive lumbar lordosis **(Fig. 5.22)**. Thomas test is used to assess this fixed flexion deformity of the hip joint.
  Thomas test ***(Fig. 5.23)***: Patient is positioned supine on a firm bed and then asked to flex the normal hip to bring the knee of normal side to his chest. Patients with fixed hip flexion deformity compensate by excessive lumbar lordosis (as explained in **Fig. 5.22**), so this is done to obliterate that compensatory lumbar lordosis so that the flexion deformity at affected hip can manifest. Hence, ensure that there is no space between the patient's back and the table before proceeding further. Now ask the patient to hold this normal limb in this position with his own hands. This automatically brings the diseased hip (with fixed flexion deformity) into some flexion (as obliteration of lumbar lordosis makes the masked deformity manifest). The examiner then passively lowers the affected limb to the bed. If the limb remains up off the table, a fixed flexion deformity of the hip is suspected. The angle subtended between the thigh and the bed is the angle of flexion deformity.
- In fixed adduction or abduction deformities, to ambulate normally, the body compensates by tilting the pelvis. In fixed abduction deformity ASIS is fixed at a lower level as compared to the other side (*see* **Fig. 5.24A** for an explanation) while in fixed adduction deformity ASIS will be at a higher level as compared to the other side (*see* **Fig. 5.24B** for explanation).

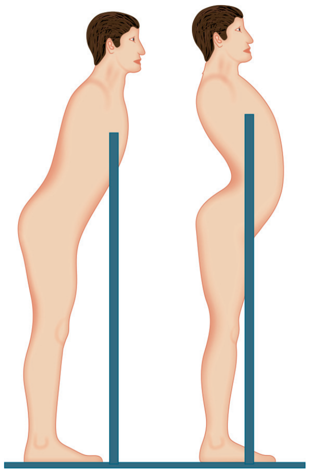


Fig. 5.22: Flexion at hip has been compensated by increasing lordosis at lumbar spine and the trunk has been leveled

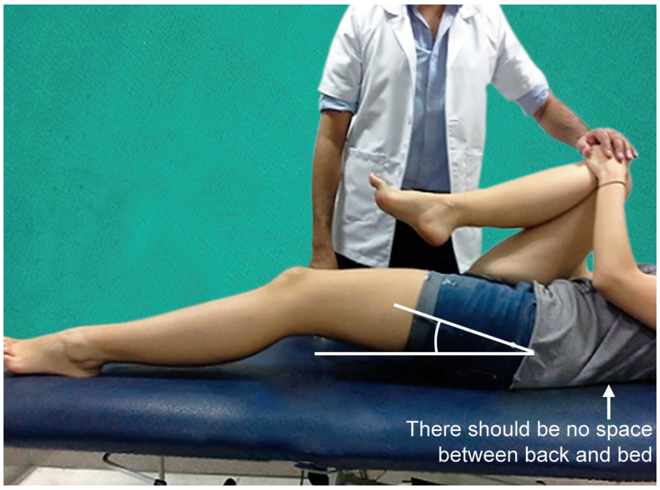
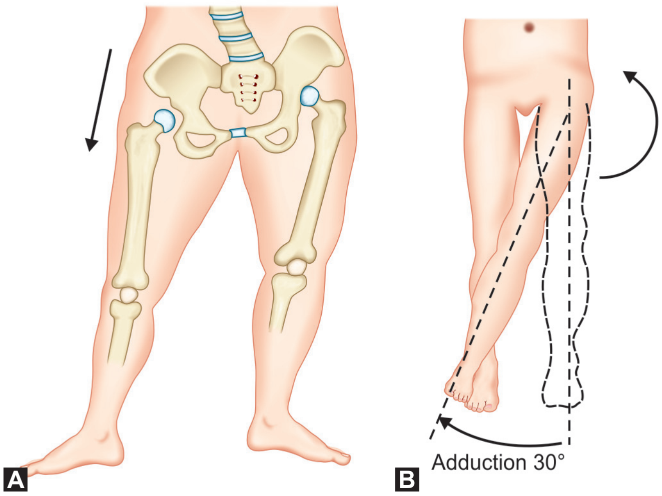


Fig. 5.23: Thomas test

The amount of either deformities can be very easily quantified as explained below. An essential prerequisite to make the calculation is a process called "squaring the pelvis". This involves bringing both the ASIS to same level by moving the affected hip (moving the normal hip cannot tilt the pelvis so affected hip is moved to tilt the pelvis to get both ASIS on to the same level).

– To calculate the amount of deformity the affected limb is further abducted until both the ASIS are at the same level (squaring of pelvis). The angle subtended between the mid line and the affected thigh is the amount of abduction deformity.
– To calculate the amount of deformity the affected limb is further adducted until both the ASIS are at the same level (squaring of pelvis). The angle subtended between the mid line and affected thigh is the amount of adduction deformity.



Figs 5.24A and B: (A) Right hip of this patient has fixed abduction. To place it flat on the ground, the ipsilateral ASIS has to be dropped down and thus over time it gets fixed at a lower level, and (B) Left hip of the patient has fixed adduction. To bring this leg into parallel alignment (dotted diagram), the ipsilateral ASIS has to be lifted up and thus it gets fixed at a higher level

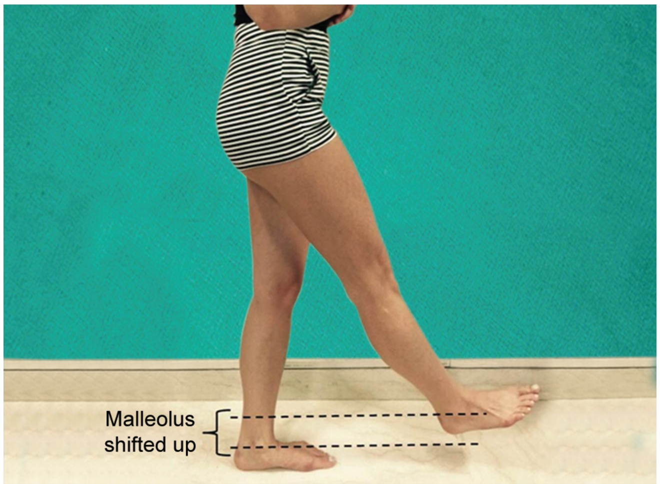


Fig. 5.25: Malleolus moves proximally when the hip is flexed apparently shortening the limb

Assessment of True and Apparent Length

Affections of the hip can lead to alterations in the limb length. The alteration can occur either due to real bone loss causing true change in length of limb or due to compensatory postures adopted by the patient causing apparent changes in length of limb. For example, if there is a fixed flexion deformity of the hip, the malleolus apparently moves proximally as shown in **Figure 5.25**, although the limbs are actually of the same length. Now the patient brings this hip to extension by developing compensatory lumbar lordosis but the malleolus stays proximally located giving a false impression of a short limb. Similarly, in fixed adduction, due to compensation the ASIS gets fixed proximally and the limb is apparently shortened while in fixed abduction, the ASIS goes lower and the limb is apparently lengthened **(Figs 5.24A and B)**.

The true and apparent lengths can be measured as shown in **Table 5.3**. Remember that finally, true length = apparent length ± (compensation because of fixed deformity), where you add for flexion or adduction deformities that shorten limb while subtraction is done for abduction deformity that lengthens the limb.

Assessment of Supratrochanteric Shortening

Any pathology in the lower limb (hip, thigh, leg, etc.) can be a cause of limb length discrepancy. In case the clinical examination reveals true shortening (i.e. loss of bone length), the next step in such patients is to decipher the level of shortening. This can be deciphered by performing the Galeazzi's test.

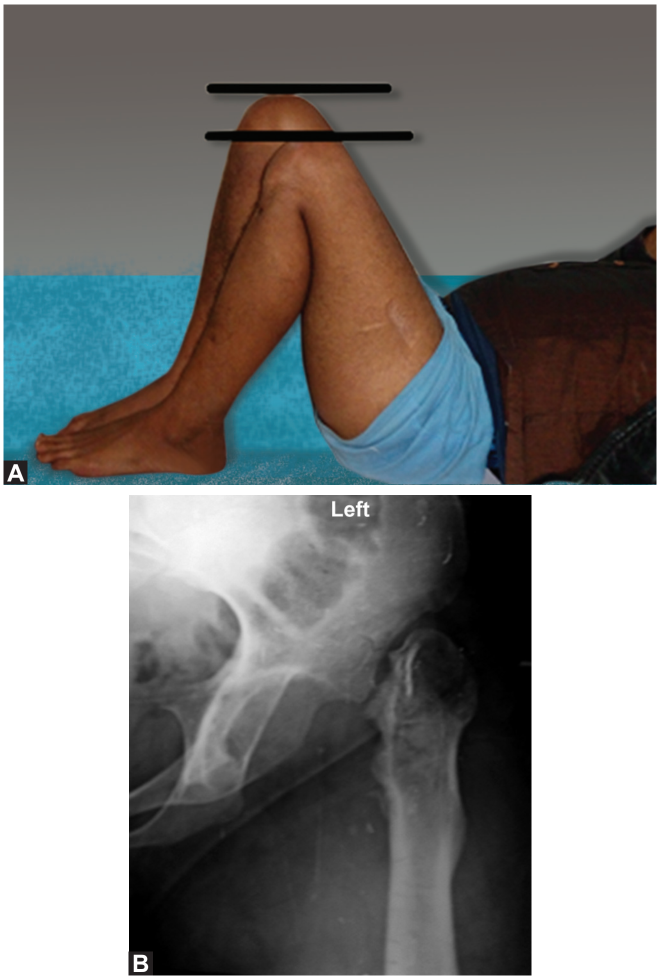
*Galeazzi/Allis test **(Figs 5.26A and B)**:* This test demonstrates whether the shortening is in the femur or tibia. The patient lies supine with the hips flexed to 45° and the knees flexed up to 90° and both the lower limbs placed side to side with malleoli touching together. The examiner assesses the position of both knees from the end of the bed and from the side. Normally both knees lie at the same level. When the normal knee projects farther forwards than the affected, the affected femur is shorter and when affected knee is lower than the other the tibia is shorter.

In patients with hip pathologies with Galeazzi's test the shortening can thus be localized to the femur. Next step is to localize whether the shortening is subtrochanteric (measure length from GT to lateral knee joint line and compares two sides) or is supratrochanteric (pathology located above the greater trochanter as in the destruction of the femoral head, neck, or a dislocation of the joint). From hip joint affection one would

Table 5.3: Measurements of true and apparent length

True length	From ASIS* to medial malleolus	Limbs in identical position with respect to pelvis	Pelvis is squared	In fixed abduction deformity true shortening will be more than apparent shortening. In fixed adduction deformity true shortening will be less than apparent shortening
Apparent length (functional length)	From any central point on trunk (umbilicus or xiphisternum) to medial malleolus	Limbs parallel to each other	Pelvis is not squared	It is primarily a measurement of pelvic tilt

*ASIS (anterior superior iliac spine) is identified by first palpating the pubic tubercle and then following the inguinal ligament up and laterally. The first bony landmark encountered is the ASIS.



Figs 5.26A and B: Positive Allis/Galeazzi's test due to resorption of head and neck of femur, see X-ray (as a sequel of septic arthritis in this patient)

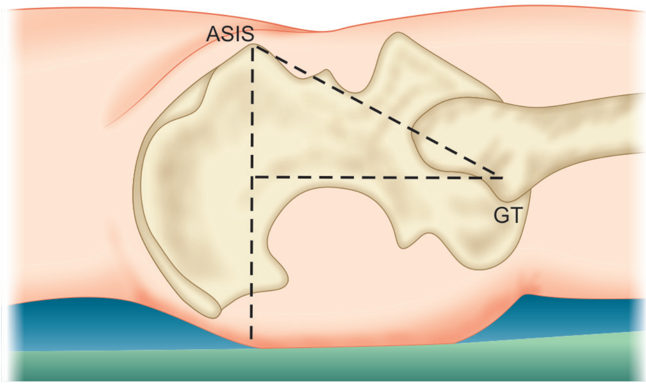


Fig. 5.27: Bryant's triangle

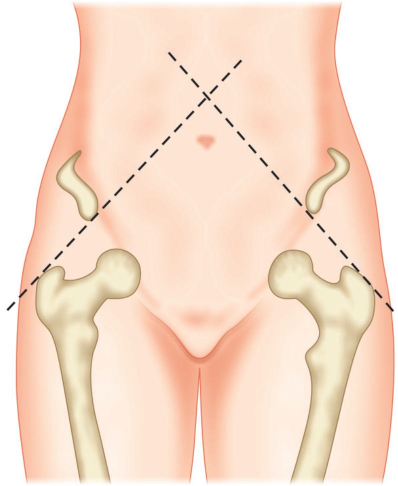


Fig. 5.28: Schoemaker's line

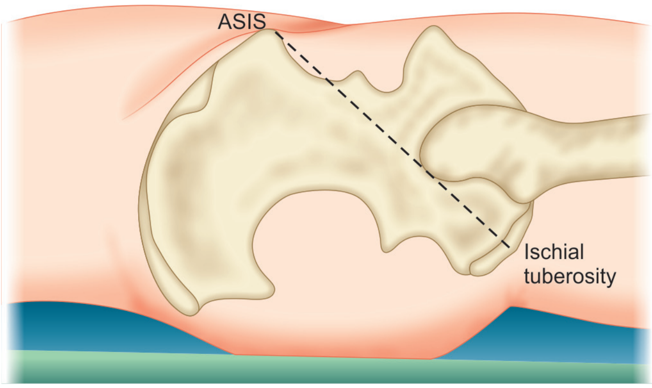


Fig. 5.29: Nelaton's line

expect to find supratrochanteric shortening. This can be deduced and measured in a number of ways as follows:

- *Bryant's triangle* ***(Fig. 5.27)***: In a squared up pelvis in supine position a line is drawn from the ASIS perpendicular to the bed. Another line perpendicular to the first line is drawn from tip of GT. A third line from ASIS to tip of GT completes the triangle. This is compared to Bryant's triangle of normal side. Any shortening of the base indicates supratrochanteric shortening.
- *Schoemaker's line* ***(Fig. 5.28)***: In supine position line joining the ASIS and tip of GT should meet the same line of opposite side at or above the umbilicus in the midline. In supratrochanteric shortening this line of affected side meets its counterpart below the umbilicus and the intersection is not centered at midline.
- *Chienes line*: With the patient lying supine, lines are drawn joining the two ASIS and the two greater trochanters. Normally, the two lines would stay parallel. In the case of one trochanter has migrated proximally, the lines will converge on that side.
- *Nelaton's line* ***(Fig. 5.29)***: Patient is positioned in lateral position with the diseased side up. Flex the hip joint at 90°. Draw a line joining the ischial tuberosity to ASIS. In supratrochanteric shortening the trochanter will be above this line. Normally, this line passes through the tip of GT. The advantage of Nelaton's line over the other methods is that it can measure supratrochanteric shortening in cases of bilateral hip pathologies as comparison with other side is not needed.

Special Tests around the Hip

Telescopy ***(Fig. 5.30)***: With the patient in supine position, flex the hip and knee joint to 90° (or less if this much of flexion is not possible) and adduct the hip joint slightly (10°–15°). To test the right hip, stand on the right side of the patient, hold his flexed knee with right hand and put palm on the trochanter and extended fingers on the buttock. Now pull up and push down the knee. The push movement is more important to focus. An obvious excursion of the trochanter can be felt if telescopic test is positive.

This test indicates the instability of the hip joint and is positive in neglected posterior dislocation of hip joint, congenital dislocation of hip, paralytic hip, nonunion fracture neck of femur, advanced cases of AVN, and septic arthritis with resorption of head and neck.

Note: Stand on same side of affection. The clinician is standing on the opposite side to ensure good visibility to the reader.

HIGH-YIELD POINTS

- Lumbar lordosis can hide up to 30° of flexion deformity at the hip joint.
- Thomas test cannot detect bilateral hip flexion deformity. In such cases a prone test is used for detection.

INJURIES AROUND THE HIP JOINT AND FRACTURE SHAFT OF FEMUR

DISLOCATION OF THE HIP

Hip dislocations are orthopedic emergencies that require immediate diagnosis, evaluation, and treatment. The dislocation may be posterior, central, or anterior. 90% of hip dislocations are posterior type in both adults and in children owing to the classical mechanism of injury (*see* below). Anterior fracture dislocation is more common than central fracture dislocation which is rarely seen.

Fig. 5.30: Telescopy test of the hip joint

Mechanism of Injury

The hip is the most stable joint in the body with best articular configuration. The strongest ligament in the body (the Y-shaped iliofemoral ligament or the ligament of Bigelow) is also present around the hip. So in the majority of cases dislocation of the hip occurs due to a high-velocity motor vehicle injury. Posterior traumatic hip dislocations occur when axial force is applied to flexed, adducted, and internally rotated hip joint. Dashboard injuries in which person's flexed knee, with flexed hip strikes against the dashboard is a common mechanism of injury for posterior dislocation of hip. Thompson-Epstein classification is used to classify posterior hip dislocations **(Table 5.4)**. Anterior hip dislocation is classified by Epstein's classification into superior (pubic and subspinous) and inferior types (obturator and perineal).

Clinical Features

Patients present with a typical attitude of limb depending upon the type of dislocation **(Table 5.5)**, with inability to use the involved lower limb. Since the mechanism is mostly a dashboard injury, many a times these patients can have a concomitant fracture of posterior wall of the acetabulum, patellar fractures, and posterior cruciate ligament injury in the knee.

All hip movements are painful. Femoral head may be palpable at the ipsilateral gluteal region in posterior dislocation while it is palpable in groin in an anterior dislocation. In a central fracture

Table 5.4: Thompson-Epstein classification of posterior dislocation of the hip joint

Type	*Description*
Type I	Posterior dislocation with no or minor fracture of posterior acetabular rim
Type II	Posterior dislocation with large single fracture of posterior acetabular rim
Type III	Posterior dislocation with comminution of acetabular rim, irrespective of the size of fragments
Type IV	Posterior dislocation with fracture of the acetabular floor
Type V	Posterior dislocation with fracture of the femoral head

Table 5.5: Mechanism of injury and limb attitude in hip dislocation

Type of dislocation	*Mechanism of injury*	*Attitude of limb*
Posterior dislocation of hip	Axial force along the shaft of femur with hip flexed, adducted, and internally rotated	Flexion, adduction, and internal rotation, true shortening may be present **(Fig. 5.31)**
Anterior dislocation of hip	Hyperabduction and external rotation of flexed hip joint	Abduction and external rotation with flexion (with limb shortening, obturator type) or extension (with limb lengthening, pubic type) at hip joint
Central fracture-dislocation of hip joint.	Axial force on internally rotated and abducted hip, direct injury on the trochanter	Virtually any deformity possible. Mostly flexion, abduction and internal rotation or flexion, adduction and external rotation. True shortening may be present