ELSEVIER

Operative Techniques in
Orthopaedics

Hip Arthroscopy by the Lateral Approach

James M. Glick, MD, and Thomas G. Sampson, MD

Hip arthroscopy performed with patients positioned on their sides is designed to help visualize the hip joint and maneuver instruments in obese patients and to enter the hip joint in patients with spurs on the anterolateral aspect of the acetabulum. The patient is placed on his/her side with the hip for surgery on top. The leg is placed in traction and a well-padded perineal post is applied for counter traction. An image intensifier is placed around the hip to aid in directing the instruments into the hip joint. Traction is necessary to reach the depths of the hip joint. After traction is applied, 2 portals are made over the greater trochanter and one directly anterior. To help in maintaining the portals and in maneuvering the arthroscope and instruments, a capsulotomy is performed at each portal sight. To visualize the intracapsular area around the femoral neck, traction is released and the hip flexed. An additional, ancillary portal may be required to reach the intracapsular portion around the femoral neck. This portal is made anterior and distal to the first direct anterior portal. We found this approach to be highly effective in all cases. A regular traction table requires adjustments of the perineal and traction posts to apply traction on legs in patients on their sides. Special traction devices make the set up easier. The lateral approach to the hip for arthroscopy provides a safe and consistent way of entering, visualizing and performing surgical procedures in the hip.
Oper Tech Orthop 15:218-224

KEYWORDS hip arthroscopy, lateral approach, maneuver instruments

Hip arthroscopy performed on patients placed in the lateral position has proven to be reliable and safe.[1] The fat drops away from the operative site when patients are placed on their sides, and the portals provide a direct entry into the hip joint. The posterior portal in particular allows the surgeon to gain access easily to the joint when a large spur blocks the other portals of entrance.

Operative Room Setup

The patient is on his or her side on an operating table. The foot is connected to the traction device. A padded post is placed in the perineum for counter traction. An image intensifier (fluoroscope) is positioned around the hip for anteroposterior views. After all the portals are completed, the image intensifier can be moved out of the way to give the surgeon more room to work. The surgeon stands in front of the patient. The video monitor, image intensifier screen, and power and fluid pump equipment are to the rear of the patient so the surgeon can view the video screen and the various LED readings comfortably. The nurse stands on the side and a little in back of the surgeon.

Hip arthroscopy, whether performed in the lateral or supine position, requires extra-long and curved instruments. Curved shavers and graspers should be available to reach underneath the circular femoral head to gain access to the corners and depths of the hip joint. Electrothermal or laser devices also are useful for reaching and cutting pathology that is either obstructed by the curve of the acetabulum or deep and in the corners of the joint. Special traction devices are now available, but a fracture table can be used just as effectively (Fig. 1).[2] No matter what traction device is used, the safety factors to prevent neuropraxia of the sciatic and pudendal nerves must be followed.

Technique

The patient under general anesthesia is placed in the lateral decubitus position with the hip to be treated on top. The foot and leg is strapped into the distraction device, which places the hip in abduction (Fig. 2). The hip is then positioned in slight abduction, flexion, and external rotation to relax the capsule. If there is a hip flexion or adduction contracture,

Department of Orthopedic Surgery, University of California San Francisco, San Francisco, CA.
Address reprint requests to James M. Glick, MD, 1199 Bush St. Ste 200, San Francisco, CA. 94109. E-mail: glick@itsa.ucsf.edu

 1048-6666/05/$-see front matter
doi:10.1053/j.oto.2005.07.006

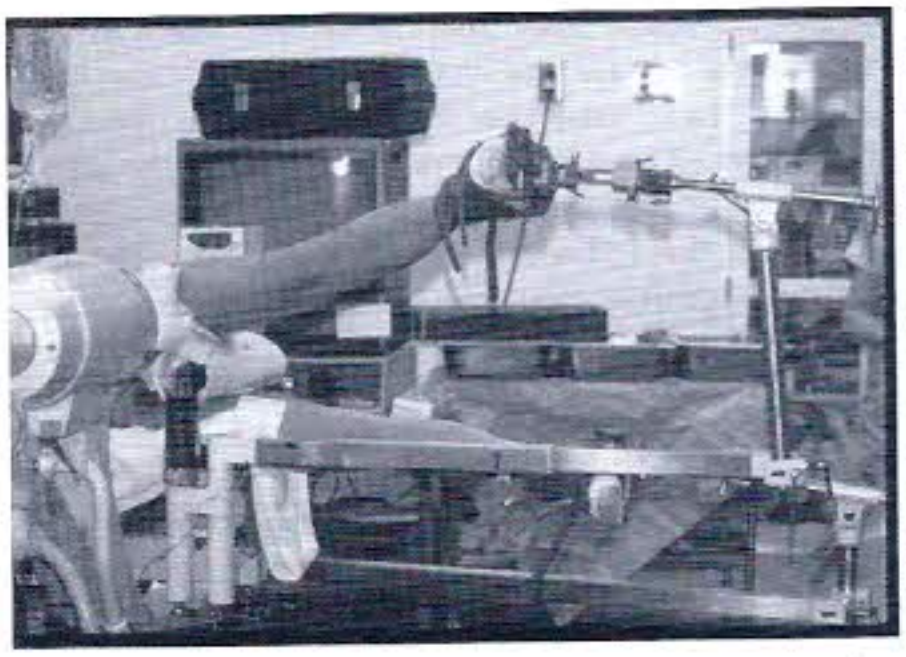


Figure 1 A regular fracture table set up for hip arthroscopy. The foot posts are repositioned to accommodate the leg with the patient on his/her side. (Reprinted with permission from Glick.[2]) (Color version of figure is available online.)

then the hip must be left in that position to distract the hip adequately with a safe amount of traction. The perineal post placed between the legs is pushed upward against the medial portion of the thigh on the involved leg. This produces slight upward distraction and will keep the post away from the branch of the pudendal nerve that crosses over the ischium. Two portals are made over the greater trochanter, and one directly anterior (Fig. 3). Additional anterior portals can be made to visualize and perform procedures around the femoral neck. We find that just working in the depths of the hip joint, most procedures can be performed through the 2 lateral paritrochanteric portals while using an extra-long spinal needle in the direct anterior position for fluid outflow. The extra-long spinal needles are inserted into the skin at the

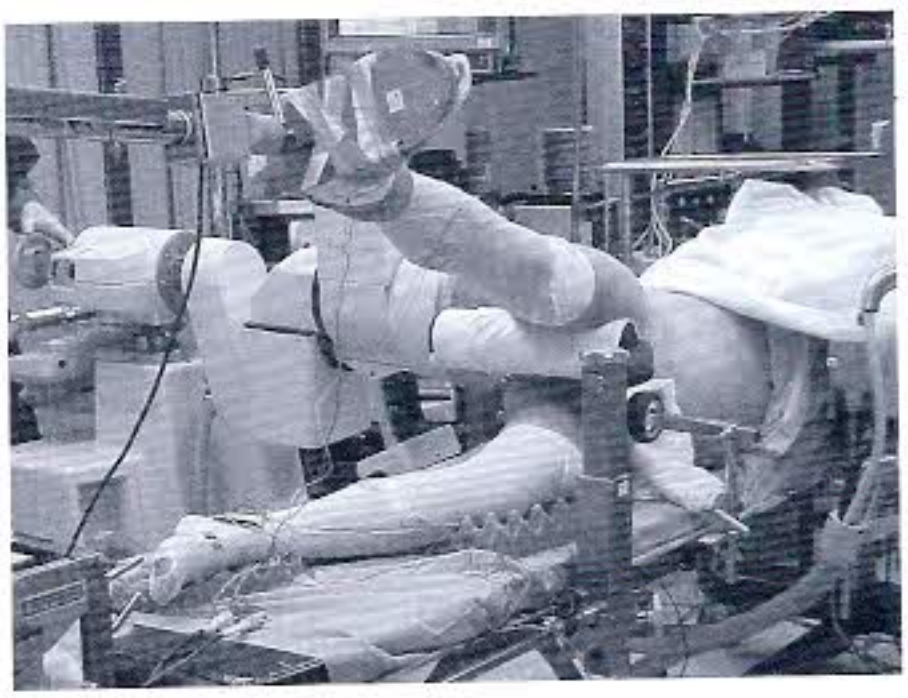


Figure 2 The right leg of a patient positioned in the foot piece of a traction device. The leg is positioned in slight flexion, abduction and external rotation to relax the hip capsule. The perineal post is positioned upward against the medial side of the thigh so that it applies slight upward distraction and does not rest against the branch of the pudendal nerve that crosses over the ischium. (Reprinted with permission from Glick.[10]) (Color version of figure is available online.)

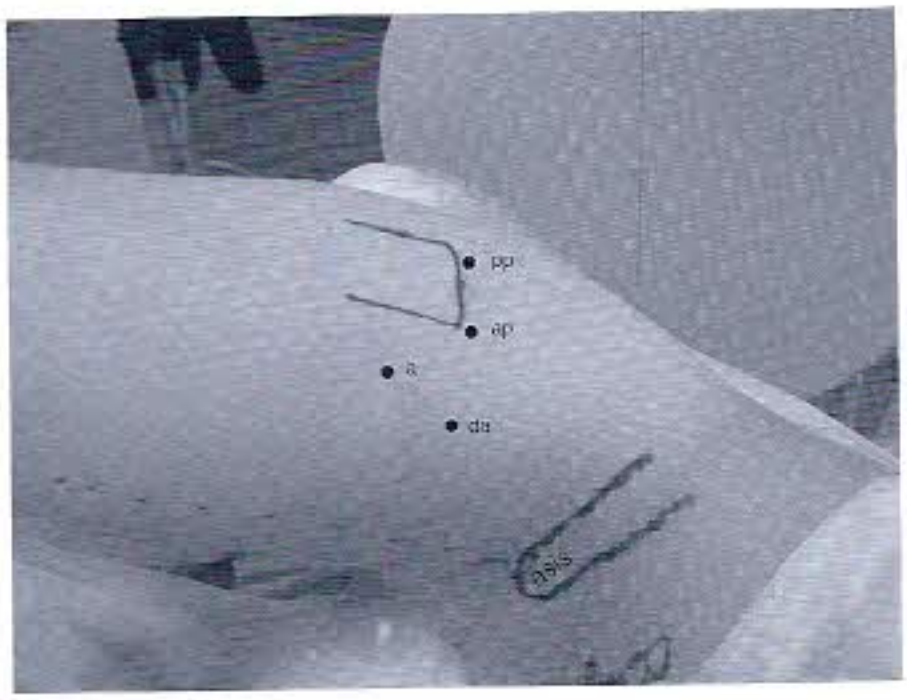


Figure 3 The direct lateral approach. The right hip is viewed from the front. The iliac crest and the greater trochanter are marked on the skin. The small circles mark the portal sights. The circles from anterior below to posterior above represent the direct anterior portal, an accessory portal, the portal at the anterior edge of the greater trochanter and the portal at the posterior edge of the greater trochanter, respectively. The dotted line represents the medial most margin where no incisions should be made because of the femoral artery and nerve that lie below it. gt, greater trochanter; asis, anterior superior iliac spine; da, direct anterior portal; a, accessory portal; ap, anterior paratrochanteric portal; pp, posterior paratrochanteric portal. (Color version of figure is available online.)

planned portal sites to ensure accurate placement of the incisions. Important arteries and nerves are safely away from the insertion sites. Branches of the lateral femoral cutaneous nerve are near, but not dangerously close to the direct anterior portal. We use a pump to introduce fluid into the hip joint through the arthroscope sheath. The pump pressure should be kept between 50 and 70 mm Hg to prevent excessive fluid extravasation.

Before the patient is prepped and draped, mark the landmarks with a marking pen. The landmarks consist of the anterior–superior iliac spine and the greater trochanter (Fig. 3). The anterior–superior iliac spine is marked out as a reminder that the neurovascular bundle lies medial to it. After drawing the landmarks, perform the maneuvers that will have to be made to visualize the various areas of the hip during the actual procedure. Apply traction at this time to determine the amount that will be needed to distract the hip for safe entrance. The distraction is visualized on the image intensifier screen. If excessive traction does not distract the hip, do not be concerned because during the actual procedure, after air is injected into the hip, the suction seal will break and the hip will distract sufficiently to insert the arthroscope and arthroscopic instruments safely. Also, make sure all body parts are properly padded, especially around the perineal post. Finally, as will have to be done to view the periphery of the hip, position the hip into flexion to make sure that the leg does not rub against parts of the traction device.

Next, sterilely prep and drape the hip. The image intensi-

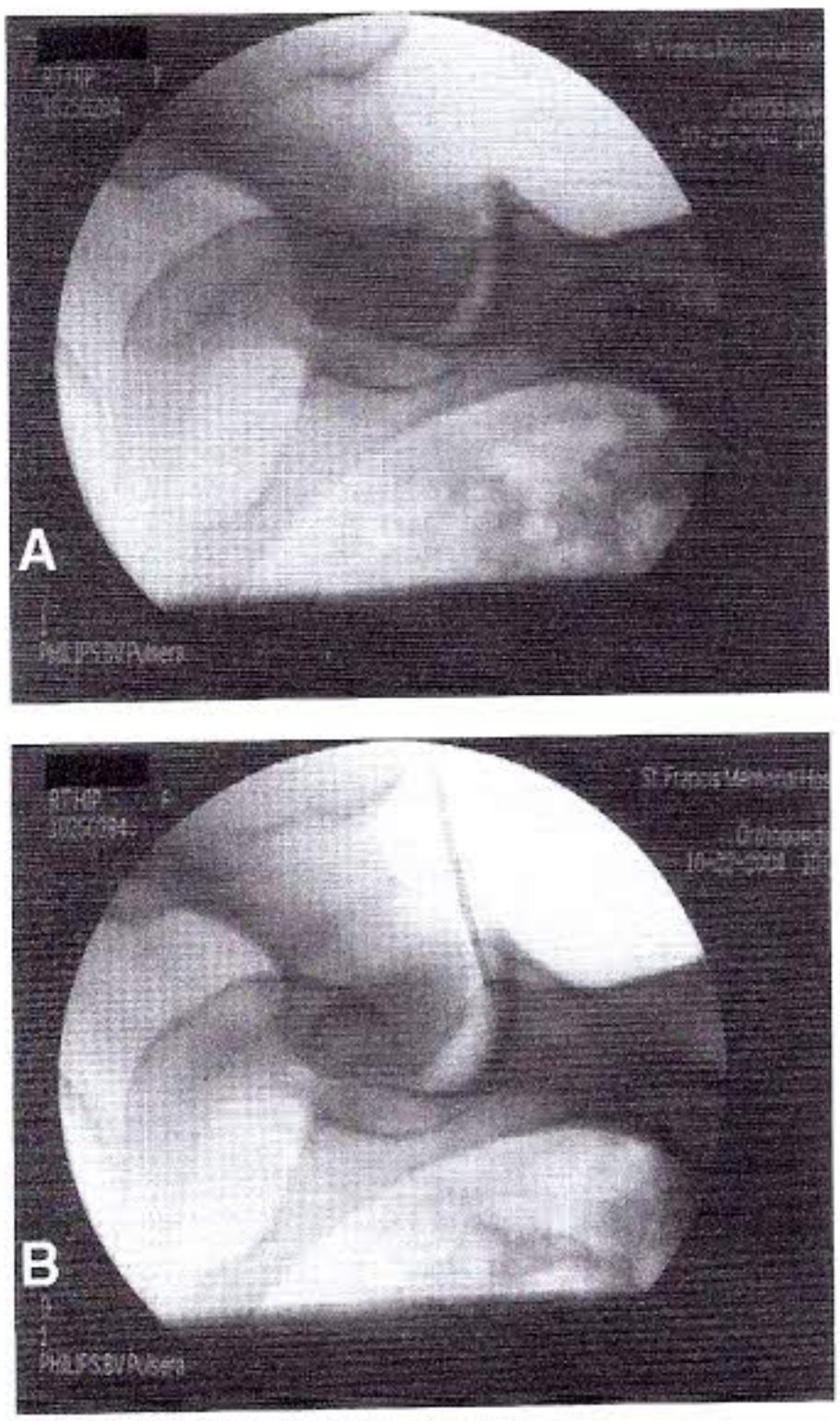


Figure 4 A fluoroscopic image of a right hip before and after a spinal needle has been inserted and room air injected to break the suction seal. A, The distracted hip before insertion of the spinal needle. In this hip, 70 lbs of traction did not distract the hip sufficiently to insert instruments without scuffing the joint surfaces. B, The same hip showing increased distraction after insertion of the spinal needle and the injection of 10 mL of room air.

fier should be draped out of the surgical field. Then, apply enough traction to distract the hip at least 12 mm as noted on the image intensifier. Do not hesitate to apply more traction if necessary, but after all instruments have been inserted, the traction should be reduced back to 50 to 75 pounds. After the traction is brought back to a safer level the distraction will remain, owing to muscle relaxation. Once the hip has been distracted sufficiently, insert an extra-long spinal needle over the anterior edge of the greater trochanter and advance it down the neck of the femur into the hip joint. A definite "give" is felt when the capsule is penetrated and the bony floor of the acetabulum then stops the needle. At this point, verify the position of the needle in the hip joint with the image intensifier. If the joint has not been entered, manipulate the needle into the joint under image intensification. Try to place the needle away from the labrum, which in most instances can be visualized on the image intensifier, so not to damage it.[3] Next, remove the stylet, and with a syringe inject 10 to 15 mL of room air into the joint to break the suction seal. Once the suction seal is broken, the hip will relax and more distraction will occur (Fig. 4). At this time, aspirate to see if fluid is present. Next, insert a Nitanol guidewire into the needle, and then remove the needle, leaving the guide wire in the hip joint. With the guide wire in place, make an incision around it with a No. 11 blade. Then, introduce the arthroscopic sheath with its cannulated blunt trochar over the wire. To prevent damage to the articular cartilage, control the advancement of the sheath and trochar by twisting the trochar, watching its progress on the image intensifier (Fig. 5).

Once the sheath is within the confines of the capsule, remove the trochar and wire and couple the 30° fore-oblique arthroscope to it. Most of the time, viewing the hip with its ambient air is all that is necessary to continue the next steps. If visualization is poor, fluid should be inserted through the stopcock on the arthroscope sheath to clean the joint. With the arthroscope in place, insert two more extra-long spinal needles in a similar manner, one over the posterior aspect of the greater trochanter and the other directly anterior under direct vision. Make sure that these two needles do not pierce the labrum. Use a 70° fore-oblique arthroscope if the edge of the acetabulum and the labrum are not well visualized with the 30° fore-oblique arthroscope. When the other 2 needles are visualized within the joint, the image intensifier can be pushed aside until it is needed for another part of the case as the rest of the procedure is performed under direct vision. Now, flow fluid into the joint through the arthroscope sheath and allow outflow through one of the

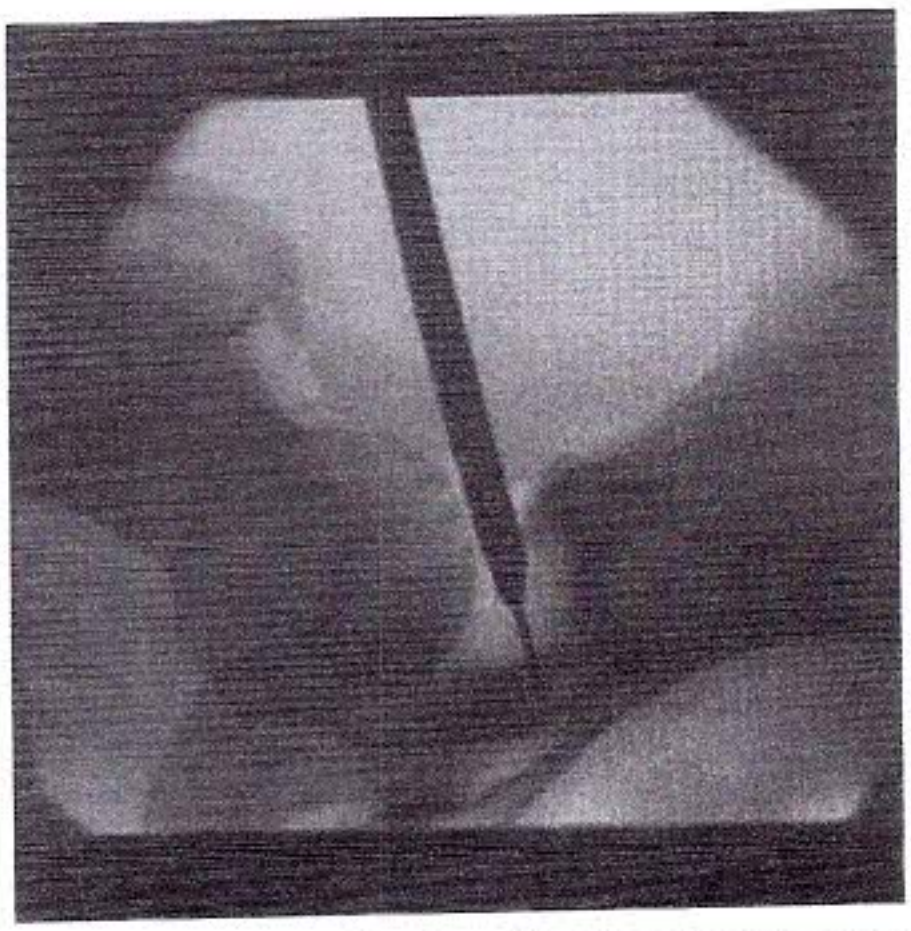


Figure 5 An image intensifier view of the arthroscope sheath and cannulated blunt trochar entering a right hip joint over a guide wire. (Reprinted with permission from Glick.[10])

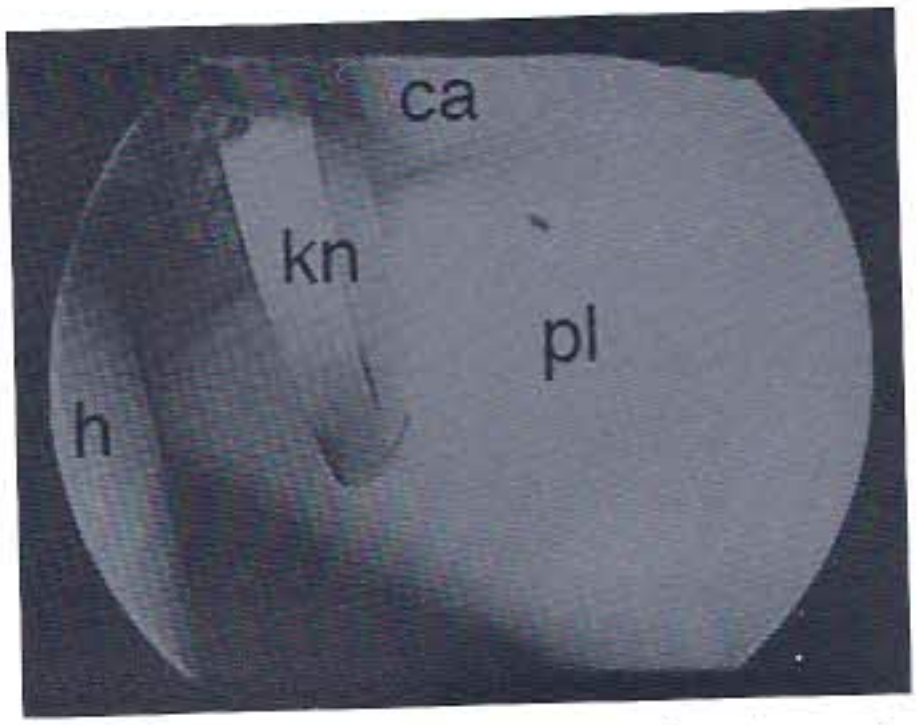


Figure 6 An arthroscopic knife cutting the capsule at the posterior paratrochanteric portal of a right hip. The arthroscope is viewing through the anterior paratrochanteric portal. h, femoral head; ca, capsule; pl, posterior labrum; kn, knife. (Reprinted with permission from Glick.[10])

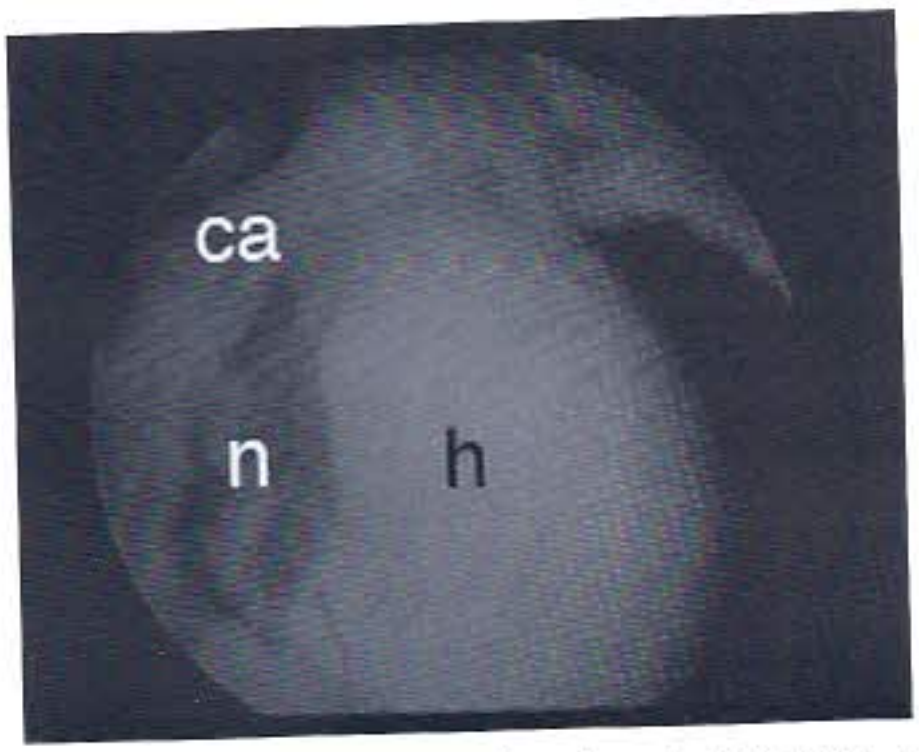


Figure 8 The technique for approaching the neck of the femur. A view of the entire head/neck interval of a right hip after a wide capsulotomy with the traction off. The capsulotomy allows the arthroscope to be retracted providing a wider field of vision. h, femoral head; n, neck; ca, capsule. (Reprinted with permission from Glick.[11])

remaining needles. We like to use the needle in the direct anterior portal for outflow and develop the posterior peritrochanteric portal as our first working portal. The process is repeated for the posterior peritrochanteric portal. In most instances, the deep portions of the hip joint can be reached through the two peritrochanteric portals. If not, the anterior portal can be developed in the same manner as the two peritrochanteric portals.

The last step is to widen the capsular portion of each portal

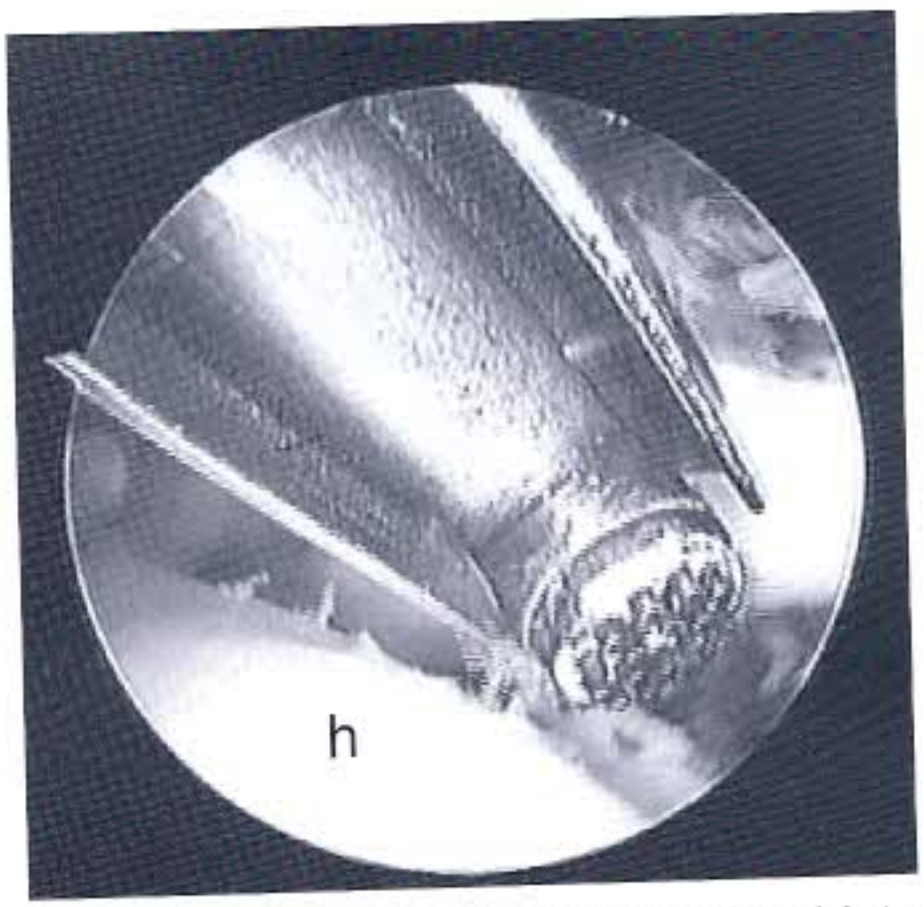
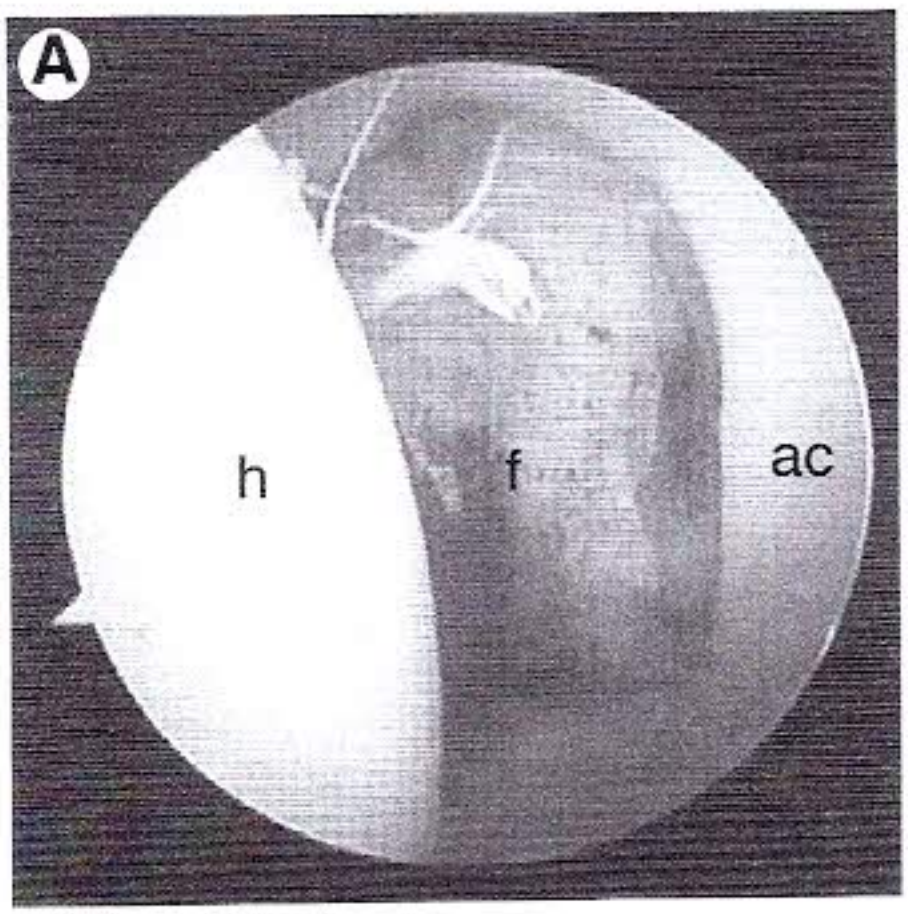


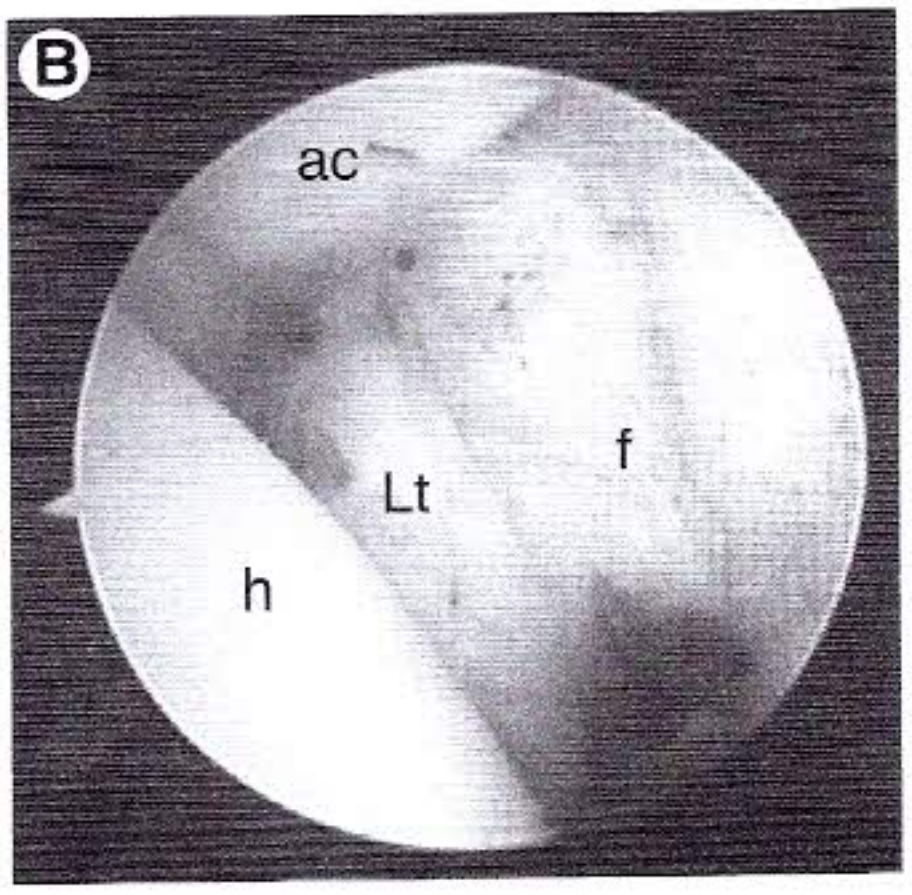
Figure 7 A view of a slotted cannula with an electrothermal device entering the right hip joint through an anterior paratrochanteric portal. The arthroscope is viewing through the posterior paratrochanteric portal. H = femoral head. (Reprinted with permission from Glick.[10]) (Color version of figure is available online.)

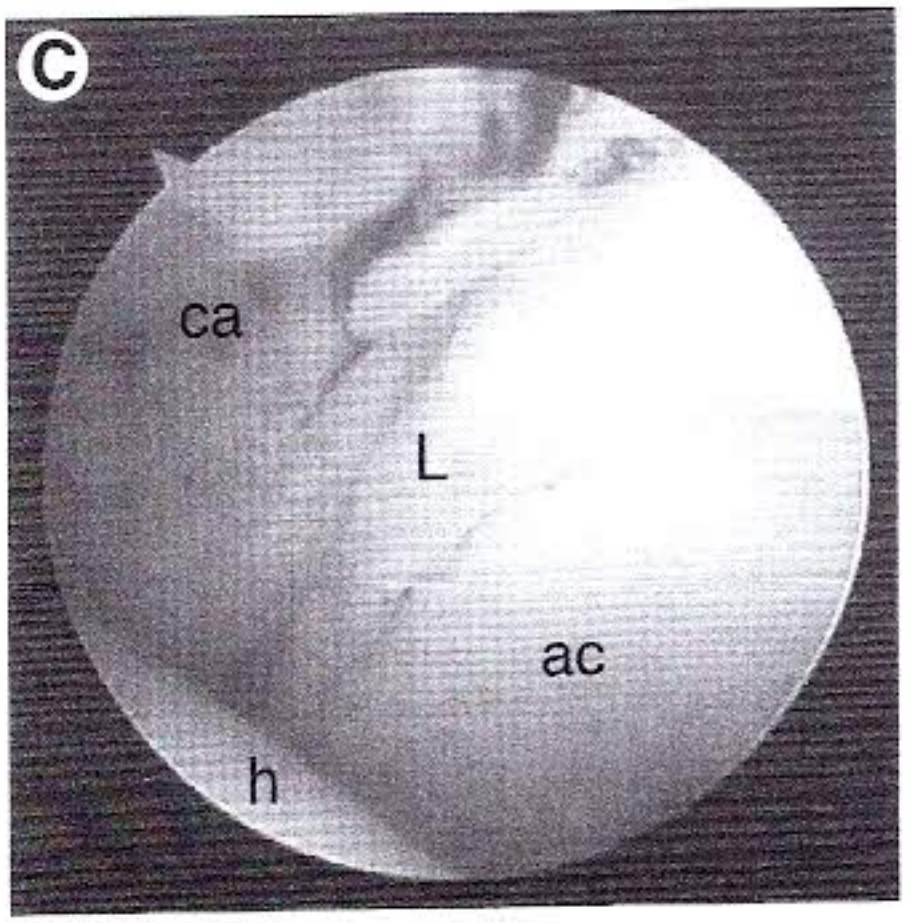
to increase instrument mobility and to improve access to all portions of the hip joint. To do so, an arthroscopic knife is inserted under direct vision and the capsule is cut in all directions as far as possible (Fig. 6). In addition, cutting the capsule permits easy passage of all instruments into the joint without maintaining the portal with a cannula. Usually, a curved shaver can be easily inserted into the joint once the capsule has been cut. However, a slotted cannula will make it easier to insert a curved instrument. Before removing the arthroscopic knife, insert a slotted cannula over it and observe the cannula entering the joint. Then, remove the knife and direct the curved instrument along the slotted cannula (Fig. 7). Once the curved device is in the joint, remove the slotted cannula, so the instrument can be moved freely around the joint.

When a large anterior spur is present, entrance into the hip joint is difficult and sometimes impossible. The spur may completely block the 2 anterior portals. The portal over the posterior aspect of the greater trochanter is not blocked and can be effectively used to enter the hip. We found that the best way to develop the posterior portal is with the patient on his or her side. To start, insert the arthroscope into the posterior portal. Distend the hip with fluid inserted through the arthroscope sheath. Next develop the anterior paratrochanteric portal. Visualize the region of the spur through the arthroscope. With the aid of the image intensifier, insert a motorized shaver blindly down to the spur and debride the soft tissue until the shaver tip comes into view. The electrothermal ablator can be used to speedup the debriding process once a space is made with the motorized shaver. Then insert a motorized abrader and under direct vision take off the spur. Once the spur is removed, the third direct anterior portal may be developed.

To visualize the periphery of the hip joint, release the







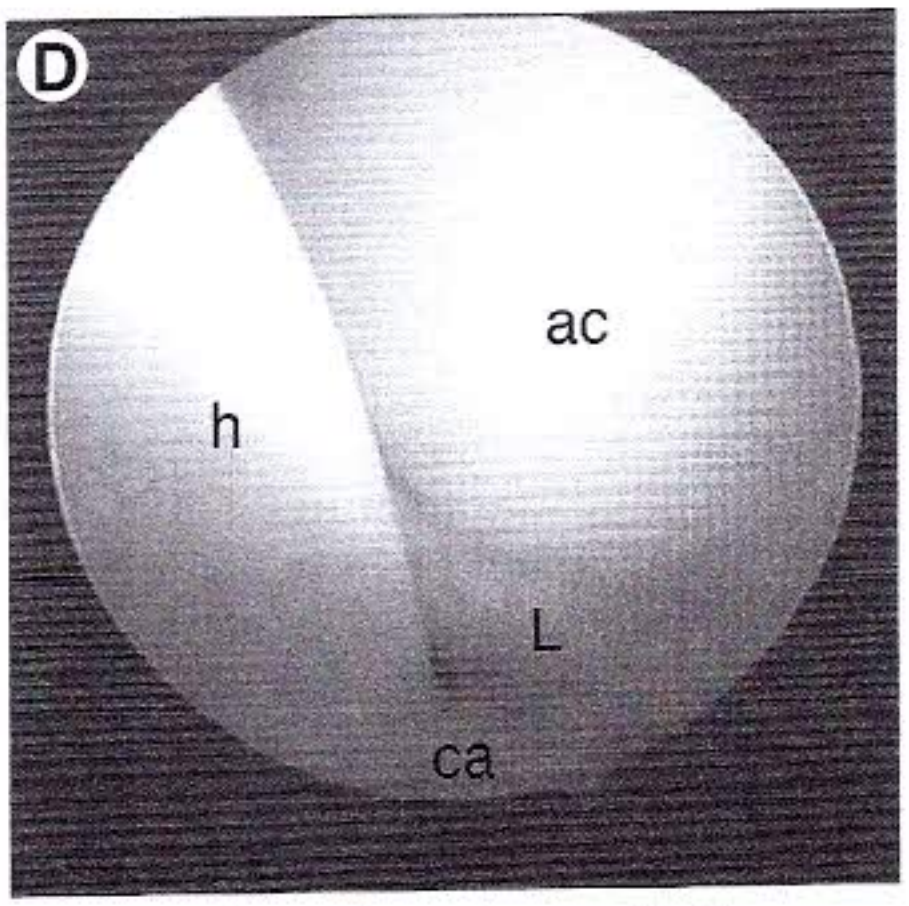


Figure 9 The right hip joint. A, The acetabular fossa. B, Deep in the acetabular fossa. C, The posterior aspect of the hip joint. D, The anterior aspect of the hip joint. h, femoral head; f, acetabular fossa; Lt, ligamentum teres; ac, acetabulum; L, acetabular labrum; ca, capsule. (Reprinted with permission from Glick.[10]) (Color version of figure is available online.)

traction and flex the hip to around 30° to relax the capsule. Then, cut the capsule with a motorized cutter and an electrothermal ablator under direct vision and the aid of the image intensifier. We find that cuts made with high radiofrequency ablators remove the capsule and synovium faster then a motorized cutter. Trim the capsule proximally and distally so that the junction of the head and the neck is easily visualized (Fig. 8). With the arthroscope in either of the paratrochanteric portals, manipulate the arthroscope downward to visualize underneath the femoral neck, which is actually its anterior face. Surgical instruments and the arthroscope can be interchanged among any of the portals. Rotating, adducting, abducting, flexing, and extending the leg and transferring the arthroscope to each portal can achieve a complete view of the intracapsular aspect of the hip.

The reason we suggest that the surgeon stand in front of the patient while performing the lateral approach is most of the pathology in the hip presents anteriorly. There will be some cases, however, that lesions will occur in the posterior

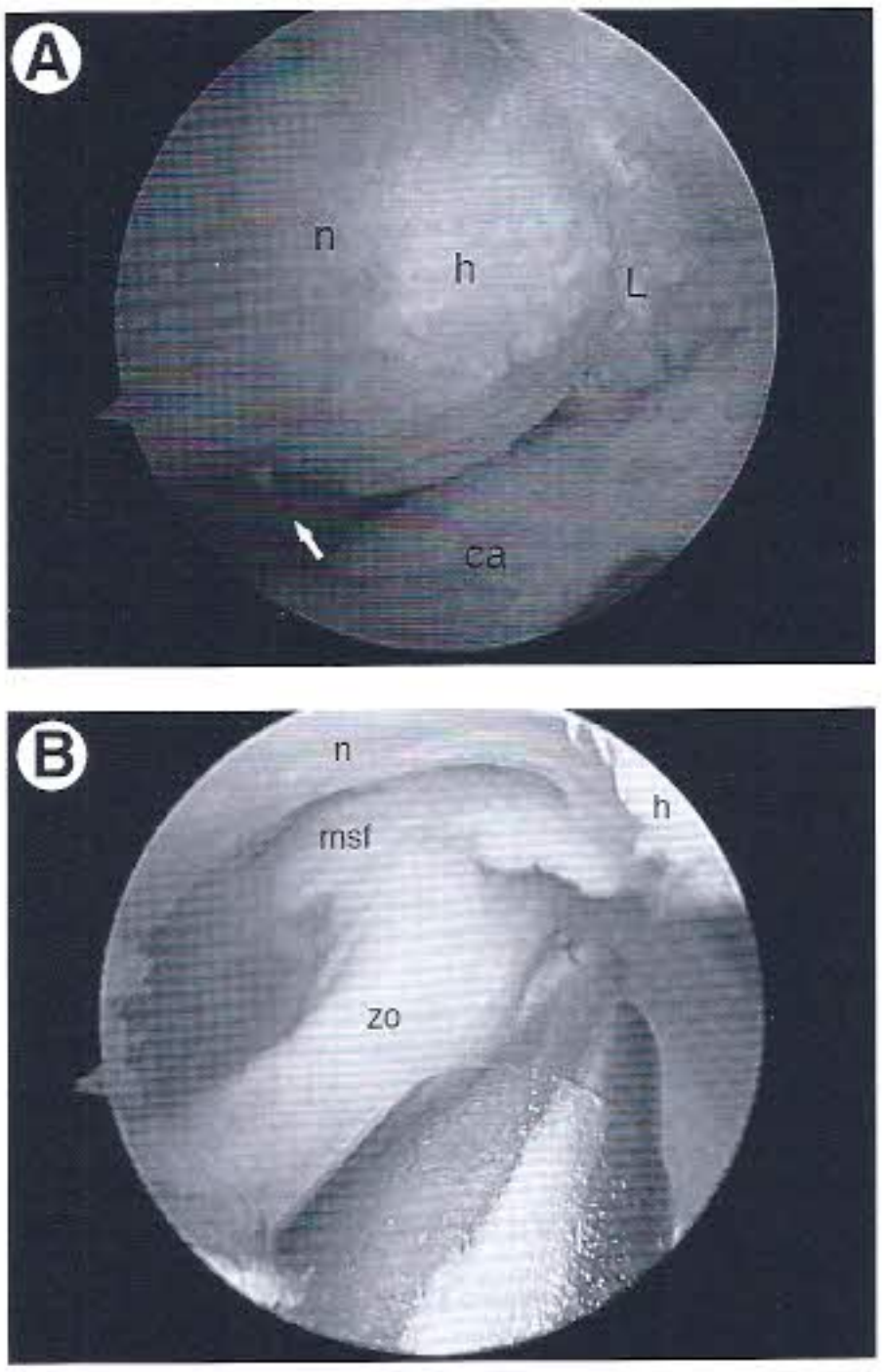


Figure 10 The anterior surface of the head neck interval of this right hip appears underneath the femoral head and neck. The hip is flexed to relax the capsule. A, is a view of the anterolateral surface of the femoral head and neck. The anterior lateral labrum is noted cupping the anterior-lateral aspect of the femoral head. The arrow points to the anteromedial surface of the femoral neck, which in the lateral approach appears to be underneath the femoral neck. B, The medial synovial fold marks the medial edge of the anterior neck. It runs distally toward the greater trochanter from the distal aspect of the femoral head. A circumferential thickening of the anterior capsule is known as the zona orbicularis. h, femoral head; L, acetabular labrum; msf, the medial synovial fold; ca, capsule; zo, zona orbicularis. (Color version of figure is available online.)

part of the joint. In these cases, we find it easier to reach the region by standing in back of the patient. There is no difference in the performance of the procedure when standing in back of the patient, but the orientation on the video screen changes.

Arthroscopic Anatomy

The lateral approach provides a safe route for the arthroscope.[4] The vital structures are away from the actual insertion sites and are in jeopardy if the bony landmarks are not recognized. The palpable bony landmarks are the greater trochanter and the anterior superior iliac spine. The deep bony landmarks are the neck and head of the femur and the acetabulum. These are palpated with the spinal needle and the trochar as the joint is approached. The instruments pass through the gluteus medius and minimus muscles as they are directed into the hip joint. A definite "give" on either side is felt as the capsule is pierced, and the bony floor of the acetabulum stops the instrument. If bone is struck before the capsule appears to be penetrated, the instrument is placed too superior, striking the outer wall of the acetabulum, or too inferior, hitting the head of the femur. The vital adjacent structures include the sciatic nerve posteriorly and the lateral femoral cutaneous nerve anteriorly. The femoral artery and nerve anteriorly and the superior gluteal nerve are far removed from the portals of entry,[5] but their location should be kept in mind. Likewise, the vascular leash that runs on the posterior side of the femoral neck and supplies the femoral head should be avoided when working around the neck.

With the surgeon in the anterior position, the video camera is oriented to provide the same image that the surgeon sees through the arthroscope. On the video screen, the head of the femur appears on the side opposite to that operated on. For example, in the right hip the femoral head is on the left, and in the left hip the femoral head is on the right; anterior is down and posterior is up in both the right and left hips. When standing in back of the patient the view on the screen changes, so now the femoral head appears on the same side to that operated on and anterior is up and posterior is down in both the right and left hips. The entire acetabulum can be seen by the direct lateral approach. The acetabular labrum is attached to the rim of the acetabulum and the transverse acetabular ligament at the site where the acetabular fossa opens inferiorly. The arthroscopic views displayed in Fig. 9 are what we see in a normal hip joint. Note the orientation and the position of the ligamentum teres. This structure is best seen with the arthroscope directed to the medial aspect of the joint. The capsular attachments define the joint and what can be seen with the arthroscope. Proximally, the cap-

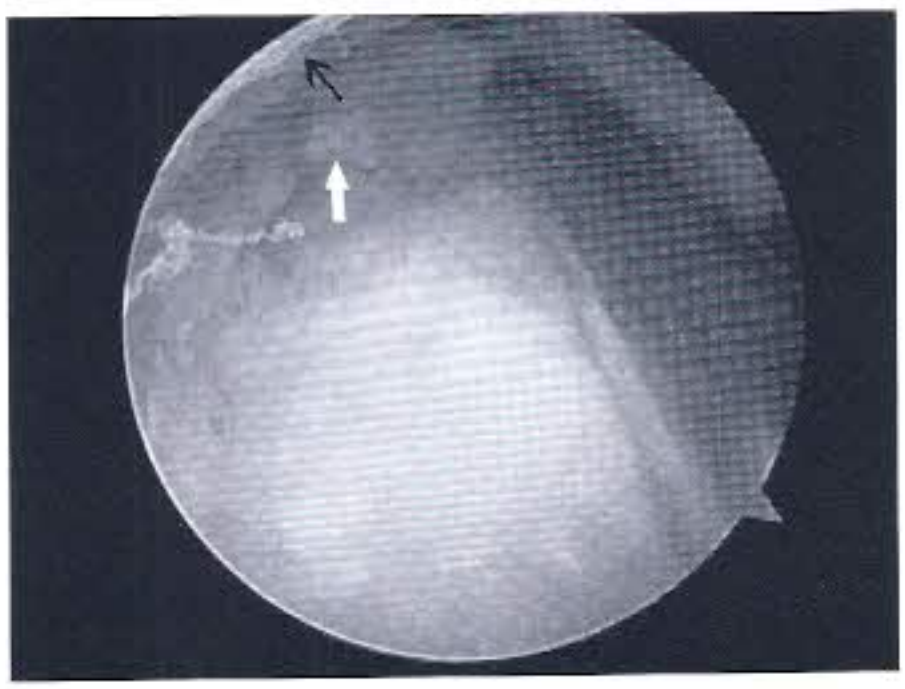


Figure 11 The white arrow identifies the iliopsoas tendon of this left hip. The black arrow points to the antero-medial surface of the femoral neck. (Color version of figure is available online.)

sule covers the labrum. Distally, it attaches to the intertrochanteric line on the anterior aspect of the neck and just proximal to the intertrochanteric crest on the posterior side of the neck. A greater portion of the femoral neck is visible anteriorly than posteriorly because of the way the capsule attaches. The thick overlying ligaments of the hip form the folds in the capsule. With the patient in the lateral position the anterior face of the femoral neck appears to extend underneath the neck (Fig. 10A). The medial edge of the anterior part of the femoral neck is identified by the medial synovial fold, which runs from the medial margin of the femoral head distal to the intertrochanteric crest (Fig. 10B).[6] Adjacent to the medial synovial fold and hidden by the synovium is the iliopsoas tendon. The iliopsoas tendon lies under the anterior capsule. The tendon outline can be palpated with a probe. After the tendon is exposed, it can be followed distally to its attachment on the lesser trochanter (Fig. 11). The zona orbicularis is a ligament, which forms a circular ring around the neck of the femur at the base of the femoral head as shown in Fig. 10B. Loose bodies frequently hide under this structure.

Discussion

The lateral approach provides an easy and safe access to the hip joint. The line from skin to the joint itself is a straight, downward drop. The vital arteries and nerves are a safe distance from the portal sites. The potential problems that can arise from this procedure are from the traction applying a compression force on the branches of the pudendal nerve as they cross the ischium and traction force on the sciatic nerve.[7,8] We have always maintained that traction should be treated like a tourniquet; that is, it should be applied for no more then 2 h. Further more, the amount of traction should not exceed 75 pounds. We use a tensiometer, but it is not mandatory as the major issue with the traction is the time of application. JMG monitored the sciatic nerve using both evoke potentials and, in some cases, motor potentials in over seventy cases and the poundage and time limits of the traction (75 lbs and 2 h) were verified. In addition, if the fracture table has a vertical post as well as a perineal post, set the vertical post in the back of the patient and not in the front. Flexing the hip around that post will greatly increase the traction and at the same time will place an extreme stretch on the sciatic nerve, setting up the chance of a significant sciatic nerve neuropraxia. To protect the pudendal nerve, Lyon et al[9] suggest that the perineal post be at least 9 cm in diameter to distribute the forces in a wide area on the ishium and make sure that the pelvis is well supported so the pressure of the post is not placed directly on the this nerve. The perineal posts on most fracture tables are only 3 cm in diameter. These can be made larger by wrapping them with padding. In some fracture tables the slats that support the lower leg can be removed and consequently the support on the pelvis is lost. For hip arthroscopy, the slats do not have to be removed.

References

1. Glick JM, Sampson TG, Gordon RB, et al: Hip arthroscopy by the lateral approach. Arthroscopy 3:4-12, 1987
2. Glick JM. Hip arthroscopy using the lateral approach, in Bassett FH III (ed): Instructional Course Lectures, volume 37. Rosemont, IL, American Academy of Orthopaedic Surgeons, 1988, pp 223-231
3. Byrd JWT: Avoiding the labrum in hip arthroscopy. Arthroscopy 16: 770-773, 2000
4. Glick JM, Sampson TG: The lateral approach to the hip joint, in McGinty JB (ed): Operative Arthroscopy (ed 3). Philadelphia, Lippincott Williams & Wilkins, 2003, pp 856-865
5. Foster DE, Hunter JR: The direct lateral approach to the hip for arthroplasty. Orhopaedics 10:274-280, 1987
6. Dienst M, Godde S, Seil R, et al: Hip Arthroscopy without traction: In vivo anatomy of the peripheral hip joint cavity. Arthroscopy 17:924-931, 2001
7. Glick JM: Complications of hip arthroscopy by the lateral approach, in Sherman OH, Minkoff J (eds): Arthroscopic Surgery (ed 1). Baltimore, MD, Williams & Wilkins, 1990, pp 193-201
8. Sampson TG: Complications of hip arthroscopopy. Clin Sports Med. 831-835, 2001
9. Lyon BS, Koval KJ, Kummer F, et al: Pudendal nerve palsy induced by the fracture table. Orthopedic Rev May:521-525, 1993
10. Glick JM: Hip arthroscopy by the lateral approach. Clin Sports Med 20:733-747, 2001
11. Glick JM: Arthroscopic surgery of the hip, in Chapman MN (ed): Operative Orthopaedics (ed 2). Philadelphia, JB Lippincott, 1993, pp 2391-2401