# Patient Selection and Physical Examination

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J.W. Thomas Byrd

The key to successful outcomes in hip arthroscopy lies most clearly in proper patient selection. The best operation will fail when performed for the wrong reasons. Selection revolves around imaging evidence or at least clinical findings of a problem potentially amenable to arthroscopic intervention. Another important selection factor is assuring that the patient has reasonable expectations of what may or may not be accomplished by the procedure. The success of the operation is gauged by the patient's function and subjective sense of satisfaction. If the patient has unreasonable expectations of what the procedure may accomplish, then it will be deemed a failure, even in the presence of a well-performed procedure.

Examination of the hip joint is succinct and requires only a few minutes. However, examination of the hip region can be complex and requires much more detail. Numerous disorders can mimic a hip joint problem. Generally, these are neurological, visceral or musculoskeletal. An upper lumbar disk problem causes anterior hip pain and minimal traction signs, which is different than the findings that would be more easily distinguished in association with more common lower lumbar disk problems. Major nerves include the sciatic, femoral, and obturator, but any nerves of the lumbosacral plexus can become entrapped with sometimes variable and overlapping pain patterns that may need to be deciphered [1]. Referred symptoms from a visceral origin include disorders of the gastrointestinal, urological, or gynecological systems. Other musculoskeletal problems such as mechanical back pain or pelvic dysfunction from the SI joint or symphysis pubis must be differentiated.

Additionally, not all hip problems are amenable to arthroscopic intervention. Stress fractures, avascular necrosis, and advanced degenerative disease are just a few examples. Also, keep in mind that the hip and pelvis are the sites of origin of approximately 10–15% of all primary musculoskeletal tumors, although metastatic disease is more common among older adults. Because of the joint's deeply situated anatomy, tumors can grow to considerable size before being clinically evident. Radiographs are important. These are helpful to rule out other problems in addition to assisting in the diagnosis of intra-articular disorders amenable to arthroscopy.

It is refreshing to evaluate a patient who has a simple isolated hip joint problem. Often there may be coexistent disease or secondary disorders where the patient has been compensating for the hip or simply other coexistent abnormalities.

It is not uncommon for an adult patient with early degenerative hip disease to perhaps have some concomitant degenerative problems of the lumbar spine. Differentiating the contribution of each can be a clinical challenge. Among athletes, hip and back problems often coexist, especially in sports where rotational velocity is a premium. Dysfunction of one results in reduced ability to compensate for the other. The physician may find himself alternately treating one or the other, but they actually require a comprehensive management strategy. There is ample data that hip disorders often go undetected for a protracted period of time [2]. As individuals compensate for their hip problem, secondary disorders develop such as gluteal symptoms or trochanteric bursitis. On examination, the secondary disorders may be more evident and obscure the underlying primary hip problem. Treatment of these secondary disorders fails when the primary problem is not addressed. Lastly, there may simply be other coexistent problems such as snapping of the iliopsoas tendon or iliotibial band. Since these have a recognized prevalence in a normal population and may be present in someone with a hip disorder, these can further challenge the clinical assessment [3].

Patient demographics provide useful tips in formulating a differential diagnosis. Age, gender, vocation, or avocation all provide useful clues. For example, femoroacetabular impingement (FAI) is a common source of problems in ice hockey. Dysplasia is more common in dancers where mobility

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is more of a premium. Also in this group, even slight impingement can become problematic because of the super physiologic demands of motion. Older patients are more likely to have problems with arthritis. Advancing age is not an indicator of poor results with arthroscopy, but the amount of arthritis is [4].

## History

There are various disorders that can result in a painful hip, and thus the history may be equally varied as far as onset, duration, and severity of symptoms. For example, acute labral tears associated with an injury have gone undiagnosed for decades, presenting as a chronic disorder. Conversely, patients with a degenerative labral tear may describe the acute onset of symptoms associated with a relatively innocuous episode and gradual progression of symptoms.

In general, a history of a significant traumatic event is a better prognostic indicator of a problem potentially correctable with arthroscopy [5]. Insidious onset of symptoms can be a less favorable prognostic indicator but not a contraindication to arthroscopy. This situation reflects the likely existence of underlying predisposition to injury. Patients may recount a specific precipitating episode such as a twisting injury, but even with these circumstances, there is a likelihood of some underlying susceptibility to joint damage.

Mechanical symptoms such as locking, catching, popping, or sharp stabbing in nature are better prognostic indicators of a problem correctable by arthroscopy [6]. Simply pain in absence of mechanical symptoms is a poorer predictor. However, the presence of a "pop" or "click" is an often overrated feature of the hip examination. This may indicate an unstable lesion inside the joint, but many painful intra-articular problems never demonstrate this finding, and popping and clicking can occur due to many extra-articular causes, most of which are normal. Constant intractable pain present even with inactivity presents a particular challenge and is often unlikely to be solved by arthroscopy.

There are characteristic features of the history that can indicate a mechanical hip problem (Table 2.1). These are helpful in localizing the hip as the source of trouble but are not specific for the type of pathology. As expected, the pain is worse with activities, although the degree is variable. Straight plane activities such as straight-ahead walking or even running are often well tolerated, while twisting maneuvers such as simply turning to change direction may produce sharp pain, especially turning toward the symptomatic side which places the hip in internal rotation. Sitting may be uncomfortable, especially if the hip is placed in excessive flexion. Rising from the seated position is especially painful, and the patient may experience an accompanying catch or sharp stabbing sensation. Also, after a period of sitting, the first few steps upon rising may be painful. Symptoms are worse with ascending or descending stairs or other inclines. Entering and exiting an automobile is often difficult with accompanying pain. This loads the hip in a flexed position along with twisting maneuvers. Dyspareunia is almost uniformly present and a problem for sexually active individuals, although often patients may be reluctant to share this bit of information. Difficulty with shoes, socks, or hose may simply be due to pain or may reflect restricted rotational motion and more advanced hip joint involvement.

**Table 2.1** Characteristic hip symptoms

| |
|---|
| Symptoms worse with activities |
| Twisting, such as turning changing directions |
| Seated position may be uncomfortable, especially with hip flexion |
| Rising from seated position often painful (catching) |
| Difficulty ascending and descending stairs |
| Symptoms with entering/exiting an automobile |
| Dyspareunia |
| Difficulty with shoes, socks, hose, etc. |

Based on the information obtained in the history, a preliminary differential diagnosis should be formulated. The history assists the examiner in performing an appropriately directed physical examination.

## Physical Examination

The information obtained in the history is just a screening tool. It helps direct the examination, but it should not unduly prejudice the approach. The examiner must be systematic and thorough to avoid potential pitfalls and missed diagnoses (Fig. 2.1). In reference to examination of the hip, Otto Aufranc [7] noted that "more is missed by not looking than by not knowing."

## Inspection

The most important aspect of inspection is stance and gait. The patient's posture is observed in both the standing and seated position. Any splinting or protective maneuvers used to alleviate stresses on the hip joint are noted. While standing, a slightly flexed position of the involved hip and concomitantly the ipsilateral knee is common (Fig. 2.2). In the seated position, slouching or listing to the uninvolved side avoids extremes of flexion (Fig. 2.3).

An antalgic gait is often present but dependent on the severity of symptoms. Typically, the stance phase is

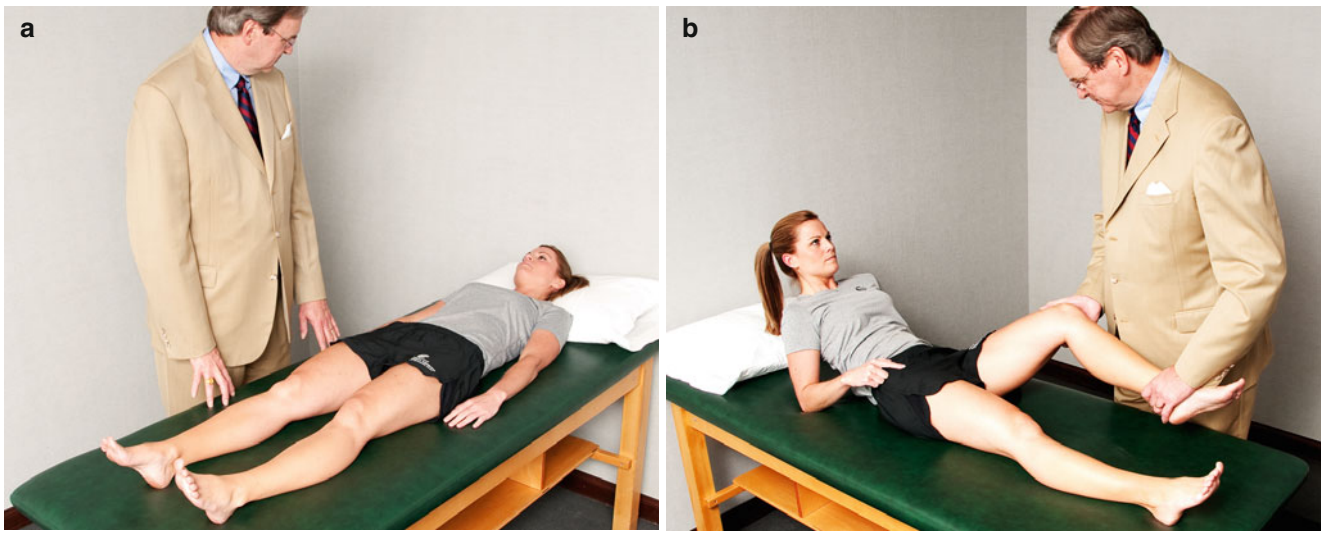


**Fig. 2.1** (**a**) It is important that both hips be examined. This necessitates that the examination table be positioned so that the examiner can approach the patient from both sides. (**b**) Always begin the examination with the uninvolved extremity. This can gain the patient's confidence and provide potentially useful information for comparison when examining the involved hip. Failure to do so can result in possibly missing useful information. (All rights are retained by Dr. Byrd)

**Fig. 2.2** During stance, the patient with an irritated hip will tend to stand with the joint slightly flexed. Consequently, the knee will be slightly flexed as well. This combined position of slight flexion creates an effective leg length discrepancy. To avoid dropping the pelvis on the affected side, the patient will tend to rise slightly on his or her toes. (All rights are retained by Dr. Byrd)

**Fig. 2.3** In the seated position, slouching and listing to the uninvolved side allow the hip to seek a slightly less flexed position. This is usually combined with slight abduction and external rotation, which relaxes the capsule. (All rights are retained by Dr. Byrd)

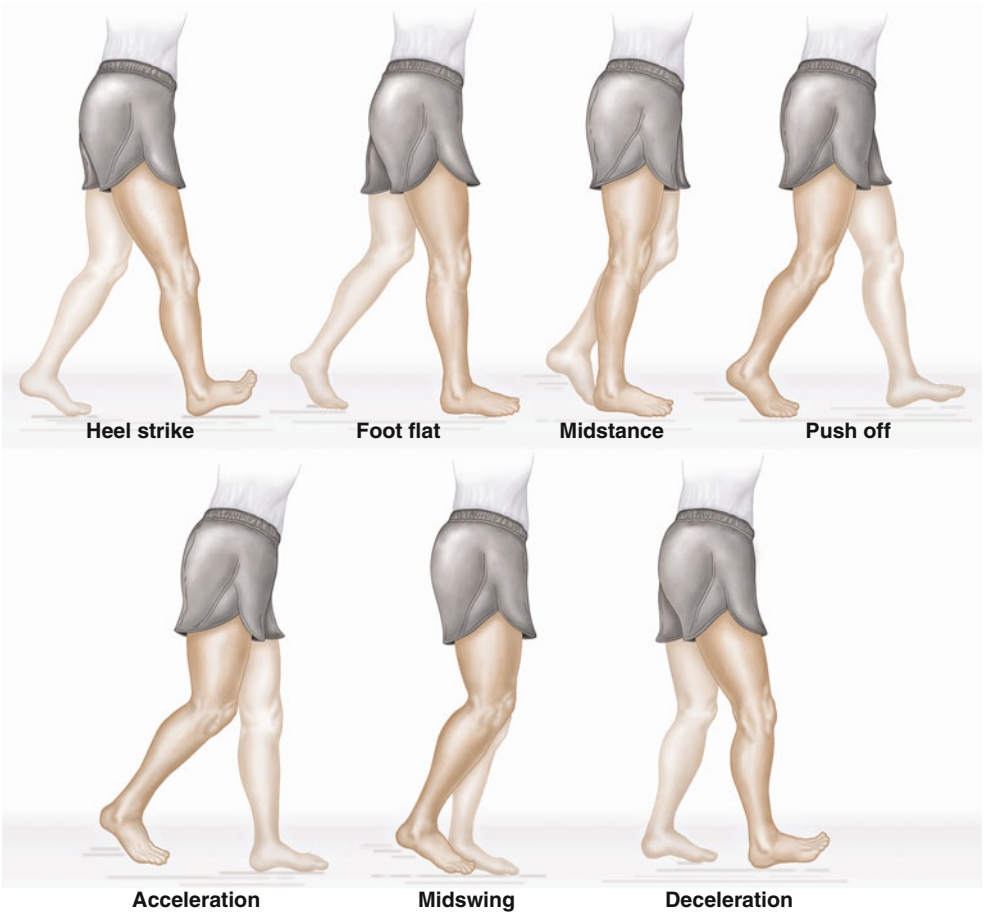


**Fig. 2.4** Normal phases of gait. (All rights are retained by Dr. Byrd)

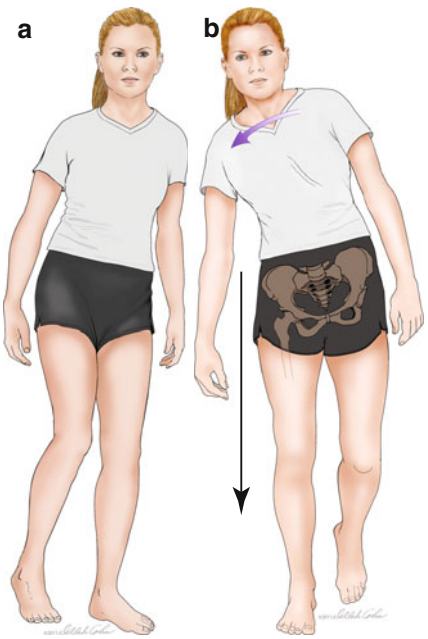


**Fig. 2.5** (**a**) During ambulation, the stance phase of gait is shortened. Hip extension is avoided by keeping the joint in a slightly flexed position. This slight flexion creates a functional leg length discrepancy with shortening on the involved side and partially creates a lurch. (**b**) Further abductor lurch may occur as a compensatory mechanism to reduce the forces across the joint. Shifting the torso over the involved hip moves the center of gravity closer to the axis of the hip, shortens the lever arm moment, and reduces compressive joint force. (All rights are retained by Dr. Byrd)

**Fig. 2.6** Assessment is made of spinal alignment, pelvic obliquity, or asymmetry. (All rights are retained by Dr. Byrd)

**Fig. 2.7** Leg lengths are measured from the anterior superior iliac spine to the medial malleolus. (All rights are retained by Dr. Byrd)

shortened, and hip flexion appears accentuated as extension is avoided during this phase (Fig. 2.4). Varying degrees of abductor lurch may be present as the patient attempts to place the center of gravity over the hip, reducing the forces on the joint (Fig. 2.5).

Observation is made for any asymmetry, gross atrophy, spinal alignment, or pelvic obliquity that may be fixed or associated with a gross leg length discrepancy (Fig. 2.6).

## Measurements

Certain measurements should be recorded as a routine part of the assessment. Leg lengths should be measured from the anterior superior iliac spine to the medial malleolus (Fig. 2.7). Significant leg length discrepancies (greater than 1.5 cm) may be associated with a variety of chronic conditions. Typically, if this appears to be a contributing factor, we try to correct for half of the recorded discrepancy in the course of conservative treatment, preferably with an insert that is cosmetically more acceptable than a built-up shoe.

Thigh circumference, although a crude measurement, may reflect chronic conditions and muscle atrophy (Fig. 2.8). The involved leg is compared to the uninvolved side. Sequential measurement on subsequent examination can be an indicator of response to therapy. This only indirectly reflects hip function, but hip disease affects the entire lower extremity.

Range of motion of the hip must be recorded in a consistent and reproducible fashion. This is important for comparing sides and also chronicling the response to treatment on

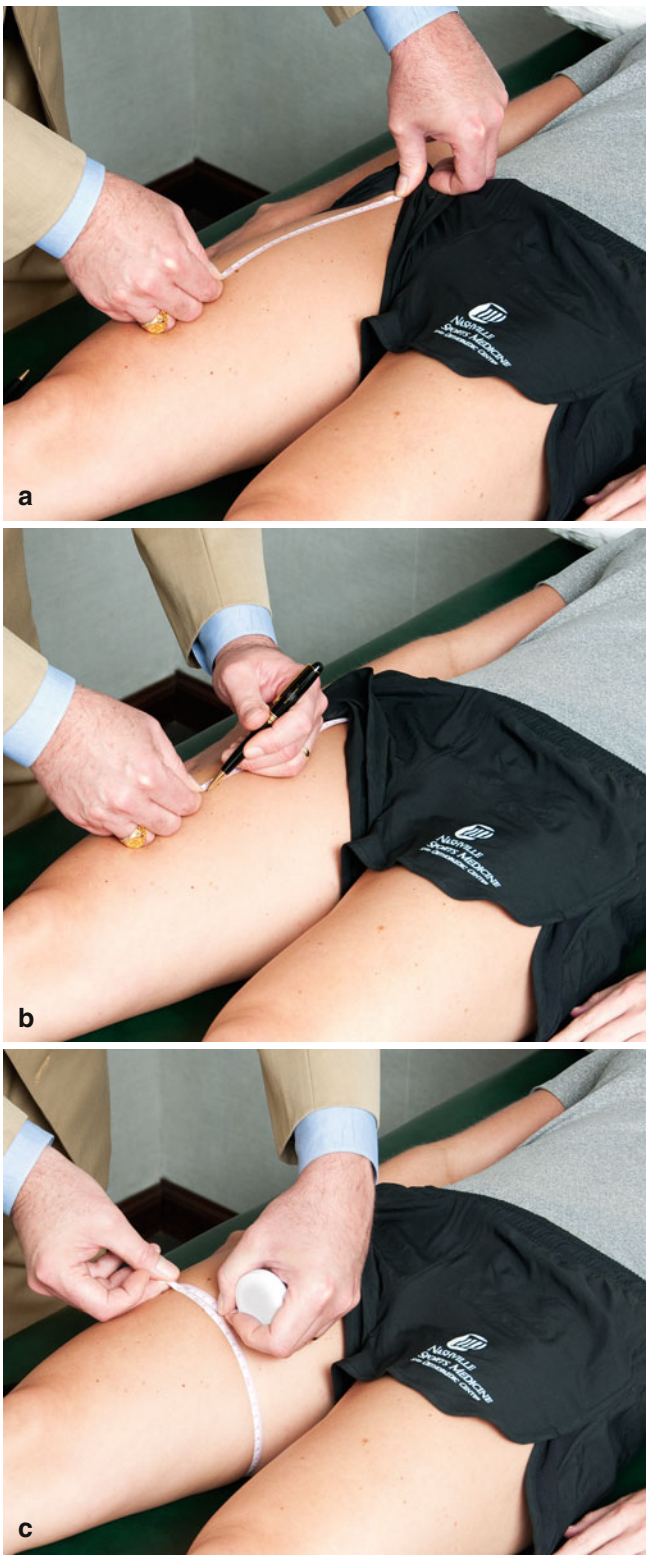


**Fig. 2.8** Thigh circumference should be measured at a fixed position, both for consistency of measurement of the affected and unaffected limbs and for consistency of measurement on subsequent examinations. (**a**) A tape measure is placed from the anterior superior iliac spine (ASIS) toward the center of the patella. (**b**) A selected distance below the anterior superior iliac spine is marked (typically 18 cm). (**c**) Thigh circumference is then recorded at this fixed position. (All rights are retained by Dr. Byrd)


**Fig. 2.9** (**a**) In the supine position, the uninvolved hip is kept in maximal extension. This stabilizes the pelvis and avoids contribution of pelvic tilt to hip flexion. The affected hip is then maximally flexed and motion recorded. (**b**) To check extension or presence of a flexion contracture, the unaffected hip is brought into maximal flexion and held by the patient, locking the pelvis. The affected hip is then brought out toward extension and motion recorded. (All rights are retained by Dr. Byrd)

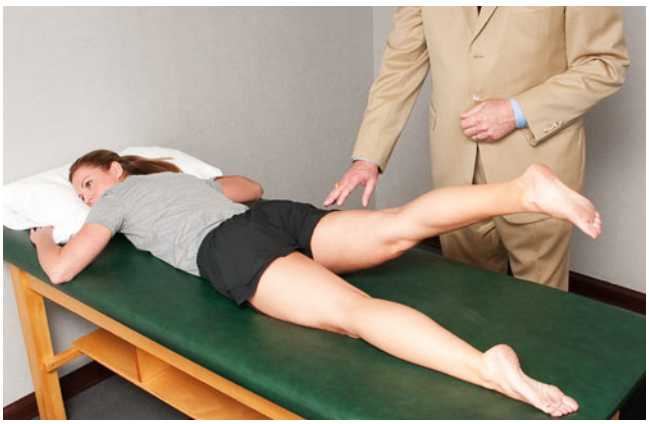

**Fig. 2.10** In the prone position, extension can also be quantitated. (All rights are retained by Dr. Byrd)

subsequent examinations. The degree of flexion and the presence of a flexion contracture are determined by using the Thomas test (Fig. 2.9). Extension is recorded with the patient in the prone position, raising the leg (Fig. 2.10). There are several methods for recording rotational motion of the hip. It is important to select one and be consistent. Flexing the hip 90° and then internally and externally rotating the joint are easy and reproducible means for recording rotational motion (Fig. 2.11). Abduction and adduction are recorded as well (Fig. 2.12).

People with limited range of motion of the hip become adept at compensating by increased pelvic motion. Thus, when assessing motion, the examiner must be vigilant that the pelvis remains stable.

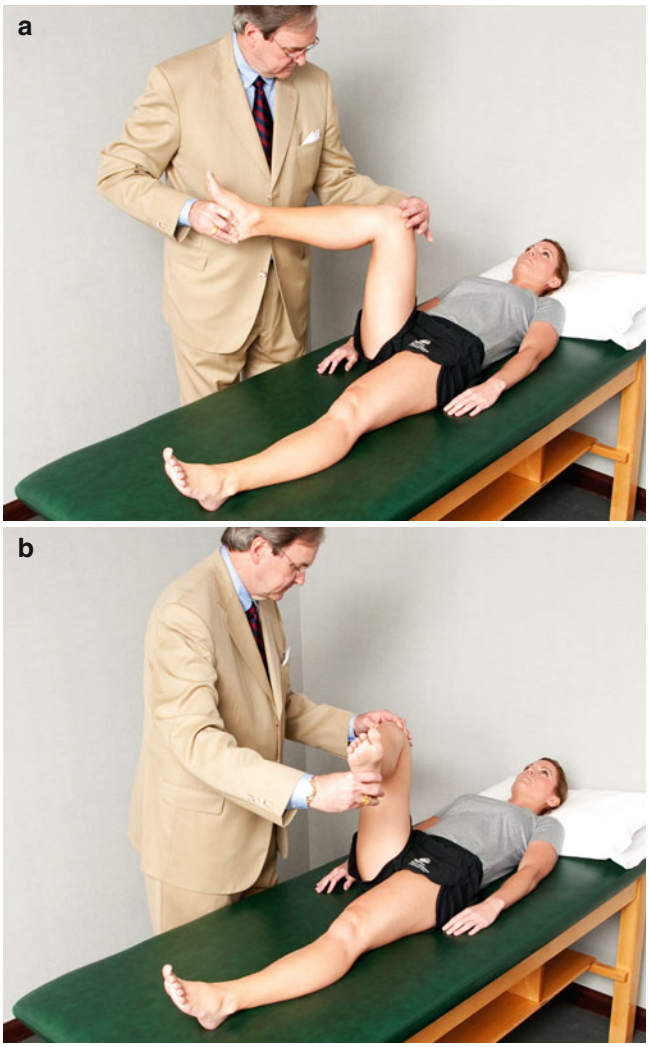


**Fig. 2.11** (**a**, **b**) Supine, with the hip flexed 90°, the hip is maximally rotated internally and externally with motions recorded. This method is simple quick and reproducible. (**c**, **d**) Alternatively, rotational motion can be recorded with the hip extended in the prone position. Whatever method is chosen, it is important to be consistent on sequential examinations. (All rights are retained by Dr. Byrd)

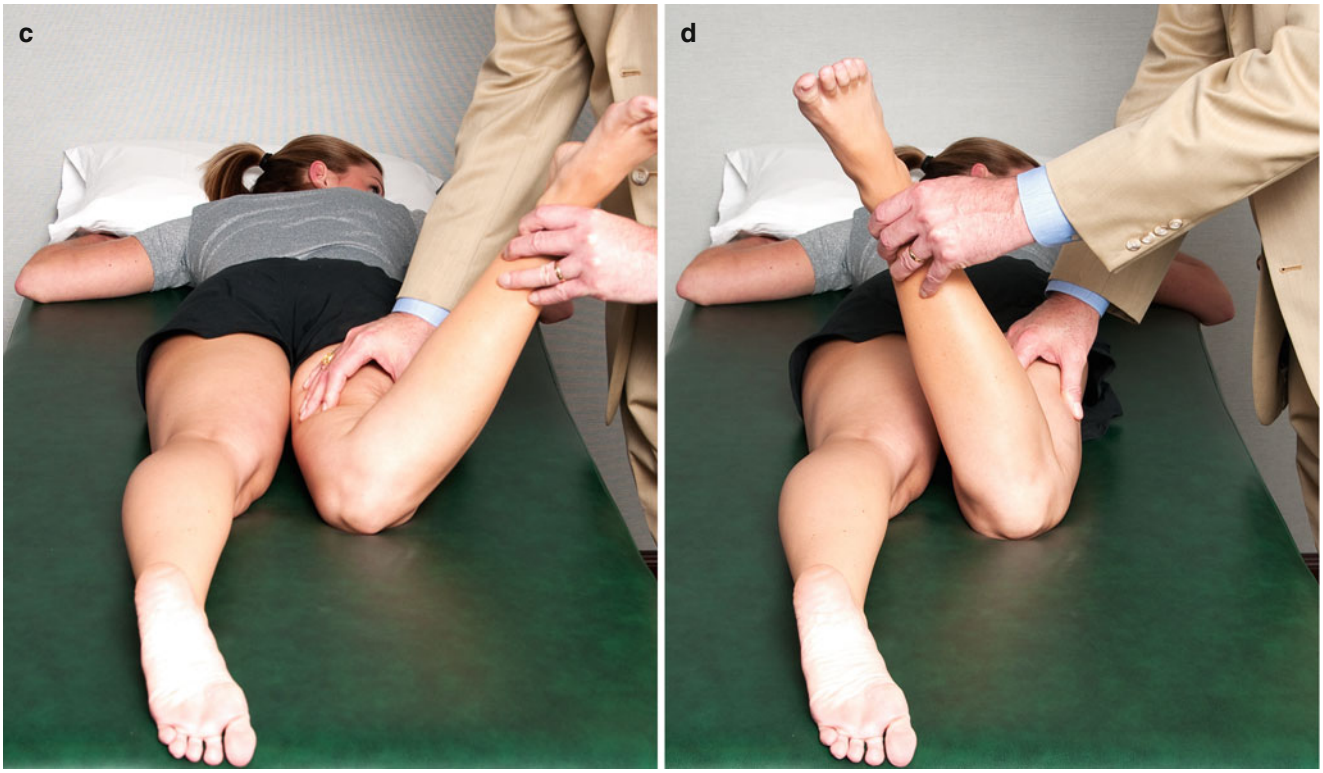


**Fig. 2.11** (continued)

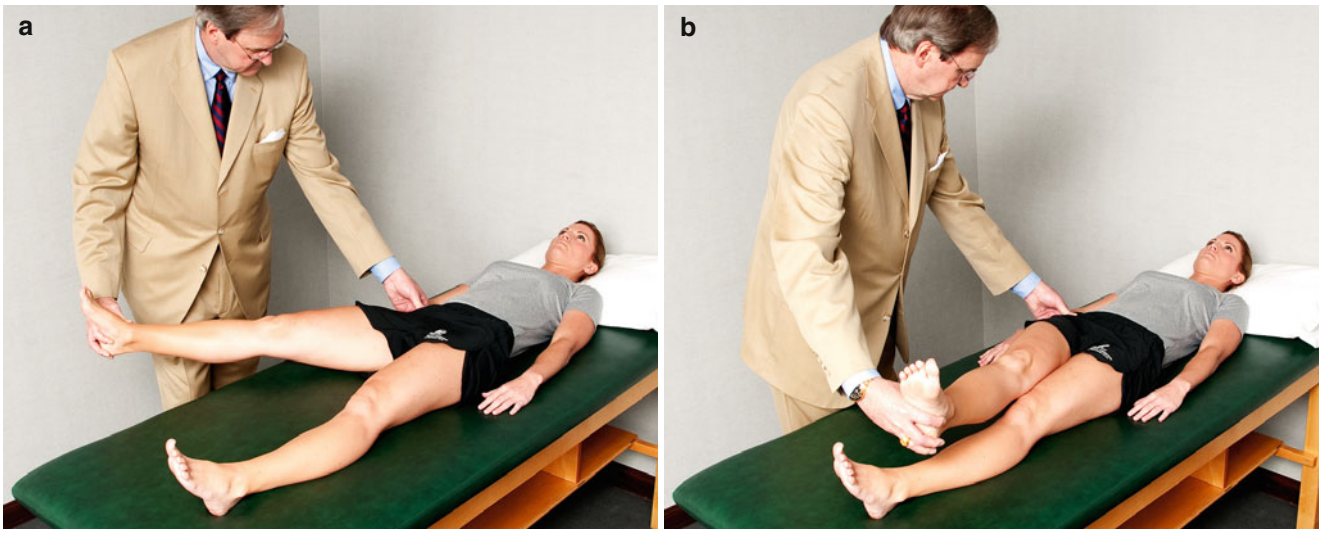


**Fig. 2.12** (**a**, **b**) The hip is abducted and adducted and range of motion recorded relative to the midline. (All rights are retained by Dr. Byrd)

## Symptom Localization

### The One Finger Rule

Although this is less well applied to the hip than to other joints, such as the knee, it is still important to ask the patient to use one finger and point to the spot that hurts the worst (Fig. 2.13). This provides much useful information before beginning palpation. It allows the examiner to discern the point of maximal tenderness. Consequently, this area is reserved until last when performing the examination. This forces the examiner to be more systematic, exploring uninvolved areas first, and enhances the patient's trust by not stimulating pain at the beginning of the examination (Fig. 2.14).

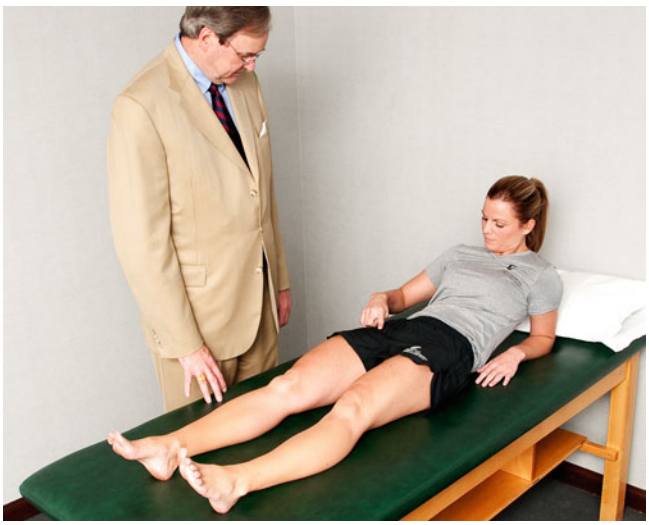

**Fig. 2.13** Often the patient will wave over a large area of involvement. However, the patient is asked, with encouragement and instruction, to point with one finger to the area of maximal involvement. (All rights are retained by Dr. Byrd)

**Fig. 2.14** "This is where it hurts?". (All rights are retained by Dr. Byrd)

Hilton's law states that "the same trunks of nerves whose branches supply the groups of muscles moving a joint furnish also a distribution of nerves to the skin over the insertion of the same muscles, and the interior of the joint receives its nerves from the same source" [8]. While this may ensure physiological harmony among the various structures, it also explains why muscle spasms and cutaneous sensations may accompany joint irritation.

Classic mechanical hip pain is described as being anterior, typically emanating from the groin area. The hip joint receives

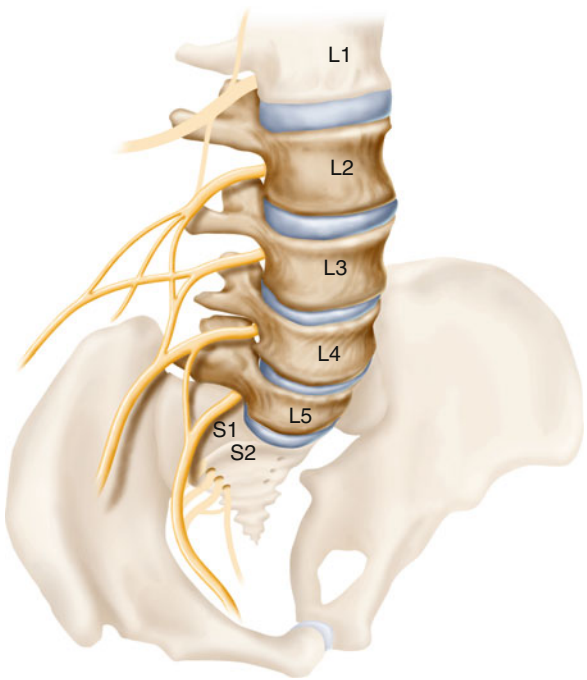


**Fig. 2.15** The hip joint receives innervation from branches of *L2* to *S1* of the lumbosacral plexus but predominantly from the *L3* nerve root. (All rights are retained by Dr. Byrd)

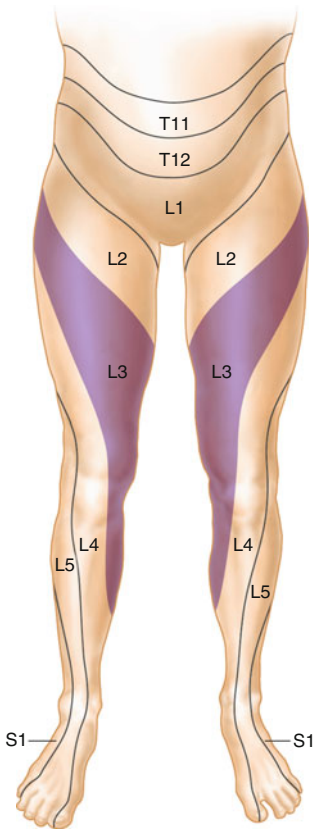


**Fig. 2.16** The *L3* dermatome crosses the anterior thigh and extends distally along the medial thigh to the level of the knee. (All rights are retained by Dr. Byrd)

innervation from branches of L2 to S1 of the lumbosacral plexus, predominantly L3 (Fig. 2.15). Consequently, hip symptoms may be referred to the L3 dermatome, explaining the presence of symptoms referred to the anterior and medial thigh, distally to the level of the knee (Fig. 2.16).

Intracapsular hip pathology usually has a component of anterior hip pain. Occasionally, there may be more deep lateral discomfort but only rarely posterior pain.

### The C Sign

The classic complaint of patients with hip pathology is "groin pain." However, the author has identified a very common characteristic sign of patients presenting with hip disorders. The patient will cup their hand above the greater trochanter when describing deep interior hip pain. The hand forms a C, and thus, this has been termed the "C sign" (Fig. 2.17). Because of the position of the hand, this can be misinterpreted as indicating lateral pathology such as the iliotibial band or trochanteric bursitis, but quite characteristically, the patient is describing deep interior hip pain.

### Palpation

Deep palpation over the anterior hip capsule may create slight discomfort with an irritable hip. Palpation is otherwise more useful for distinguishing various extra-articular problems. The examiner must be systematic and familiar with the topographic and deep anatomy in order to correlate the structures being palpated. Aufranc noted in reference to examination that "a continuing study of anatomy marks the difference between good and expert ability" [7]. Palpation is generally broken down into anterior, lateral, and posterior regions. These are detailed in Figs. 2.18, 2.19, and 2.20.

Manual muscle testing is a crude measure of hip function but may elicit useful information (Fig. 2.21). If injury to a specific muscle group is suspected, resisted contraction should reproduce localized symptoms.

Active range of motion and resisted active range of motion may also reproduce joint symptoms. However, when carefully interpreted, a distinction can be made between symptoms of a muscle strain and hip pain. This differentiation may be least clear with a strain of the hip flexors. In this setting, active hip flexion reproduces pain while passive flexion should not.


**Fig. 2.17** (**a**, **b**) The C sign. This term reflects the shape of the hand when a patient describes deep interior hip pain. The hand is cupped above the greater trochanter with the thumb posterior and the fingers gripping deep into the anterior groin. (All rights are retained by Dr. Byrd)

## Special Tests

There are various specific examination maneuvers for evaluating the hip joint as well as assessing the surrounding extra-articular structures. These are helpful to distinguish different disorders that may have similar presentations as well as coexistent problems that may occur either coincidentally or as a compensatory disorder. Keep in mind that none of these tests are 100% reliable in every circumstance. Also, as part of the clinical reality of evaluating patients, the

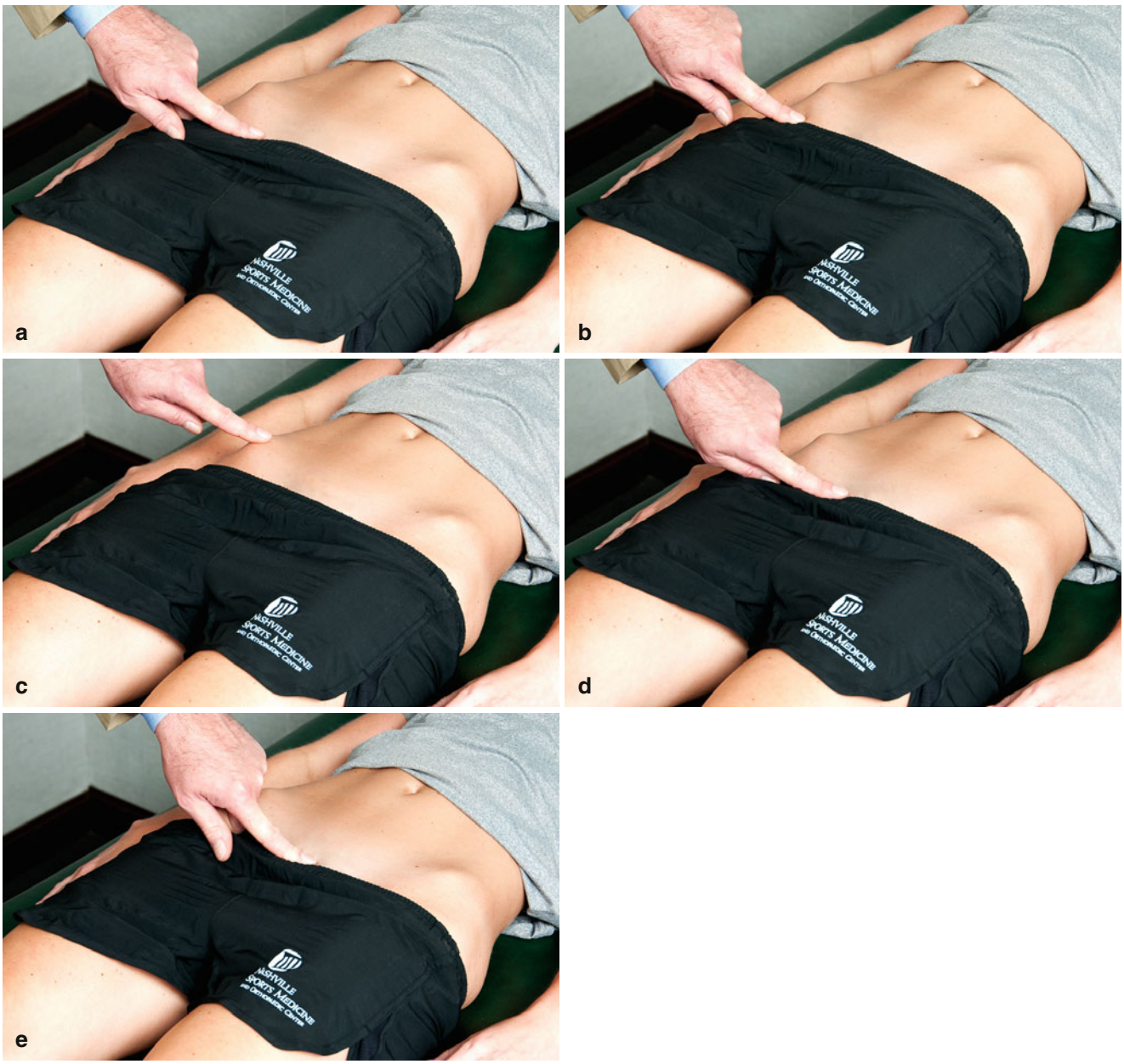


**Fig. 2.18** Anterior palpation includes the following structures. (**a**) Anterior hip and hip flexor region. (**b**) Sartorius. (**c**) Anterior superior iliac spine. (**d**) Pubic ramus. (**e**) Symphysis pubis. (All rights are retained by Dr. Byrd)

examiner may be confronted with conflicting examination findings that will require prioritizing the importance of the observations encountered.

The single most specific test for hip pain is logrolling of the hip back and forth (Fig. 2.22). This moves only the femoral head in relation to the acetabulum and the surrounding capsule. There is no significant excursion or stress on myotendinous structures or nerves. Absence of a positive logroll test does not preclude the hip as a source of symptoms, but its presence greatly raises the suspicion.

Forced flexion, adduction and internal rotation is a one manuever. That may elicit symptoms associated with even subtle hip pathology (Fig. 2.23). This is often referred to as an "impingement test" in reference to testing for FAI [9]. However, we have found that this test is not specific for impingement as most irritable hips will be painful with this maneuver regardless of the etiology of the intra-articular pathology. This maneuver may normally be uncomfortable, so it is important to compare the response on the symptomatic and asymptomatic sides.


**Fig. 2.19** Lateral palpation includes the following structures. (**a**) Greater trochanter and trochanteric bursa. (**b**) Posterior trochanter and trochanteric bursa. (**c**) Insertion site of the gluteus maximus. (**d**) Proximal tip of the trochanter and insertion of the gluteus medius. (**e**) Muscle belly of the gluteus medius. (**f**) Tensor fascia lata originating from the anterior margin of the iliac crest. (**g**) Iliac crest. (All rights are retained by Dr. Byrd)


**Fig. 2.20** Posterior palpation includes the following structures. (**a**) Posterior iliac crest. (**b**) Posterior superior iliac spine. (**c**) Sacroiliac joint. (**d**) Sciatic notch. (**e**) Region of the piriformis and overlying gluteus maximus. (**f**) The ischium is best palpated in the lateral decubitus position with the hip flexed. (**g**) The origin of the hamstrings is palpated prone with resisted contraction of the hamstring muscle group. (All rights are retained by Dr. Byrd)


**Fig. 2.21** (**a**) Resisted hip flexion with the knee flexed isolates the iliopsoas tendon. Contribution from the sartorius is minimal as this is a very weak muscle. (**b**) Resisted hip flexion combined with knee extension recruits the rectus femoris, which crosses both joints as a hip flexor and knee extensor. (**c**) Resisted hip extension can be tested with the patient prone. (**d**) Another useful test for extensor weakness is to simply have the patient rise from the seated position with the arms crossed. This is difficult when significant extensor muscle weakness is present. (**e**) Manual testing of abductor strength is most easily performed in the lateral position. Resistance testing across the extended knee recruits the tensor fascia lata. (**f**) Resistance testing with the knee flexed isolates the gluteus medius. (**g**) The Trendelenburg test is another dynamic method for assessing abductor strength. Lifting the unaffected leg off of the ground, with normal abductor strength, the patient should be able to maintain a level pelvis. (**h**) If the abductors are weak, the patient is unable to maintain a level pelvis, and it drops toward the unaffected side with the raised leg. (**i**) Manual testing of adductor strength can similarly be tested but with the patient supine. (All rights are retained by Dr. Byrd)


**Fig. 2.21** (continued)


**Fig. 2.22** The logroll test is the single most specific test for hip pathology. With the patient supine (**a**), gently rolling the thigh internally (**b**) and externally (**c**) moves the articular surface of the femoral head in relation to the acetabulum but does not stress any of the surrounding extra-articular structures. (All rights are retained by Dr. Byrd)

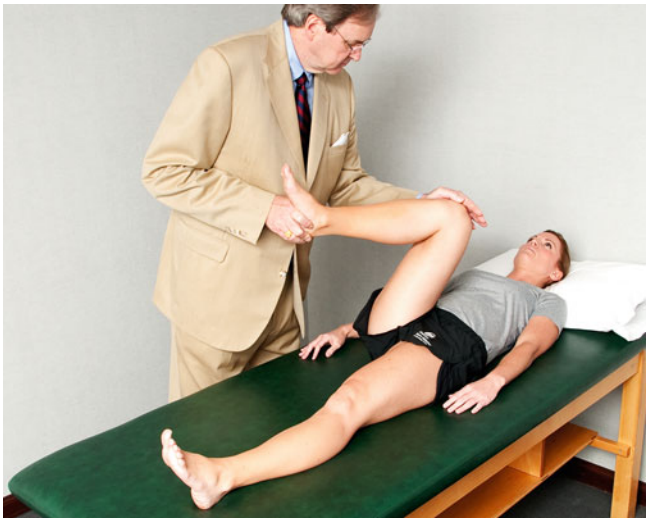

**Fig. 2.23** Forced flexion combined with adduction and internal rotation is often very uncomfortable and usually elicits symptoms associated with even subtle degrees of hip pathology. (All rights are retained by Dr. Byrd)

Forced abduction with external rotation may also create symptoms with a hip joint problem (Fig. 2.24a–c). The fist test is a useful method for quantitating the amount of restriction in abduction and external rotation [10]. This is usually present to a lesser extent than pain with flexion and internal rotation in cases of degenerative disease or severe impingement. Isolated tightness and pain with abduction and external rotation occur in the presence of posterior impingement or adhesive capsulitis [11, 12]. Global over coverage of the acetabulum can occur due to an ossified labrum resulting in painful restricted motion in all planes and what has been termed as a "captured hip." With adhesive capsulitis, external rotation is more restricted and painful than internal rotation. Both of these conditions find their highest prevalence among middle-aged females. Isolated posterior impingement is not common. It can be checked by forcing the extended hip into external rotation eliciting painful posterior impingement symptoms (Fig. 2.25). This same maneuver can be used testing for anterior instability as the femoral head can translate anteriorly with forced external rotation.

An active straight leg raise or straight leg raise against resistance tests the hip flexors but can also elicit joint symptoms (Fig. 2.26). This maneuver generates a force of several times body weight across the articular surfaces and is more than the normal forces of walking [13].

A conventional straight leg raise test is important for assessing signs of lumbar nerve root irritation (Fig. 2.27). The Patrick or Faber test (flexion, abduction, external rotation) has been described for stressing the SI joint looking for symptoms localized to this area and for isolating symptoms to the hip (Fig. 2.28). Differentiation between pain localized to the SI joint in the hip is usually easy. Occasionally, this may also elicit symptoms referable to the symphysis pubis.

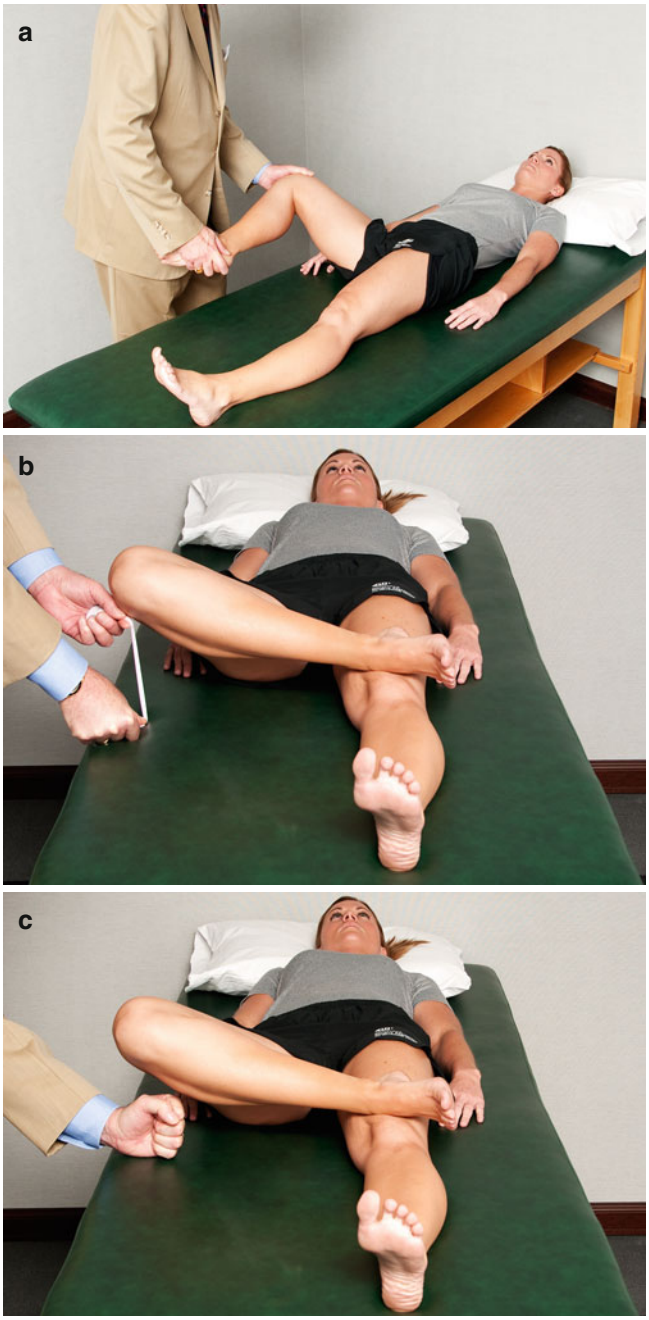


**Fig. 2.24** (**a**) Flexion combined with abduction and external rotation may be uncomfortable and can produce catching-type sensations associated with labral and chondral lesions. (**b**) Restriction in abduction and external rotation is quantitated by measuring knee elevation off of the examination table. (**c**) Estimating the number of fist widths provides a quick method of assessment. (All rights are retained by Dr. Byrd)

**Fig. 2.25** Supine, the patient is positioned close to the edge of the table so the hip can be extended along with maximal external rotation. This can elicit symptoms of painful posterior impingement. However, anterior translation of the femoral head in this position may also evoke symptoms of anterior instability or possibly elicit pain trapping an anterior labral tear. Thus, the maneuver may be positive for various forms of hip joint pathology. (All rights are retained by Dr. Byrd)

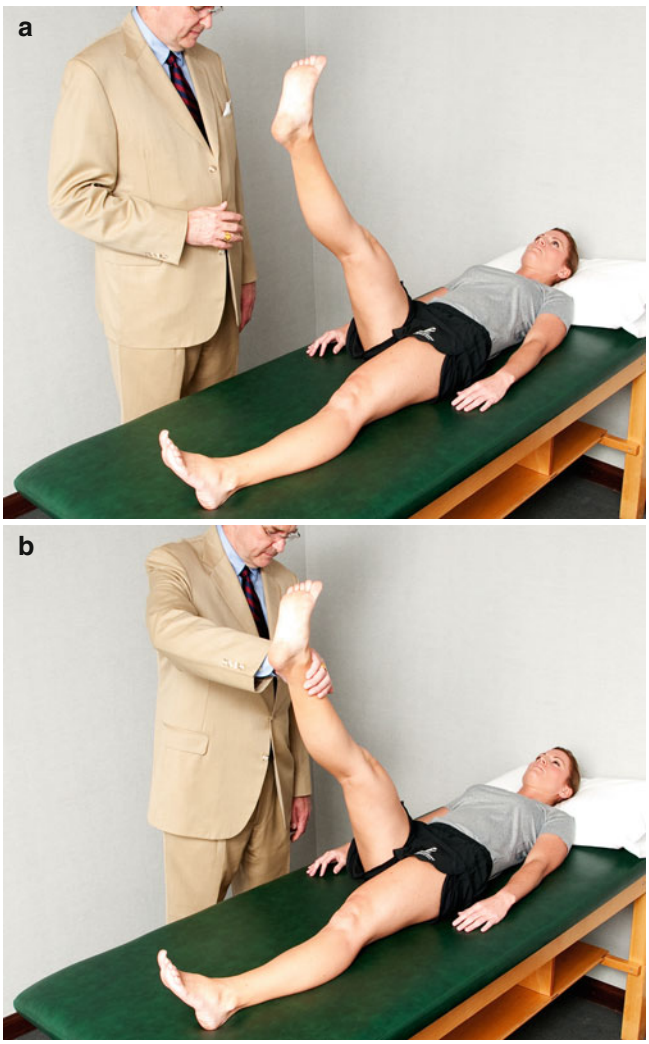


**Fig. 2.26** (**a**, **b**) An active straight leg raise, or especially a leg raise against resistance, generates compressive forces of multiple times body weight across the hip joint. Consequently, this is often painful, especially when there is even a mild degree of underlying degenerative disease. (All rights are retained by Dr. Byrd)

The Dial test has been described as an assessment of anterior capsular laxity and possible instability (Fig. 2.29) [14]. It is characterized by increased external rotation of the affected limb when resting in extension. Also, subjectively, there is loss of the normal springy endpoint with external rotation which can be indicative of compromise of the

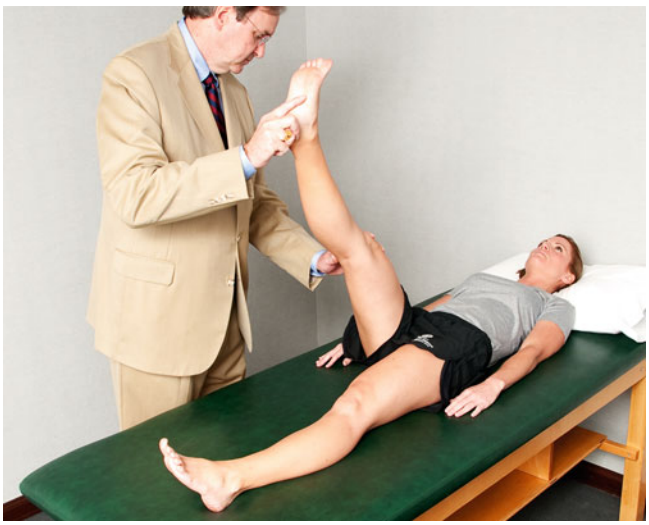

**Fig. 2.27** The classic straight leg raise (SLR) test is performed to assess tension signs of lumbar nerve root irritation. A positive interpretation is characterized by reproduction of radiating pain along a dermatomal distribution of the lower extremity. It may also re-create discomfort from stretching of the hamstring tendons. (All rights are retained by Dr. Byrd)

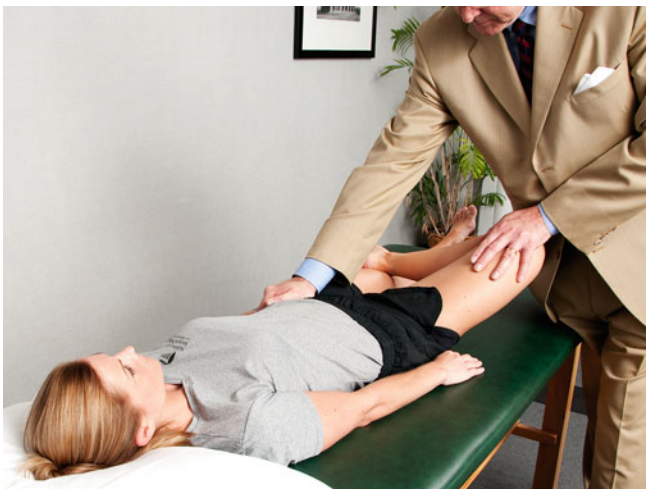

**Fig. 2.28** With the patient supine, the Patrick of Faber test is performed by crossing the ankle over the front of the contralateral knee and then forcing the knee of the involved extremity down on the table while applying counterforce to the contralateral iliac crest. This combination of flexion, abduction, and external rotation stresses the sacroiliac (SI) joint, and when injury or inflammation is present, this movement may exacerbate symptoms localized to the SI area. This same maneuver can irritate the hip joint as well but with distinctly different localization of symptoms. Occasionally, it may also elicit symptoms emanating from the symphysis pubis. (All rights are retained by Dr. Byrd)

structural integrity of the anterior capsule. Forced external rotation of the extended hip translates the femoral head anteriorly and may evoke symptoms of anterior instability (Fig. 2.25). Assessing for pathological laxity in the hip is aided by looking for generalized signs of excessive laxity (Fig. 2.30) [15].

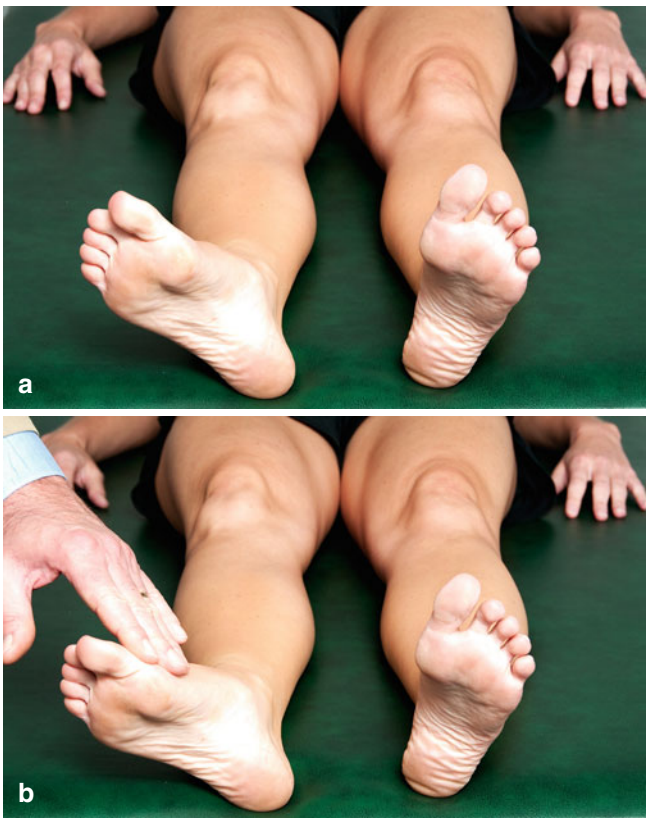


**Fig. 2.29** A positive Dial test is ascribed to anterior capsular laxity. (**a**) In the resting position, the affected hip tends to lie in excessive external rotation. (**b**) Passively externally rotating the limb, a soft end point is encountered. (All rights are retained by Dr. Byrd)

Athletic pubalgia ("sports hernia") can mimic or coexist with a hip joint problem [16, 17]. Groin tenderness to palpation is elicited over the pubis at the tendinous confluence of the insertion of the rectus abdominis and origin of the adductors (Fig. 2.18c). Hip flexor soreness may be present (Fig. 2.31a). Tenderness is isolated by palpating the adductor origin during resisted contraction (Fig. 2.31b). Similarly, tenderness is localized palpating the insertion of the rectus abdominis during resisted sit-ups (Fig. 2.31c). These maneuvers are normally not painful with isolated joint pathology. Conversely, passive flexion with internal rotation should exacerbate a hip joint problem and not be painful with athletic pubalgia. Keep in mind that various elements of both problems may coexist. Symptoms of osteitis pubis, characterized by point tenderness over the symphysis, may occur as an isolated entity or in conjunction with athletic pubalgia caused by excessive micromotion that can occur with compromise of the pelvic stabilizers.

Snapping of the iliopsoas tendon is a common condition [3]. The examination findings and symptoms when painful can be challenging to differentiate from an intra-articular problem. The snapping occurs as the iliopsoas transiently lodges on the anterior aspect of the hip capsule or pectineal eminence (Fig. 2.32). It may be audible and sometimes palpable. The characteristic maneuver for creating this type of


**Fig. 2.30** Beighton described five examination features of generalized laxity. (**a**) Fifth finger hyperextension greater than 90°. (**b**) Ability to approximate the thumb against the proximal forearm. (**c**) Elbow hyperextension greater than 10°. (**d**) Knee hyperextension greater than 10°. (**e**) Ability to place palms flat on the floor with knees extended. (All rights are retained by Dr. Byrd)

snap is bringing the hip from a flexed, abducted, externally rotated position into extension with internal rotation (Fig. 2.33). Applying direct pressure over the front of the hip may block the snapping. Often the snapping phenomenon is better demonstrated by the patient than can be detected on examination. This may variously be shown standing, sitting, or lying, but a consistent feature is the snapping almost always occurs going from flexion to extension. With close questioning, the patient can usually tell you whether the snapping is the cause of their pain or just a coincidental finding.

Snapping of the iliotibial band is not likely to be confused with a joint problem since the findings are located laterally [3]. However, these are patients who frequently present with a sense that their hip is subluxing. They can dynamically perform a maneuver that suggests hip instability. This visual appearance is uniformly created by the tensor fascia lata flipping back and forth across the greater trochanter (Fig. 2.34). The patient is examined on their side, flexing and extending and rotating the hip to assess the snapping (Fig. 2.35). Ober testing is also performed as a routine assessment for tightness of the iliotibial band (Fig. 2.36). However, this snapping phenomenon is again better demonstrated by the patient than elicited by the examiner. Typically, the patient will stand internally and externally rotating the hip creating the visual snapping. Radiographs will demonstrate that the hip remains concentrically reduced regardless of the visual positional alterations.

Piriformis syndrome is uncommon but is likely one of the most common causes of non-spinal origin sciatica [18]. This


**Fig. 2.31** Findings associated with athletic pubalgia. (**a**) Hip flexor soreness is elicited by palpation during resisted contraction. (**b**) Tenderness is elicited at the origin of the adductors by palpation during resisted contraction. (**c**) The insertion of the rectus abdominis is palpated for tenderness during resisted contraction. Counter pressure is applied to the contralateral shoulder causing selective recruitment and contraction on the involved side. (All rights are retained by Dr. Byrd)

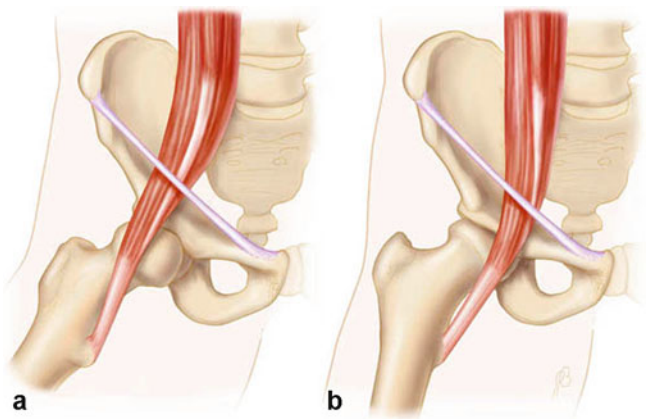


**Fig. 2.32** Illustration of the iliopsoas tendon flipping back and forth across the anterior hip capsule and pectineal eminence. (**a**) With flexion of the hip, the iliopsoas tendon lies lateral to the center of the femoral head. (**b**) With extension of the hip, the iliopsoas shifts medial to the center of the femoral head. (All rights are retained by Dr. Byrd)

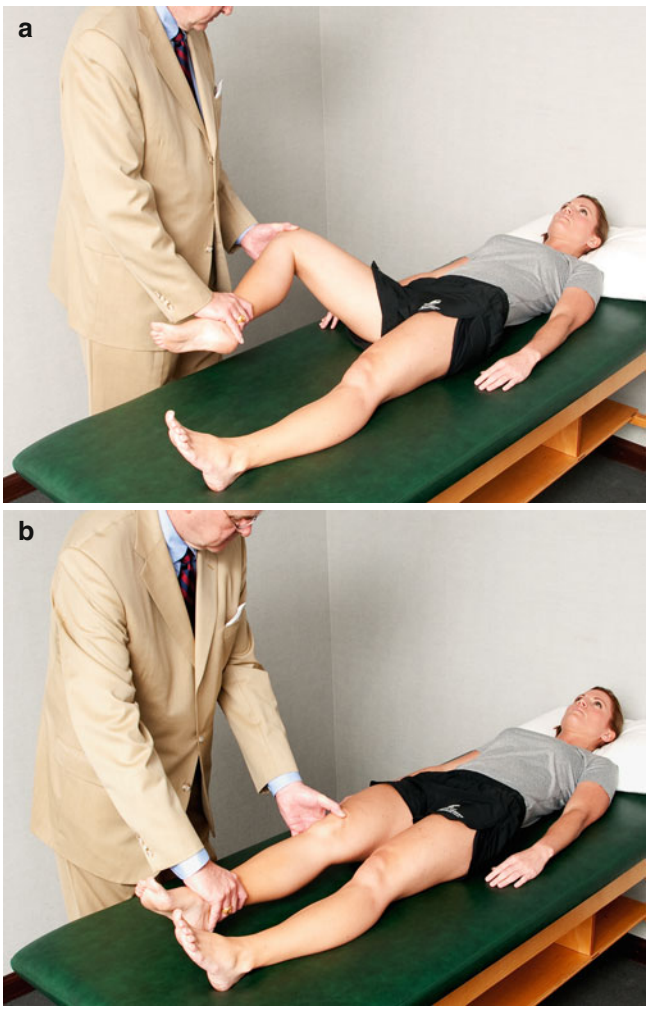


**Fig. 2.33** The characteristic examination maneuver for snapping of the iliopsoas is performed with the patient lying supine. The hip is placed in a position of flexion, abduction, and external rotation (**a**) and then rotated down into extension with internal rotation (**b**) creating the snap. (All rights are retained by Dr. Byrd)

condition is probably overlooked and overdiagnosed in equal proportions. Piriformis function changes with hip position. Provocative exam maneuvers include passive internal (Freiberg's test) and resisted external rotation of the extended hip, resisted abduction of the flexed hip (Pace's sign), and stretching in flexion, adduction, and internal rotation (Fig. 2.37). Posterior tenderness to palpation is present, but the piriformis is obscured by the overlying mass of the

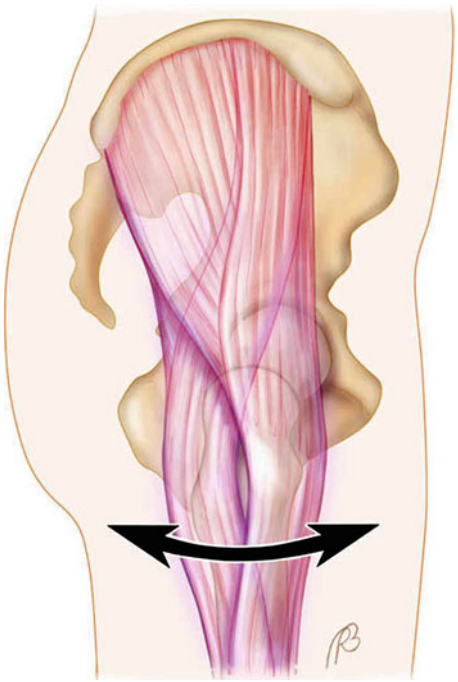

**Fig. 2.34** Snapping of the iliotibial band can occur either as the tendinous portion flips back and forth across the trochanter with flexion and extension, or the trochanter may move back and forth underneath the stationary tendon with internal and external rotation. (All rights are retained by Dr. Byrd)

gluteus maximus (Fig. 2.20); and for recalcitrant cases, the most specific examination maneuver is rectal or vaginal palpation of the piriformis from inside the pelvis. There are also other less well-defined causes of extraspinal sciatica.

## Radiology

In the past, with the emergence of advanced imaging such as magnetic resonance studies, the importance of plain radiography in the assessment of hip problems has been overlooked. Fortunately, the interest in FAI and other morphological conditions has led to a resurgence in appreciation for what plain x-rays offer [19]. A well-centered AP pelvis x-ray is important for assessing various radiographic indices as well as simply looking at closely related surrounding structures and providing a comparison view of the contralateral hip that can help in assessing subtle variations (Figs. 2.38 and 2.39). A lateral view of the affected hip is also needed. A frog lateral is not a true lateral of the hip but provides a perpendicular view of the proximal femoral anatomy (Fig. 2.40). It has good utility and is easily obtained in a consistent fashion [20]. There is much discussion about other optimal lateral radiographs for assessing FAI, but none of these are predictably reliable in all cases [21]. A false profile view can be helpful looking for deficiencies of the anterior acetabulum as well as assessing the anterior contour of the proximal femur.

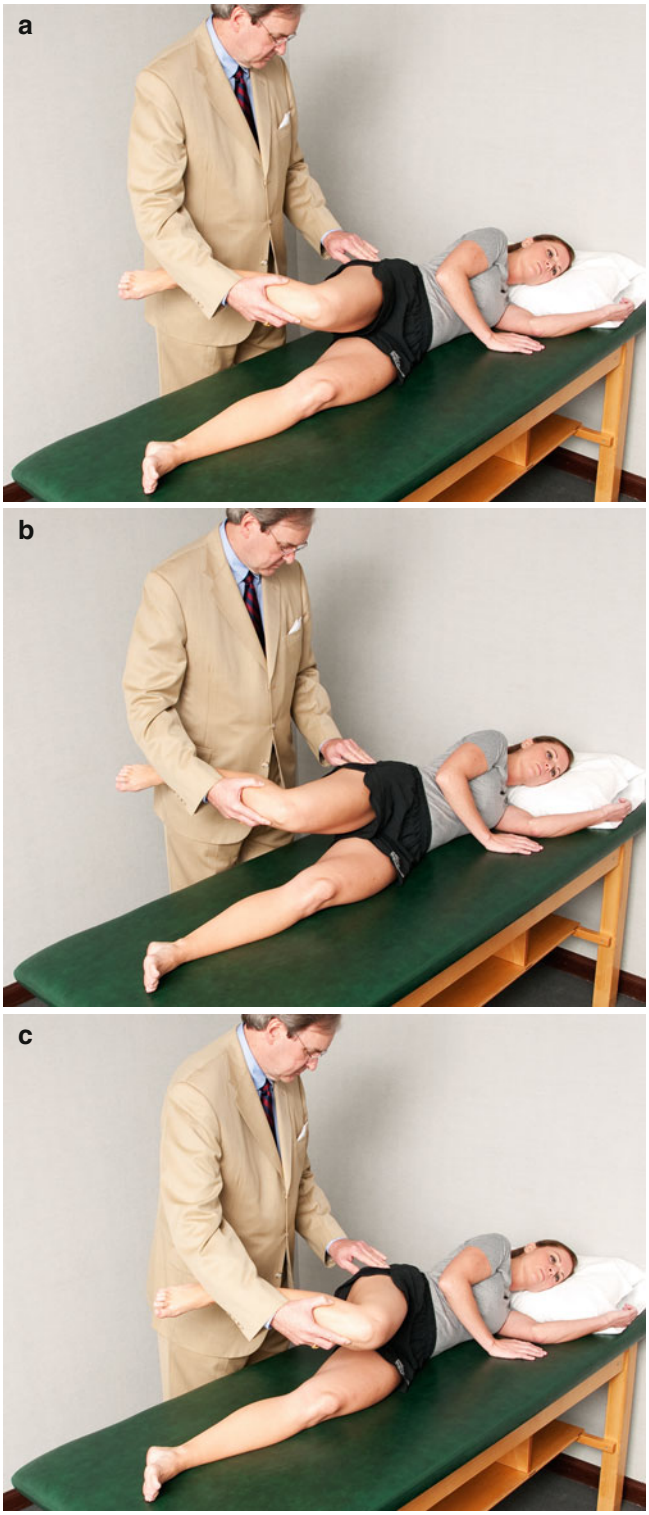


**Fig. 2.35** With the patient on the side, the limb is supported (**a**) as it is moved back (**b**) and forth (**c**) in order to elicit snapping of the iliotibial band. (All rights are retained by Dr. Byrd)

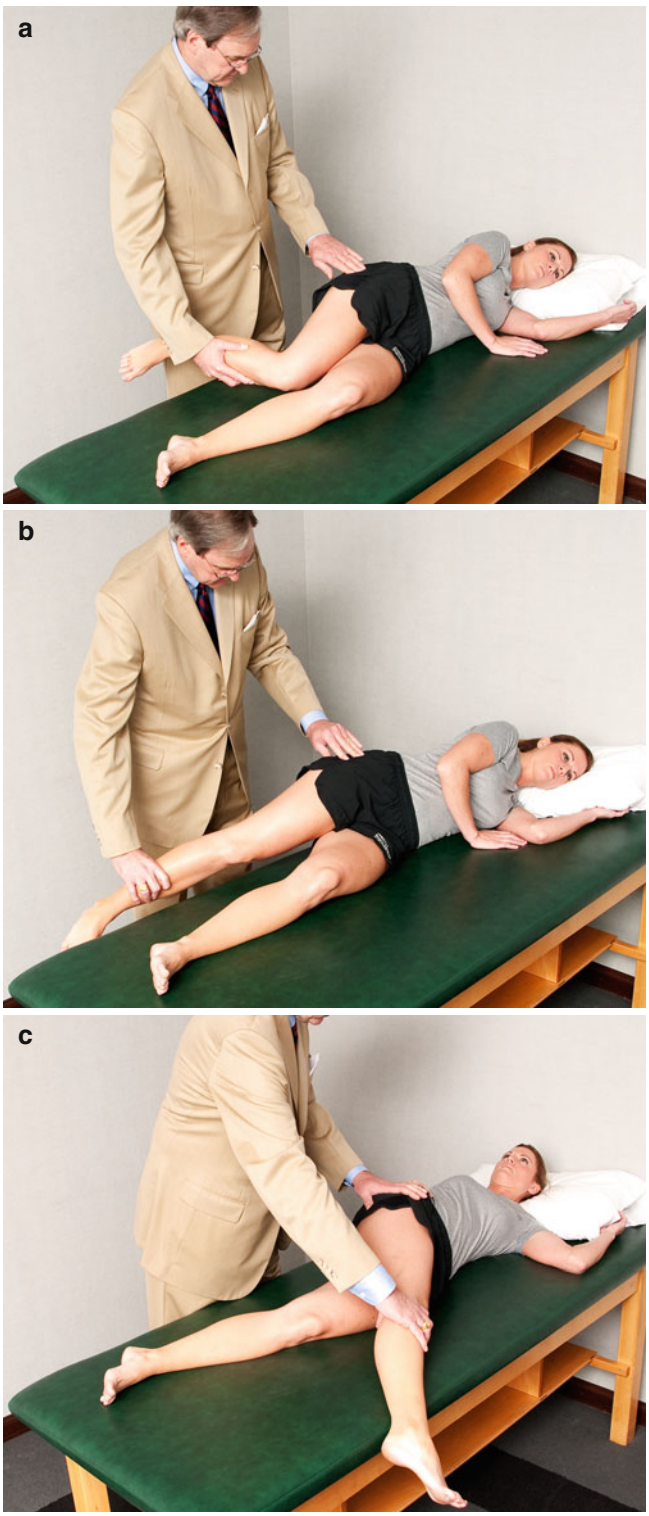


**Fig. 2.36** The patient is in the lateral decubitus position with the affected side up. (**a**) Classic Ober testing is described, lowering the knee toward the table assessing for tightness of the iliotibial band. (**b**) The tensor fascia lata and iliotibial band are isolated checking for tightness in adduction with the hip and knee extended. (**c**) Tightness of the gluteus maximus is checked in adduction with the hip flexed and the shoulders squared on the examination table. (All rights are retained by Dr. Byrd)

Numerous measurements can be obtained to quantitate the variations of hip morphology that exist on a spectrum from dysplasia to impingement [19]. Many of these variations may exist among asymptomatic individuals. Thus, it is important not to base a treatment strategy solely on radiographic abnormalities. However, it is equally important to interpret the contribution of hip morphology with joint damage. This has great implication in the strategy of arthroscopic management and also knowing when arthroscopy may not be appropriate.

Two important considerations regarding plain radiography are offered. First, the damage inside the joint must be advanced before starting to notice any radiographic changes (Fig. 2.41). Thus, subtle radiographic abnormalities may have great significance regarding the severity of intra-articular pathology. Second, x-ray changes may occur in a short period of time (Fig. 2.42). Thus, in the course of treating patients with a hip joint problem, when the symptoms do not subside, repeat plain films before embarking on surgical intervention. Especially among middle-aged and older patients, degenerative changes may start to occur at an accelerated rate. You may be initiating treatment on the beginning of a steep downhill slope that cannot be reversed. Progressive radiographic changes with joint space loss may explain the severity of symptoms and avoid potentially recommending an unsuccessful arthroscopic procedure.

Lastly are a few comments regarding magnetic resonance imaging (MRI) and MRI with gadolinium arthrography (MRA) [22]. Not all MRIs are the same. Low-resolution studies (small magnets and open scanners) are unreliable at assessing hip joint pathology. High-resolution studies with small-field-of-view images and dedicated surface coils are better but still imperfect. Gadolinium arthrography can provide more sensitivity but is not always necessary, and there are caveats. Any magnetic resonance study should include a minimum of the following: coronal and axial large-field-of-view images of the pelvis showing both hips, and small-field-of-view axial, coronal, sagittal, and oblique axial images of the affected hip. Anything less is an incomplete study.

The literature will support high reliability of MRIs and MRAs in sensitivity and specificity [23, 24]. However, in clinical practice, it is best not to put too much faith solely in these studies. They are pretty good at showing labral pathology but will usually underestimate the severity of accompanying articular damage that is present. You must simply anticipate that it is likely that the articular damage encountered at the time of arthroscopy will be more extensive, and prepare your patients with this possibility in mind since this can influence the success of arthroscopy.

Contrasted images obscure whether an effusion may have been present, which is a valuable indicator of clinically relevant hip pathology (Fig. 2.43). Also, contrasted images can obscure edema in the subchondral bone and surrounding


**Fig. 2.37** Tests for piriformis syndrome. (**a**) Passive internal rotation of the extended hip placing tension on the piriformis is referred to as Freiberg's test. (**b**) Resisted external rotation of the extended hip with contraction of the piriformis may also re-create symptoms. (**c**) Resisted abduction of the flexed hip causes contraction of the piriformis in a different hip position and is referred to as Pace's sign. (**d**) The piriformis stretch test is performed with passive flexion, adduction, and internal rotation. This may stretch the piriformis provoking posterior symptoms but can also create anterior discomfort if the hip joint is irritable. (All rights are retained by Dr. Byrd)

soft tissues (Fig. 2.44). Thus, our strategy has been to perform a limited series of pre-contrast MRI followed by a more detailed post-contrast study.

Historically, we have relied mostly simply on the response to a fluoroscopically guided intra-articular injection of anesthetic to determine whether the hip was the principal pain generator [22]. As contrasted images became more popular, we simply injected the anesthetic along with the contrast. For clinical relevance, we rely more on the response to the injection than simply findings on the images. However, there has been anecdotal experience by numerous experienced hip specialists that the contrast may somehow negate some of the anesthetic effect causing a false-negative interpretation. Presently, we have transitioned more to ultrasound-guided

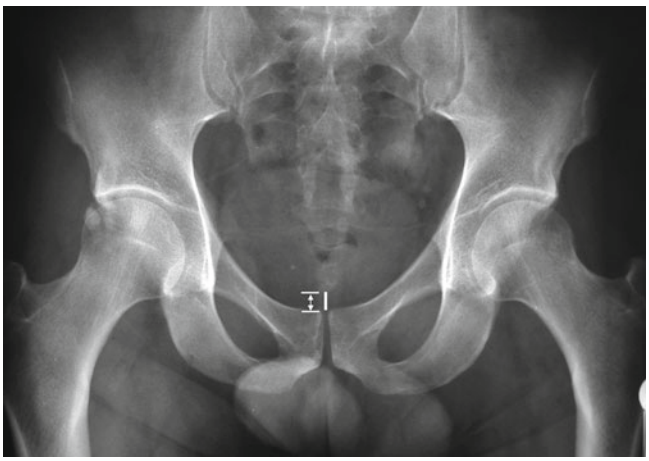

**Fig. 2.38** A properly centered AP radiograph must be controlled for rotation and tilt. Proper rotation is confirmed by alignment of the coccyx over the symphysis pubis (*vertical line*). Proper tilt is controlled by maintaining the distance between the tip of the coccyx and the superior border of the symphysis pubis at 1–2 cm. (All rights are retained by Dr. Byrd)

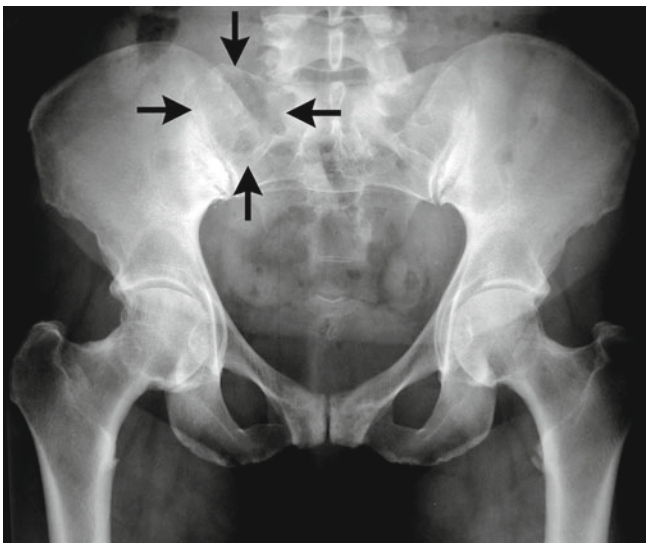

**Fig. 2.39** AP pelvis radiograph of a 50-year-old woman with a chief complaint of "right hip pain." Chronic bony changes are apparent around both hips, but an aggressive lytic lesion is identified in the right sacrum (*arrows*). (All rights are retained by Dr. Byrd)

diagnostic injections which can be conveniently performed for the patient in the office setting. It also allows real-time assessment of the patient's response, testing the hip both pre- and postinjection to determine the level of pain relief. Office-based ultrasonography now offers many new diagnostic and interventional options for patients and these are detailed in chapter 34. With the advantage and patient convenience of ultrasound-guided injections, we usually obtain only a high-resolution conventional MRI.

**Fig. 2.40** A frog lateral radiograph is useful as a routine screening film. It is easy to obtain in a reproducible fashion. (All rights are retained by Dr. Byrd)

It is important to keep in mind that some of the greatest value of the MRI is in assessing disorders that would not be evident during arthroscopy such as stress fractures, AVN, transient regional osteoporosis, tumors, and various extra-articular soft tissue disorders. The indication for arthroscopy is most often determined by the presence of recalcitrant hip joint pain that has failed conservative treatment, which may or may not be supported by obvious imaging findings of the nature of the pathology.

## Summary

This chapter has detailed a practical approach to the assessment of patients presenting with a complaint of hip pain. The evaluation includes the history and examination and how to interpret the clinical relevance of various imaging studies. This strategy evolved as a direct consequence of arthroscopy, which began mainly with the removal of loose bodies then gradually the treatment of other previously unrecognized sources of hip pain such as labral tears. This evolution has included recognizing the existence of treatable hip disorders, learning how to interpret the history and symptoms, developing examination skills, and subsequently understanding the value and limitations of imaging studies. It is hoped that this practical approach can be useful for all clinicians challenged with the evaluation of hip problems. Others have attempted to address this in an evidence-based fashion, which may complement the practical experiences expressed here [25].

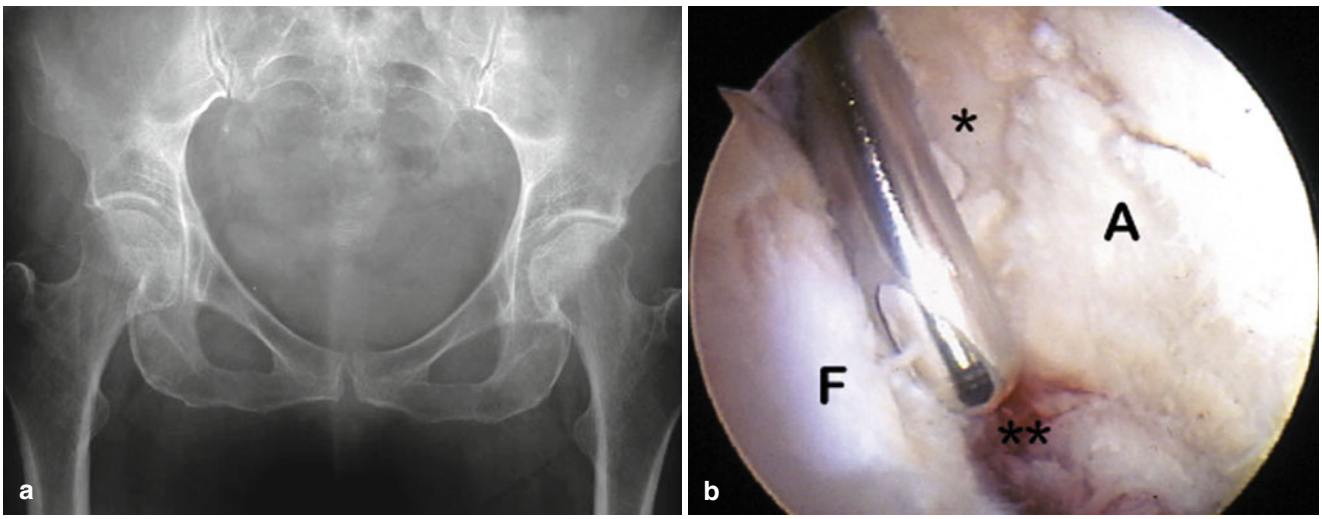


**Fig. 2.41** (**a**) AP pelvis radiograph of a 74-year-old woman with chronic rheumatoid arthritis who presented with recent onset of intractable mechanical hip pain. Radiographs were reported as superficially normal with only modest evidence of inflammatory degenerative changes, insufficient to solely explain the magnitude of her symptoms. (**b**) Arthroscopic view of the left hip from the anterolateral portal revealing extensive articular surface erosion of both the femoral head (*F*) and acetabulum (*A*) with areas of exposed bone (*) and extensive synovial disease (**). (All rights are retained by Dr. Byrd)

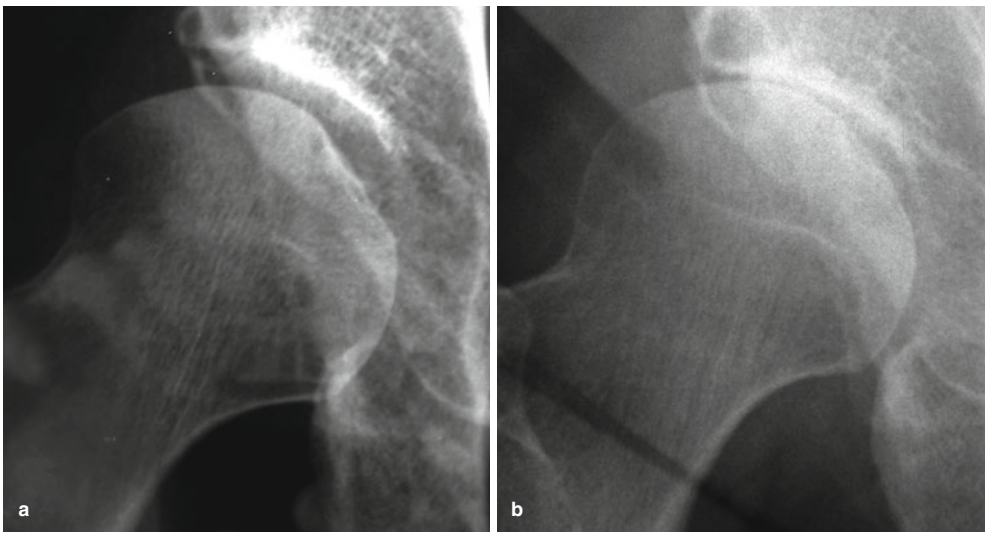


**Fig. 2.42** A 54-year-old orthopedic surgeon's wife experiences spontaneous onset of worsening mechanical right hip pain. (**a**) An AP radiograph demonstrates joint space preservation, and she was scheduled for arthroscopic surgery with MRI evidence of labral damage. (**b**) A repeat AP radiograph the day prior to surgery and only 1 month since her previous film demonstrates complete joint space loss. Arthroscopic surgery was canceled as this patient demonstrated rapidly progressive degenerative disease warranting a total hip arthroplasty. (All rights are retained by Dr. Byrd)

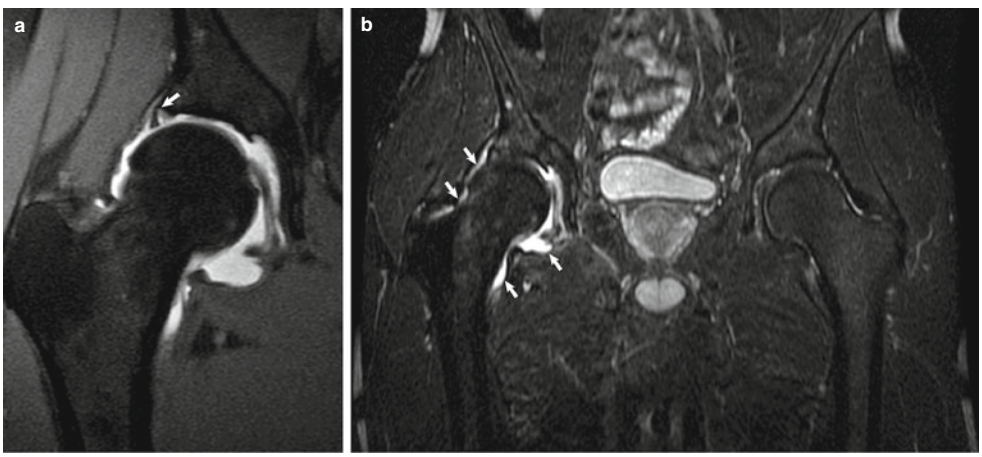


**Fig. 2.43** (**a**) A coronal MRA image demonstrates contrast separating the lateral labrum (*arrow*), which could be indicative of a pathological tear or normal labral cleft. (**b**) Pre-contrast coronal T2-weighted large-field-of-view pelvis image demonstrates an effusion (*arrows*) of the right hip which is significant indirect evidence of joint pathology. (All rights are retained by Dr. Byrd)

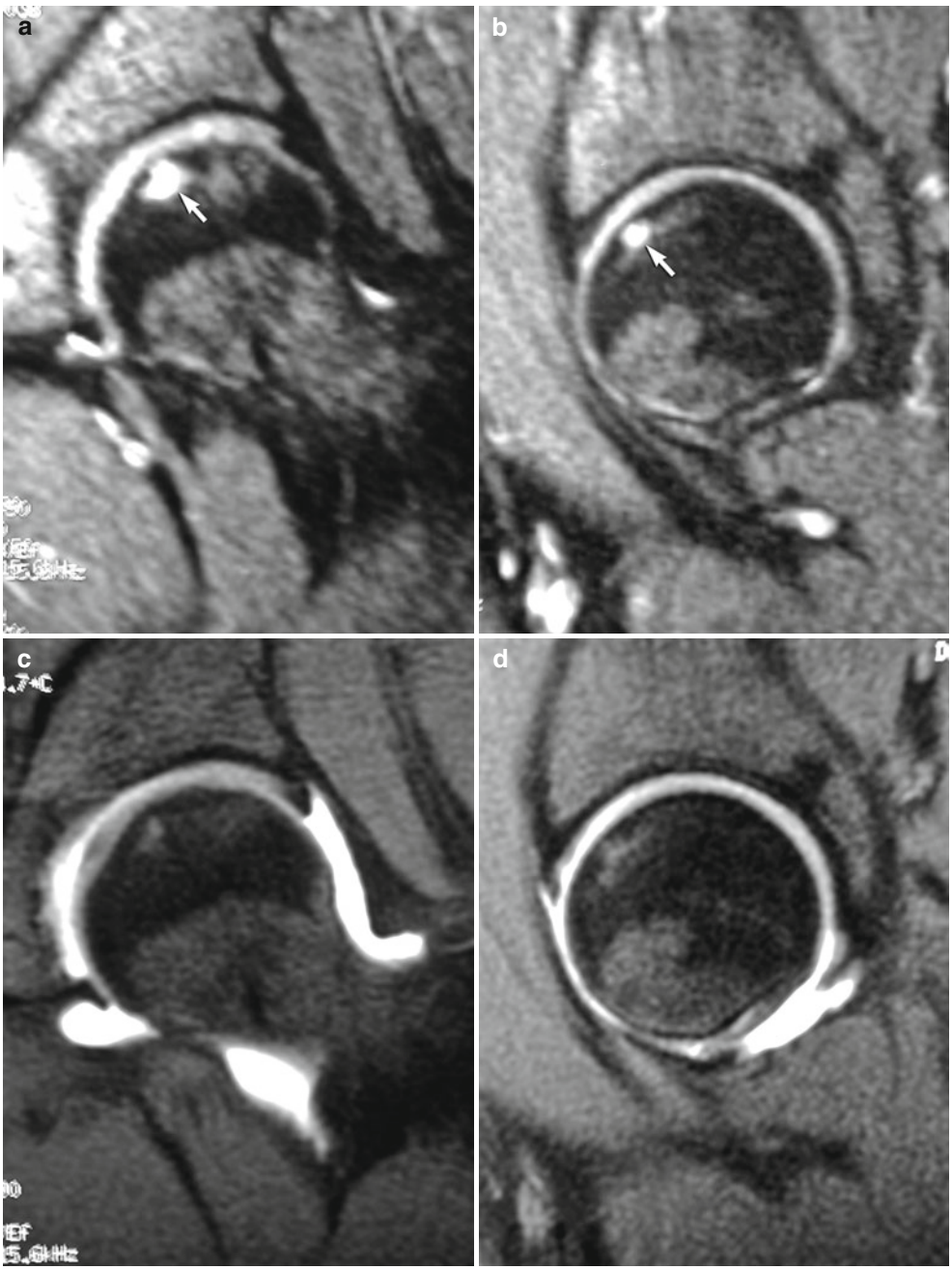


**Fig. 2.44** Pre-contrast coronal (**a**) and sagittal (**b**) MRI images demonstrate subchondral signal changes of the femoral head (*arrows*). Post-contrast coronal (**c**) and sagittal (**d**) images substantially obscure the subchondral changes. (All rights are retained by Dr. Byrd)

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