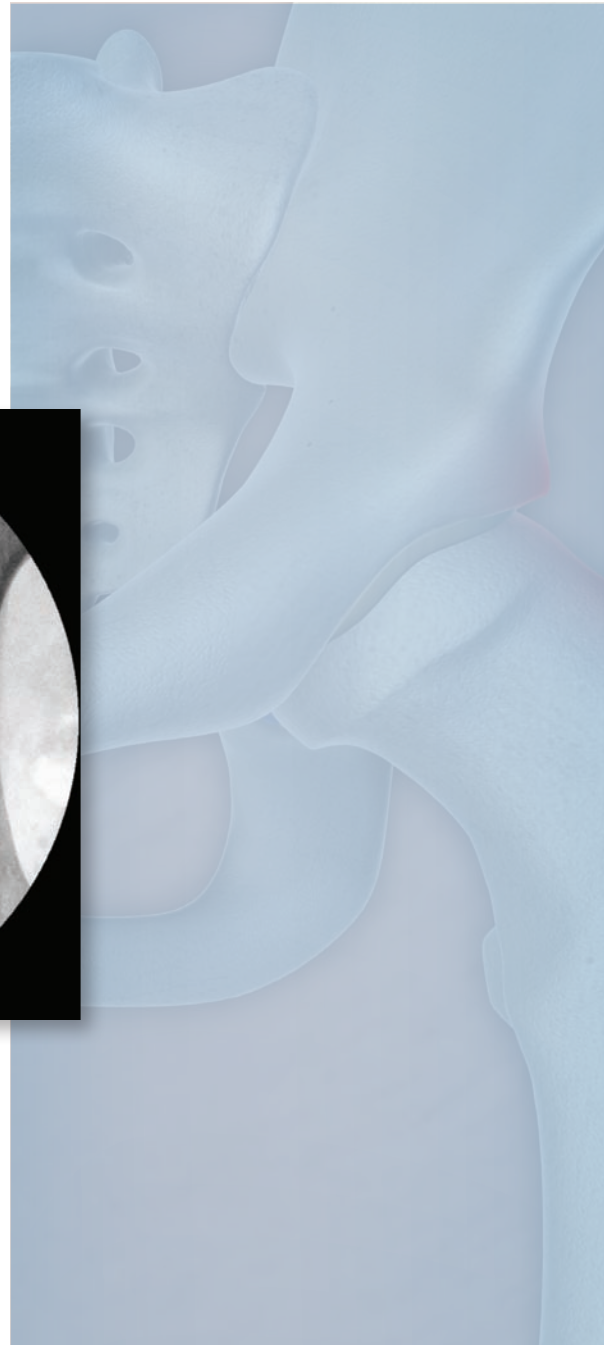
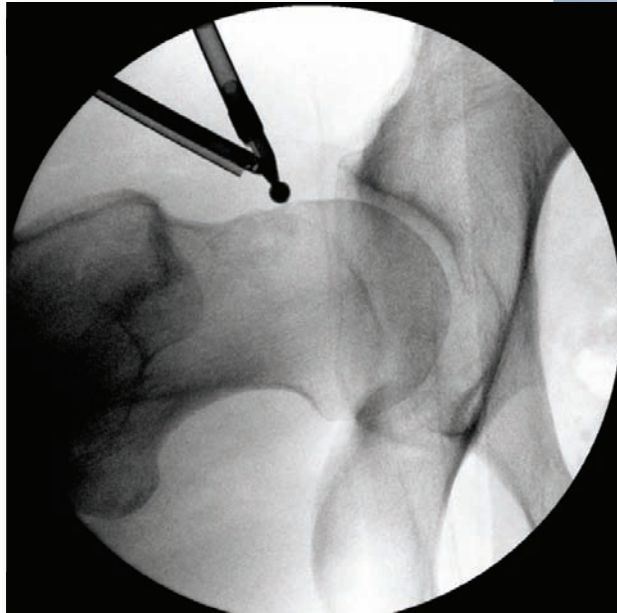


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**SURGICAL
Technique
Guide**

Struan H Coleman MD, PhD

THE AUTHOR

Struan H. Coleman MD, PhD, specializes in Sports Medicine at Hospital for Special Surgery where he treats orthopedic conditions of the shoulder, hip and knee. Dr. Coleman holds a PhD in Molecular Biology from Oxford University, England and combines a clinical practice in sports medicine with basic science research in the injury and repair of musculoskeletal tissues. Dr. Coleman was an assistant doctor to the New York Giants football team during his fellowship and is currently the head team physician for the New York Mets.

Dr. Coleman has trained using the latest arthroscopic techniques, including all-arthroscopic rotator cuff repairs, multi-ligament knee reconstructions and arthroscopy of the hip for younger patients with hip pathology. Dr. Coleman is currently the director of research for the Center for Hip Pain and Preservation at the Hospital for Special Surgery.

INTRODUCTION

Over the last decade, with improved techniques and equipment, there has been a dramatic increase in the number of arthroscopic hip procedures performed worldwide to treat a variety of pathologies. The hip presents a unique challenge to arthroscopic entry in that it is a highly constrained ball and socket joint with a relatively thick soft tissue envelope comprised of both muscle and a strong capsule. Thus, 25 to 50 lbs of traction is required to distract the hip joint, making the setup for hip arthroscopy more time consuming than for other joints. Both a 30 degree and a 70 degree arthroscope are used during hip arthroscopy. Fluoroscopy is used to both confirm that adequate traction of the hip joint has been achieved and to guide accurate portal placement. Fluoroscopy is also used to determine the amount of bony resection often required to fully treat the underlying condition of the hip. Additionally, a capsulotomy can be helpful to allow more maneuverability during the procedure; a capsular repair following a capsulotomy, or, in some cases, a capsular placcation, may be performed to prevent or treat hip instability. Using a variety of different portals, with and without traction, a surgeon can gain access to the three different compartments of the hip: central, peripheral and peri-trochanteric. Finally, careful post-operative care, including bracing, early motion and a clearly defined rehabilitation program, is critical to achieving a good outcome following arthroscopy of the hip.

As always, patient selection is critical to a good surgical outcome when performing arthroscopy of the hip, as certain conditions, such as dysplasia, femoral anteversion, coxa valga and osteoarthritis, are relative contraindications to the procedure. A careful history, a thorough physical exam and good imaging studies are essential to making an accurate diagnosis. Back pathology and soft tissue conditions, such as athletic pubalgia, must be considered and excluded. Selective injections can be used to differentiate between intra- and extra-articular pathology.

HIP ARTHROSCOPY

HISTORY

A careful history must be performed including:

Injury history

Sport participation

Duration of symptoms

Location of symptoms: “C-sign”

Description of pain: dull or sharp

What relieves the pain

What makes pain worse

Catching or locking

Snapping or popping

Instability

Subjective questionnaires

Objective questionnaires

PHYSICAL EXAM

A physical exam of the patient should be performed with the patient ambulating, standing, sitting and lying supine and prone.

The following should be assessed:

Gait

Palpation

Passive and active range of motion

Strength

Specific tests:

Thomas test

(hip flexion contracture)

Impingement test

(hip flexion/adduction/internal rotation)

McCarthy test

(hip flexion to extension listening for click)

FABER

(sacroiliac joint pathology)

Ober test

(iliotibial band tightness)

Log roll

(intra-articular pathology)

IMAGING

X-RAY EXAMINATION

AP pelvis with coccyx 2 cm above pubic symphysis

Extended neck lateral

(greater trochanter out of the way)

False profile view

(anterior coverage)

Measurements:

Center-edge angle

(normal 25–40 degrees)

Acetabular index

(normal 4–10 degrees)

Femoral neck-shaft angle

(normal 120–140 degrees)

Alpha angle

(<40 degrees is normal; >55 degrees is Cam impingement;)

SIGNS

Cross-over sign (acetabular retroversion)

MR IMAGING

Specific cartilage sequences

With or without gadolinium

CT IMAGING

Three dimensional reconstruction

DISORDERS TREATABLE WITH HIP ARTHROSCOPY

INTRA-ARTICULAR DISORDERS

Labral tears
Cartilage defects
Avascular necrosis
Ligament teres tears
Pincer impingement
Cam impingement
Loose bodies
Foreign bodies/broken hardware
Synovitis/infection
PVNS

EXTRA-ARTICULAR DISORDERS

Iliopsoas tendon snapping
Iliotibial band snapping
Trochanteric bursitis
Gluteus medius/minimus tears
Adhesive capsulitis
Capsular instability

DISORDERS NOT TREATABLE WITH HIP ARTHROSCOPY

Posterior impingement
Hip dysplasia
Coxa valgus
Femoral anteversion
Global osteoarthritis

MUST RULE OUT

Femoral neck stress fracture
Hernia
Athletic pubalgia
Osteitis pubis
Back pathology
Piriformis syndrome
Nerve compression

OPERATIVE TECHNIQUE

THE SET-UP

Hip arthroscopy can be performed in the lateral or supine position. I prefer the supine position as it is less time consuming. The patient is placed on a well padded radiolucent table. Both feet are well padded and placed in foot holders. A large, well padded post is placed in the groin and lateralized to the operative side; in men, care is taken to ensure that the genitalia are out of the way of the post. Both legs are placed in a fully extended position with 45 degrees of abduction. Gentle traction is applied to both legs equally to stabilize the pelvis. The arm on the operative side is well padded and secured across the patient's chest; the other arm is placed on an arm board. The C arm is brought in from the non-operative side perpendicular or oblique to the patient and positioned directly over the operative hip. The fluoroscopic monitor is placed below the patient's feet; the arthroscopic tower, adjustable pump and equipment control boxes are placed on the non-operative side, distal to the C-arm (Figure 1: Operating Room).

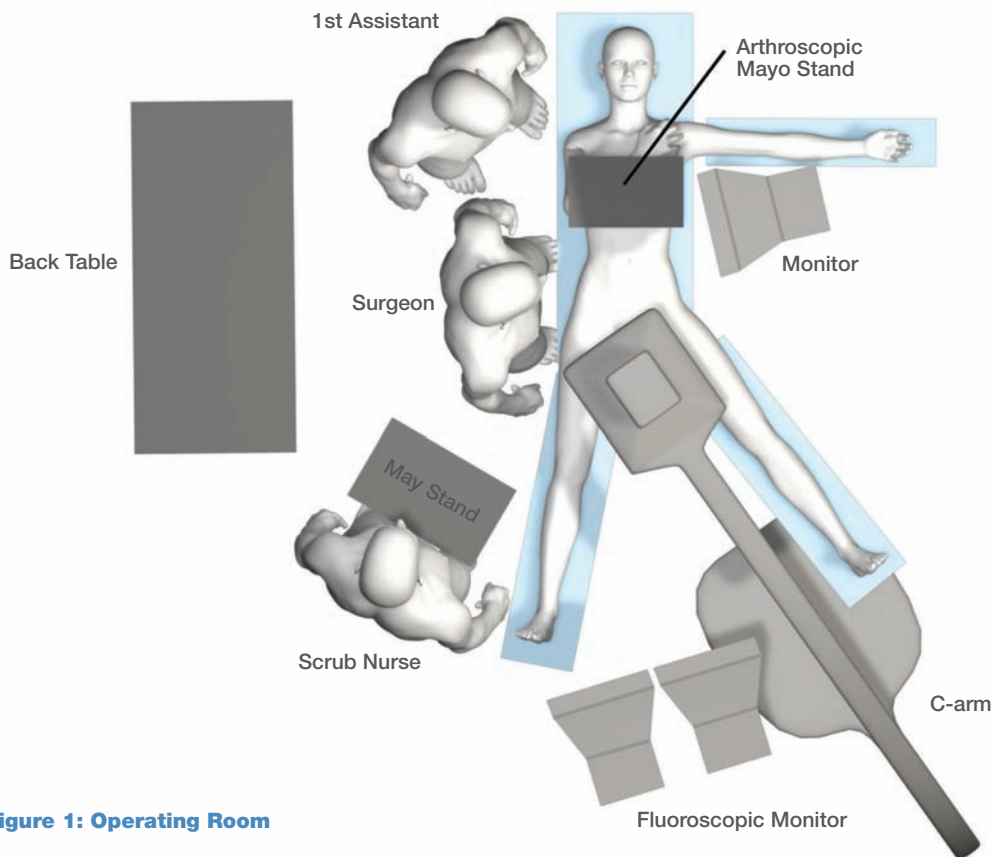


Figure 1: Operating Room

25 to 50 lbs of traction is then applied and the hip is slowly distracted until a vacuum phenomenon is observed and there is at least 10 mm of distance between the femoral head and the acetabulum. On some tables, it is possible to adduct the operative hip in order to distract the joint and achieve 25 to 50 lbs of traction.

Traction is relaxed and the hip is prepped and draped in such a way that the C-arm can be brought directly over the drape. Traction of the hip joint is re-established and confirmed with fluoroscopy. A marking pen is used to mark the ASIS and the greater trochanter. A longitudinal line is drawn from the ASIS and running distally; no portals no portals should be established medial to this line. In some patients, it may not be possible to achieve the desired joint distraction with the initial traction; in these patients, a spinal needle is introduced at the outset of the procedure in order to facilitate distraction.

INSTRUMENTATION

Long 30 degree and 70 degree arthroscopic lenses on a standard high definition camera are used during hip arthroscopy. All instrumentation should be longer than that used for standard arthroscopy of the knee and shoulder (190–220 mm). I use opaque cannulas measuring between 4.0 mm and 5.5 mm in diameter and 5 inches in length. Insertion devices are tapered to avoid scuffing the articular cartilage and are cannulated in order to pass guide wires. A slotted cannula can also be used to facilitate the introduction of larger instruments. A clear screw-in cannula is utilized for anchor placement and knot tying. A curved shaver blade and flexible heating probes are used to better navigate the constrained space of the hip joint. (Figure 2: Instrument Set)



Figure 2: Instrument Set

ESTABLISHING PORTALS

Portals are established using a 6-inch, 15-gauge spinal needle that is passed into the joint using fluoroscopic guidance and, with the exception of the initial portal, direct visualization. A nitinol guide wire is then placed through the spinal needle and left in place while the spinal needle is removed. An 11 or 15 blade is then used to make a superficial stab incision around the guide wire. A cannula with a cannulated obturator is then passed over the guide wire using a twisting motion with gentle pressure. Care is taken not to bend the guide wire while introducing the cannula as a guide wire can break. Stryker's Screwdriver Handle can be used for leverage and assist in not bending guide wire. Once the cannula is in the desired position, the trochar and the wire are removed and the cannula is then available for use. (Figure 3: Establishing Portals)

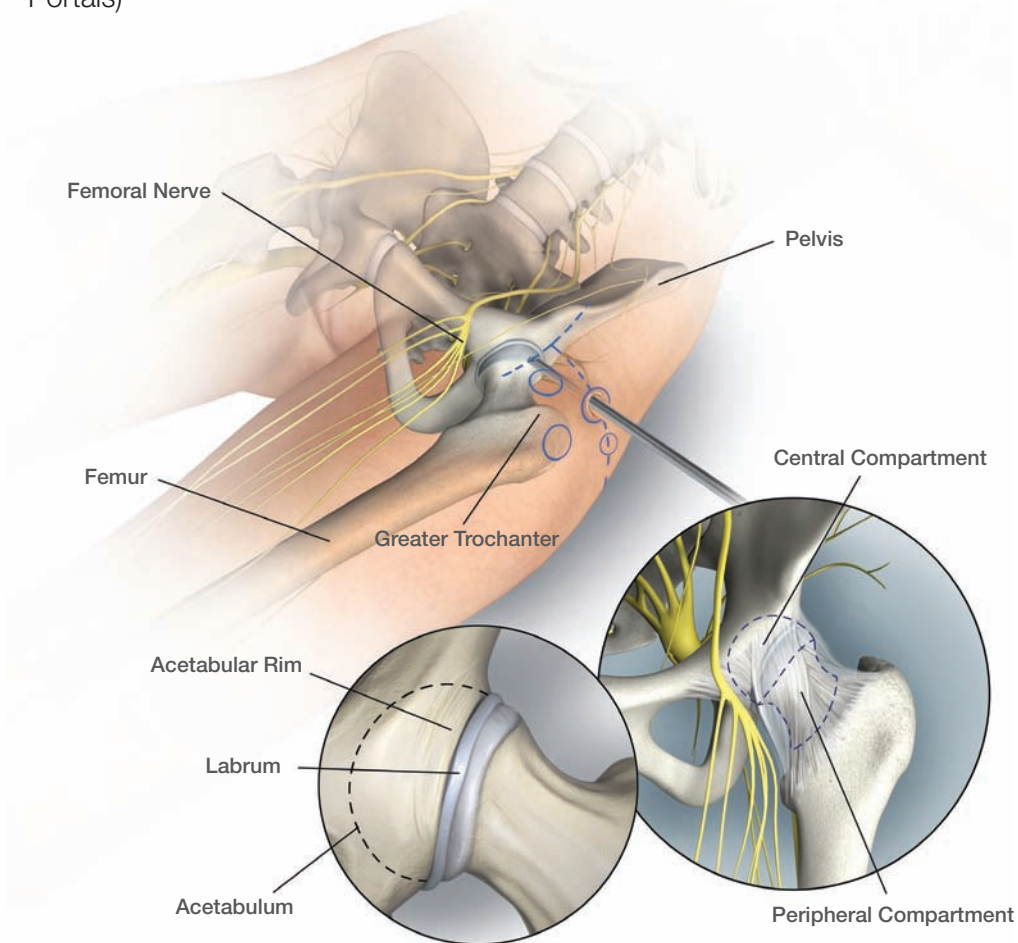


Figure 3: Establishing Portals

SPECIFIC PORTALS

An anterior peri-trochanteric portal or anterolateral portal, is used to gain initial access to the hip joint. The portal is created 1 cm proximal and 1 cm anterior to the tip of the greater trochanter. The spinal needle is introduced through the lateral hip capsule and should sit 2–3 mm above the femoral head and below the lateral lip of the acetabulum on the fluoroscopic image.

A 5.0 mm cannula is then introduced through the anterolateral portal and the camera with a 70 degree lens is brought into the joint. The high flow pump is then started to facilitate visualization of the joint. The remainder of the portals are created under direct visualization looking through the anterolateral portal. The **anterior portal** is created directly anterior to the anterolateral portal at a point that intersects the line running distally from the ASIS. The 70 degree arthroscope is positioned to observe the anterior triangle which is comprised of the anterior labrum, the anterior capsule and the femoral head. The spinal needle is directed 45 degrees cephalad and 30 degrees towards the midline and is brought into the joint under direct visualization. A guide wire is introduced and a 5.0 mm or 5.5 mm cannula is introduced into the joint. The anterior and the anterolateral portals are the main portals used for diagnosing and treating pathology within the central compartment.

A posterior peri-trochanteric portal, or the **posterolateral portal**, can be established with a spinal needle or a cannula to facilitate outflow. The posterolateral portal can also be used to remove loose bodies and to address posterior labral pathology.

An **accessory anterolateral portal** is established 3 to 5 cm distal to the anterolateral portal and is used at various stages of the procedure, particularly when addressing pathology in the peripheral and peri-trochanteric compartments.

The **midanterolateral portal** is established midway between the anterolateral portal and the anterior portal and usually 2 cm distal to both portals. The midanterolateral portal is used to establish a better angle for instrumentation used for labral repair or microfracture of the acetabulum. The midanterolateral portal can also be used for debridement of the cam lesion of the femoral neck. (Figure 4: Specific Portals)

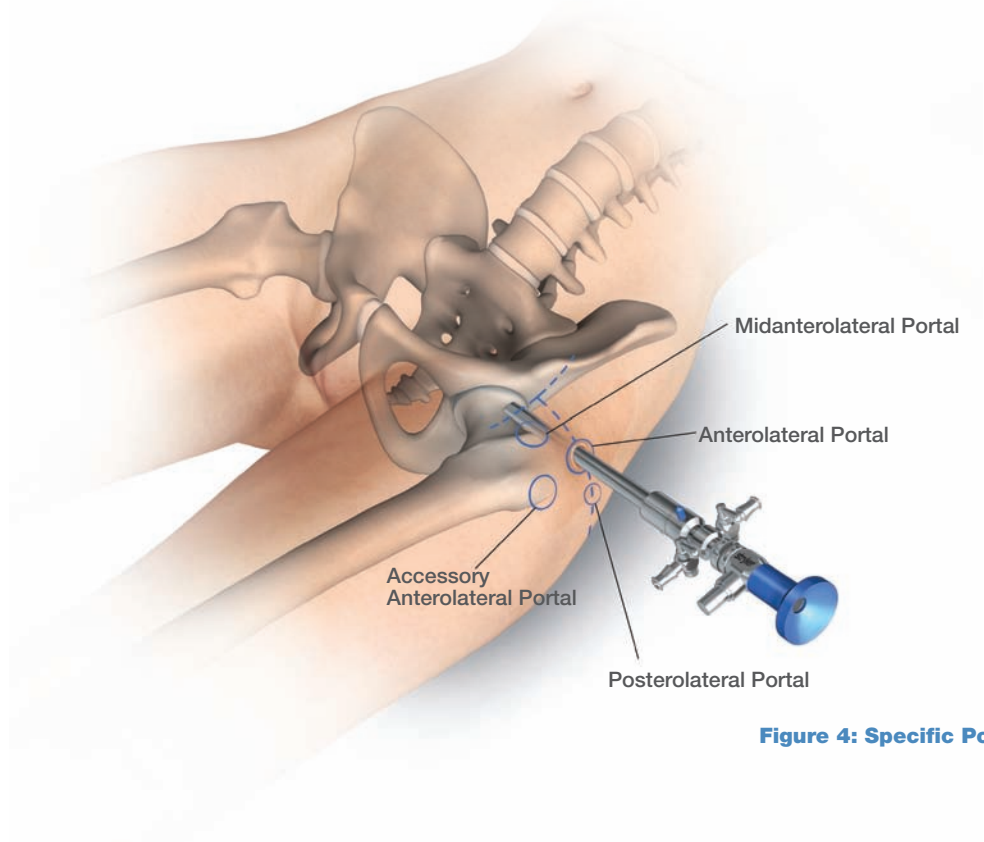


Figure 4: Specific Portals

CAPSULOTOMY

A capsulotomy between the anterior and the anterolateral portals can be performed. The 70 degree arthroscope is placed through the anterior portal and a long handled knife is introduced under direct visualization through the anterolateral portal. The capsule is then cut moving the knife in the direction of the anterior portal. The camera is switched to the anterolateral portal and the capsulotomy is completed with the knife in the anterior portal.

PINCER LESION AND LABRAL REFIXATION

A pincer lesion, or over-coverage of the acetabulum, can be diagnosed on plain x-rays (a cross-over sign) and on CT scan. The pincer lesion usually occurs from the 9 o'clock to the 12 o'clock position. The labrum is usually hypertrophic and may or may not be torn. In order to properly address the acetabular rim, the labrum may need to be detached sharply from the acetabulum using a long handled knife. The camera is then moved between the anterolateral and anterior portals in order to fully visualize the pincer lesion. The capsule is elevated proximally to the level of the inferior iliac spine; the inferior iliac spine is a useful landmark. A 5.5 mm bur is used to resect the rim of the acetabulum to the level of the articular cartilage; the bur is also moved between the anterior and anterolateral portals. Prior to rim resection, the center-edge angle should be carefully noted. Care is taken to avoid over-resection of the acetabulum, resulting in insufficient coverage. Fluoroscopy is used to guide the amount of resection of the rim of the acetabulum. (Figure 5: Pincer Lesion)

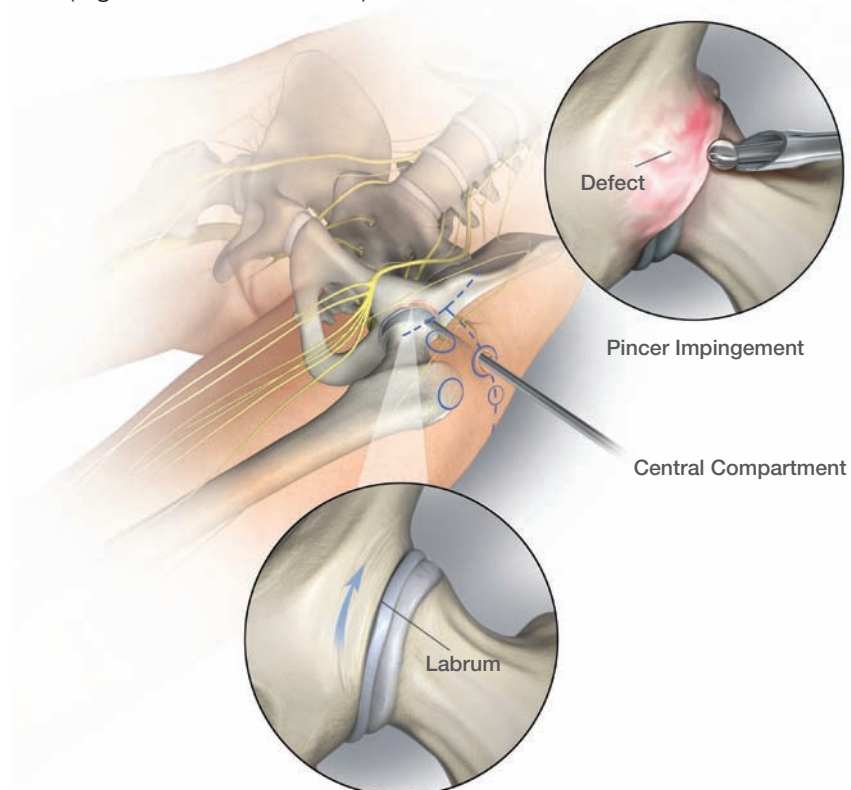


Figure 5: Pincer Lesion

Pincer Impingement Removed

Once the acetabular rim has been sufficiently resected, the labrum is reattached to the acetabulum. The camera is again moved between the anterior and anterolateral portals for complete visualization of the acetabular rim. A clear, screw-in cannula is placed in the midanterolateral portal in order to place anchors as close to the cartilage surface as possible without violating the articular cartilage; the use of a curved delivery system with a flexible drill and flexible introducer for the anchors can be used to achieve this goal.

A penetrator is used to pass one limb of the suture anchor between the labrum and the acetabulum; the penetrator is then passed through the labrum and captures the suture, such that the suture is placed in a vertical mattress fashion. Care is taken not to evert the labrum such that the seal between the labrum and the convex femoral head is lost.

Procedural Pearls: The Stryker Twinloop FLEX system comes with five drill guide options (0°, 12°, 12°RM, 25°, 25°RM). The 0°, 12°RM, 25°RM are recommend for acetabulum labral repairs. Arrows at the distal end of the drill guide should be pointing away from the articulating cartilage to ensure the flexible drill and anchors are guided away from the articulating surface. Portal placement will depend on surgeon preference. Once drill guide is set in place, drill should be introduced making sure to not start drill until 1 mm away from acetabulum bone. (Figure 6) Drill should be run in one fluid motion

until positive stop is reached. Flexible anchor is now introduced into drill guide; anchor should be seated in pilot hole before malleting anchor into place. (Figure 7) Laser lines on the proximal end of the inserter should lineup with the proximal end of the drill guide while at the same time the laser lines on the distal end of the inserter will lineup with the laser lines on the distal end of the drill guide. Once anchor is inserted inserter can now be removed, paying careful attention to pull straight back on the inserter handle (never use guide to remove inserter or twist inserter handle). (Figure 8)

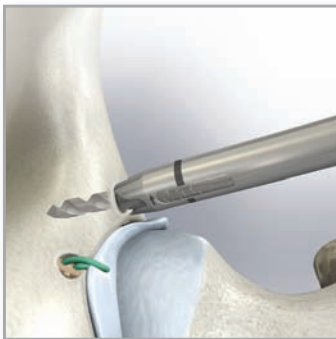


Figure 6

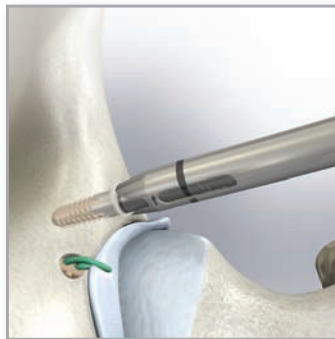


Figure 7



Figure 8

PERIPHERAL COMPARTMENT

Once the work in the central compartment is completed, the traction is released and the hip is flexed 30 to 40 degrees. The camera is then introduced into the anterior portal and the accessory anterolateral portal is created. A long handled knife is used to create a longitudinal T cut in the capsule. A switching stick is then placed into the anterolateral portal and the lateral capsule is retracted. In this way, it is possible to visualize the femoral neck from the medial retinacular vessels to the lateral retinacular vessels. The cam lesion can be observed by flexing the hip and internally and externally rotating. A pre-operative assessment of the cam lesion is also made using a 3D CT scan.

A 5.5 mm bur is used to fully resect the cam lesion; the fluoroscope is used to obtain a lateral view of the femoral neck in order to guide the appropriate amount of bony resection. Care should be taken not to over-resect the femoral neck.

Finally, the leg is brought into full extension in order to observe the lateral corner of the femoral neck. This corner is carefully contoured, paying close attention to the position of the lateral retinacular vessels. A final AP image is obtained with the C-arm in order to confirm that the resection of the femoral neck lesion is complete. The range of motion of the hip flexed to 90 degrees is then tested in order to confirm an improvement in internal rotation. (Figure 9: CAM Lesion)

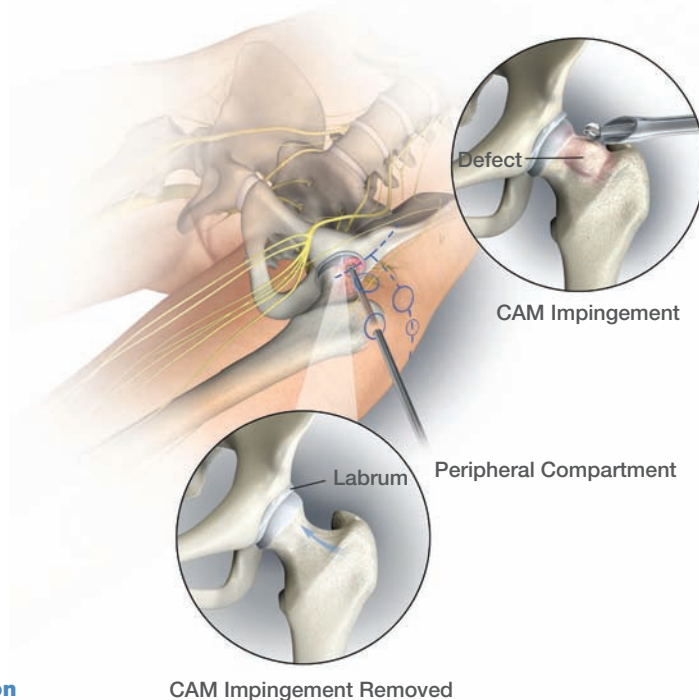


Figure 9: CAM Lesion

POSTOPERATIVE CARE

A post-operative abduction brace is used for some patients; all patients are partial weight bearing and begin early passive hip motion. A regimented post operative rehabilitation program is initiated in the immediate post-operative period.



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