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Research Article

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Hip Arthroscopic Portals: A New Approach through Accessory Portals Established Within 3cm around Anterolateral Portal

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Abstract

Background: *This new technique an approach through accessory portals established within 3cm around anterolateral portal has more advantageous aspect than any other approach taken during hip arthroscopy. Through this new approach injury to labrum, articular cartilage, neurovascular structures is avoided completely along with that this new approach makes the procedure easy and convenient.*

Aim: *To prove that accessory portals established within 3cm around anterolateral portal makes the procedure and instrumentation facilitation easy and injury to anatomical structure and NVS can be avoided completely.*

Methods and materials: *Anterolateral portal being the safest is established first and in relation to it within 3cm accessory portals are established as many as per need.*

Results: *Every year an average of 40 patients undergo hip arthroscopy and in all cases our approach is through this new technique of accessory portals established within 3cm around anterolateral portal.*

Conclusion: *The accessory portals we establish not only makes the hip arthroscopy easy but also help us avoid use of fluoroscopy and prolonged traction. The visualization within the hip joint of anatomical structure is more precise and accurate, and injury to anatomical structures and NVS is avoided completely.*

Keywords: Hip arthroscopy, Anterolateral portal, Accessory portals, 3cm, Injury.

Introduction

Hip Arthroscopic Portals, establishing is very crucial to successful outcome of surgery. Risk of iatrogenic injury to neurovascular structure is 3-4 fold higher, during establishing Hip Arthroscopic Portals in comparison to shoulder, knee, elbow, and ankle portals. With experienced hands and thorough knowledge of anatomy while establishing Hip Arthroscpic Portals, and with high tech instrumentation risk of iatrogenic injury can be reduced. Hip arthroscopy has been means to avoid open hip surgery as it is used both for diagnosis and treatment and the outcome has proven to be very significant. It is vital to have accurate knowledge of the hip anatomy and how to establish common hip portals and accessory hip portals in order to maximize clinical outcomes. An approach through accessory portals makes the hip arthroscopy easier.

Definition

HIP JOINT

The head of the femur articulates with the acetabulum of the hip to form hip joint. It's a multiaxial ball and socket type of joint.

Nature- Synovial joint.

Movements- flexion, extension, internal and external rotation, adduction and abduction, medial and lateral rotation.

Anatomy

The head of the femur and acetabulum is covered with articular cartilage while fovea is not. Articular cartilage that covers femoral head and acetabulum is relatively thin compared to that of knee. The acetabular labrum is a triangular fibrocartilage that attaches to the rim of the acetabulum at the articular cartilage edge, whereas the transverse acetabular ligaments attaches to the rim at the inferiormost region of the acetabulum. External fibrous layer and internal synovial membrane forms articular capsule of the hip joint and attaches

directly to the bony acetabular rim. Iliofemoral, pubofemoral, and ischiofemoral ligaments constitute external fibrous layer which holds the head of the femur into the acetabulum. Extracapsular ligamentum teres travels from the central acetabulum to the foveal portion of the femoral head. Medial and lateral circumflex femoral arteries are the major arteries supplying hip joint and also branches into retinacular arteries to supply the head and neck of the femur. The artery to the head of femur also supplies blood and transverses the ligamentum teres. Since vessels only penetrate the outermost layer of the capsular surface, the labrum has a relatively low healing potential. The lateral femoral cutaneous nerve, femoral nerve, superior gluteal nerve, sciatic nerve, and the ascending branch of the lateral circumflex femoral artery are the germane extra-articular neurovascular structures nearest to the hip joint. The lateral femoral cutaneous nerve supplies the skin sensation of the lateral thigh which is formed from the posterior division of the L2 and L3 nerve roots. It travels from the pelvis just distal and medial to the ASIS and divides into more then three branches distal to ASIS. The femoral nerve and artery run together with the femoral vein. They pass under the most medial but being mostly superficial at the level of hip. The femoral nerve is 3.2 cm from the anterior hip portal, but slightly closer at the level of the articular capsule. The superior gluteal nerve formed from the posterior divisions of L4, L5, S1, passes posterior and lateral to the obturator internus and piriformis muscles, then between the gluteus medius and minimus muscles approximately 4cm proximal to the hip joint. The sciatic nerve formed when nerves from L4 to S3 come together, passes anterior and inferior to the piriformis and posterior to the deep hip external rotators to supply the hamstrings and lower leg, foot, and ankle. The sciatic nerve is 2.9 cm from the posterior hip arthroscopy portal, but is closest at the level of the capsule. Externally rotating or flexing the hip prior to making the posterior portal brings the nerve dangerously close to the arthroscope. The lateral femoral circumflex artery is a branch of the femoral artery that along with the medial circumflex artery forms a vascular ring about the neck of the femur, providing arteriole branches to supply the femoral head. The lateral femoral circumflex artery is 3.7 cm inferior to the anterior arthroscopy portal, it is much closer at the level of the capsular entry of the arthroscope.

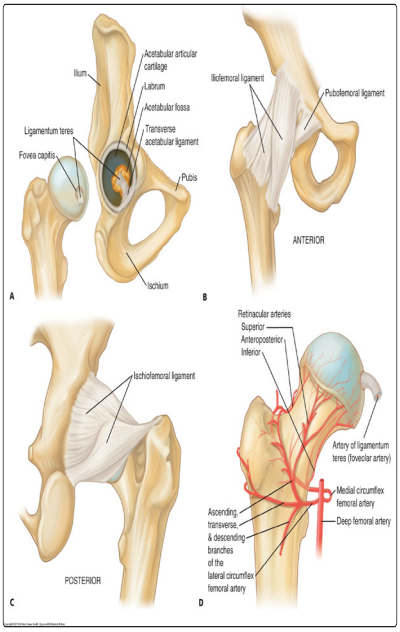
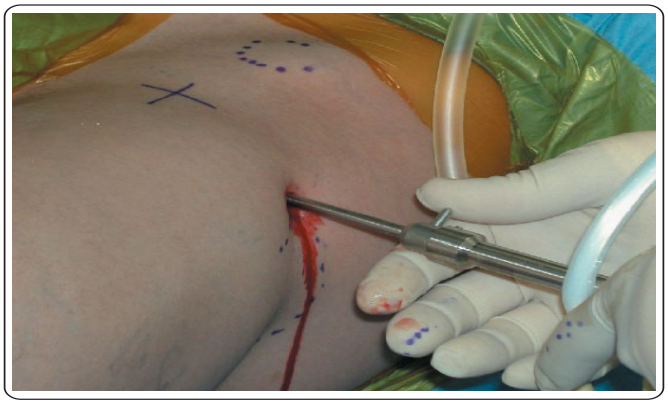
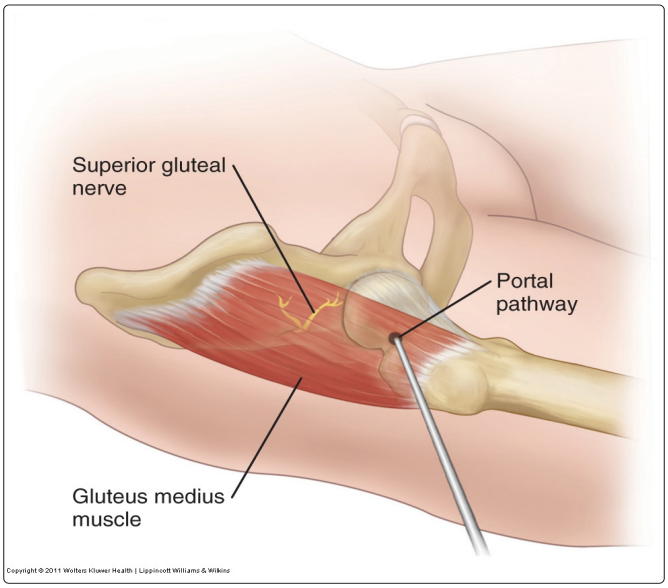


Figure 1: Portals

1. Anterolateral Portal

It's created first because it is the safest, and posing least risk of injury to femoral and sciatic neurovascular structures as being most distant from anterolateral portal. The portal penetrates the gluteus medius muscle and is positioned directly over the superior aspect of the greater trochanter at its anterior margin to enter the lateral capsule at its anterior margin. It is important to introduce the spinal needle in coronal plane by keeping it parallel to the floor while creating the anterolateral portal. Care should be taken to avoid damage to the labrum or articular surfaces as the cannula is positioned into the intra-articular space. The portal provides visualization of most of the acetabular cartilage labrum, and weight bearing femoral head within the central compartment, as well as visualization of the peripheral compartment, such as the non-weight bearing femoral head, the anterior neck, the anterior intrinsic capsular folds, and the synovial tissues beneath the zona orbicularis and the anterior labrum. The superior gluteal nerve is the closest neurovascular structure and runs 4.4 cm posterior to the portal.

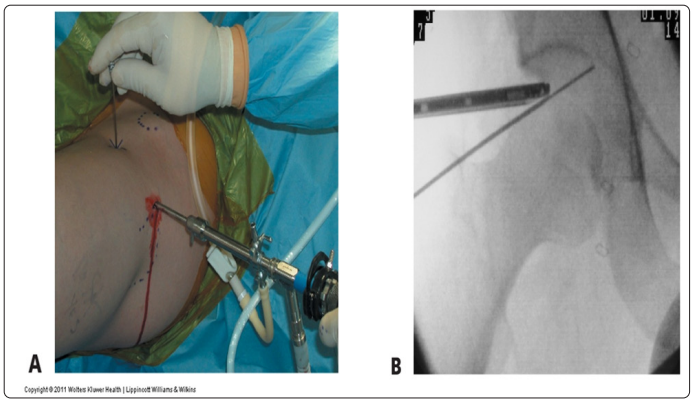


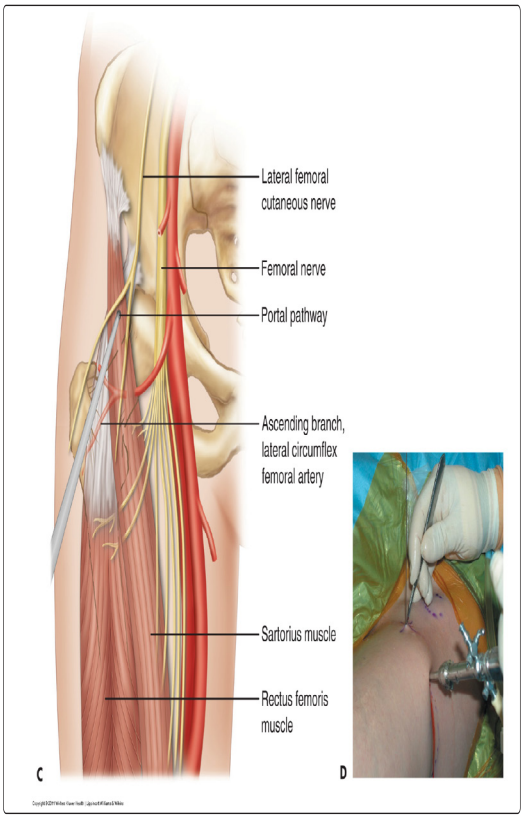


2. Anterior Portal

Arthroscopic visualization from the anterolateral portal and fluoroscopy facilitate correct portal placement, helping to avoid damage to the labrum or articular surfaces. The anterior portal enters at the junction of a line drawn distally from ASIS and a transverse line across the superior margin of the greater trochanter. The portal penetrates the Sartorious and Rectus femoris muscles as it is directed 45 degrees cephalad and 30 degrees medially to enter the anterior

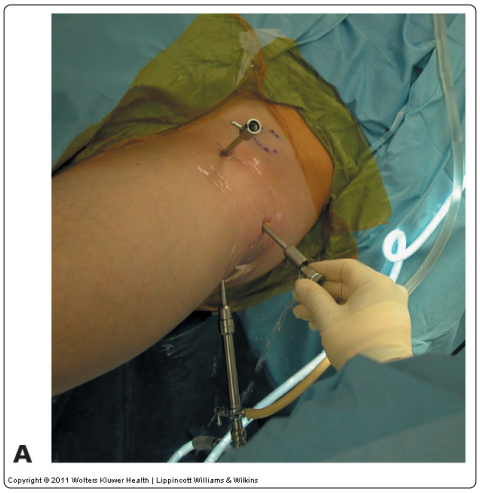
capsule. As the cannulated obturator enters the joint space, it should be kept off the articular surface and directed underneath the acetabular labrum. The anterior aspect of the joint, the superior retinacular fold, the ligamentum teres, and the lateral labrum are visualized through this portal. Directing movement medially, avoiding deep cuts at the entry site, not using vigorous instrumentation, and using a 70-degree arthroscope at the anterolateral portal to guide entry, injury to the branches of the lateral femoral cutaneous can be minimized. This femoral nerve is 3.2 medial and runs tangential to the portal. The ascending branch of the lateral femoral circumflex artery is 3.7 cm inferior to the portal, but terminal branches may be within millimiters of the portal at the capsular level.

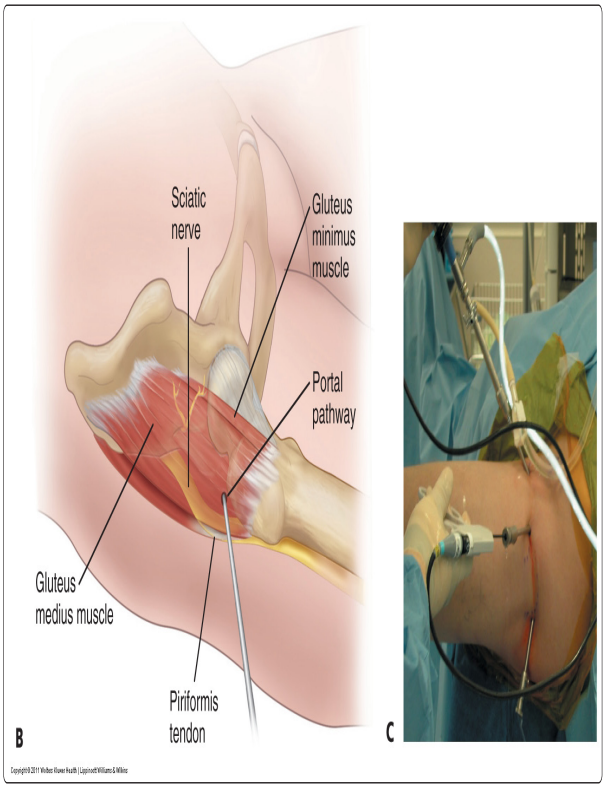




3. Posterolateral Portal

The posterolateral portal is established after the anterior portal. Arthroscopic visualization and fluoroscopy are used to guide portal placement. The portal penetrates the gluteus medius and minimus muscles and is directed over the superior aspect of the greater trochanter at its posterior border to enter the lateral capsule at its posterior margin. The portal is superior and anterior to the piriformis. The posterior aspect of the femoral head, the posterior labrum, the posterior capsule, and the inferior edge of the ischiofemoral ligament are visualized through this portal. The sciatic nerve is 2.9 cm posterior to the portal at the level of the capsule. It is important to maintain the leg in neutral rotation and extension, and to introduce the spinal needle horizontally to avoid injury to sciatic injury.

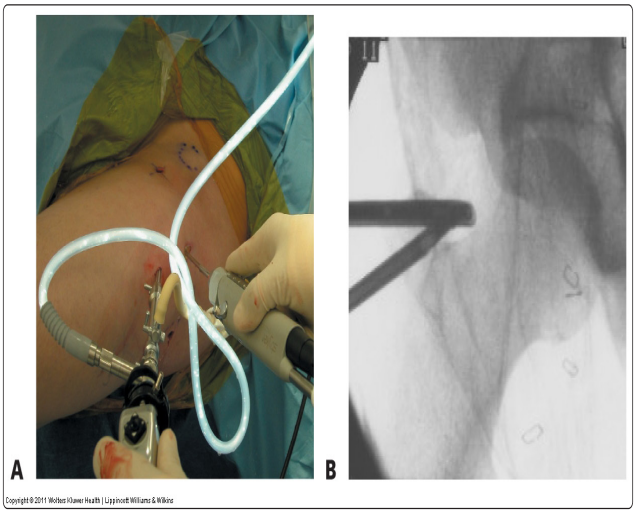




4. Distal Anterolateral Portal

To access the peripheral compartment-femoral neck region, two portals are used after traction is removed from the extremity. Peripheral compartment arthroscopy can be done in hip flexion to relax the anterior capsule or in neutral flexion extension. The anterolateral portal is used as one portal. A distal anterolateral portal is established 3 to 5 cm distal to the anterolateral portal, just anterior to the lateral aspect of the proximal femoral shaft and neck. The portal penetrates the gluteus meduis muscle and upper vastus

lateralis. The spinal needle should enter the peripheral compartment laterally. The guidewire is brought through the spinal needle and can be gently advanced to the medial capsule—the easy passage until the medial capsule is reached helpsconfirm that one is in the peripheral compartment. The skin incision is made, and the trocar and the sheath are passed over the guide wire. The heath and guide wire are exchanged for the arthroscope or instrumentation. Arthroscopy and fluoroscopy can be used together to perform surgery in the peripheral compartment.

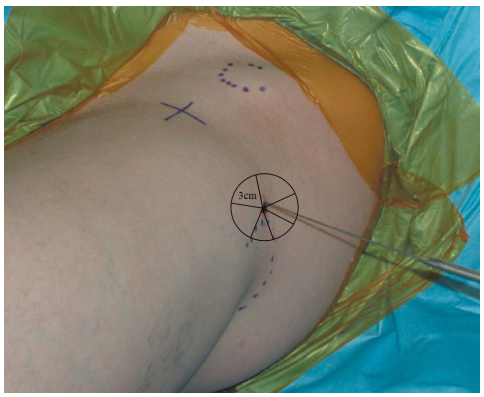


Accessory Portals

It is established within 3cm around anterolateral portal. It can be established as many as per need. The visualization of both central and peripheral compartment is achieved easily and approach through accessory portal is exact and direct over specified anatomical structure during hip arthroscopy.

Significance of Accessory Portals

The accessory portals established within 3cm in relation to anterolateral portal makes the procedure (hip arthroscopy) easy and accessible, use of fluoroscopy is avoided in our setup helps reduce procedure time, arthroscope through ALP and instrumentation through accessory portal movement can be used in close co-ordination as of being in close proximity enhancing accuracy of the procedure and releasing articular capsule can be achieved easily without endangering the anatomical structure.



Aim of the Study

The aim and objective of this study is to prove that accessory portals established within 3cm around anterolateral portal makes the procedure and instrumentation facilitation easy and injury to anatomical structures and NVS can be avoided completely.

Method and Material

The anterolateral portal is the working portal and accessory portals established within 3cm around anterolalateral portal serves for instrument facilitation. Anterolateral portal being the safest is established first and in relation to it within 3cm accessory portals are established as many as per need. The accessory portals is established medially, laterally, superior, inferior to anterolateral portal but with in 3cm around it and in the 3cm radius of anterolateral portal no major NVS are at risk and all the important anatomical structures can be visualized and managed through accessory portals.

Results

Every year an average of 40 patients undergo hip arthroscopy and in all cases our approach is through this new technique of accessory portals established within 3cm around anterolateral portal. The outcome has proven to be very satisfactory and complication rate at our department from hip arthroscopy following our new approach through accessory portal has significantly reduced. The procedure time does not exceed over 40 minutes in most cases and traction time does not exceed over 20 minutes by this approach which has helped us avoid complications like traction neuropraxia, fluid extravasation into peritoneum. The use of fluoroscopy is also avoided as both anterolateral portal and accessory portal are in close proximity and under scope guidance and visualization accessory portal is established avoiding any damage to labrum and articular cartilage completely.

Discussion

The approach to hip arthroscopy through this new technique of accessory portals introduced by my Professor Dr. Xu Jian Zhong has proven to be very significant. In world may be only few surgeons perform hip arthroscopy through this technique and in China my professor is the first known person who introduced this technique at our 1st affiliated hospital of Zhengzhou University and since then were are successfully implementing this approach during hip arthroscopy, which has helped us reduce complication rate to very low rate, avoid prolonged traction, avoid use of fluroscopy, reduce procedure time and above all through this approach it makes the hip arthroscopy procedure very convenient and easy for surgeon.

In all other literature the use of fluroscopy is stated while establishing any portals but we in our set up don't use fluroscopy since anterolateral portal is established first being the safest after that under the scope visualization we establish accessory portals avoiding labrum or chondral damage, also avoiding damage or injury to neurovascular structures as none are endangered around 3cm to anterolateral portal. The accessory portals established within 3cm around anterolateral portal also provides enough articular capsule loosening that there is no necessary to release the capsule with an arthroscopic knife avoiding a chance of iatrogenic injury to anatomical structures within the hip joint. This process of capsule loosening also contribute to joint space expansion giving more space for instrumentation facilitation and reducing traction time as hip distraction is achieved in short time of traction avoiding traction neuropraxia.

As being in close proximity of eachother the scope and instrumentation movement is used in co-ordination and visualization of anatomical structures is very clear, peripheral and central compartment and

peritrochanteric space can be accessed easily through this new technique, proving to be time efficinet and making handling of intrumentation facilitation easy and avoiding the risk of injury to structures and nerves and vessels.

So using this approach of accessory portals in relation to anterolateral portal has more significant importance than any other approach during hip arthroscopy. In our department complications like traction neuropraxia, direct injury to neurovascular structures, iatrogenic injury to labrum or chondral cartilage, fluid extravasation are never seen as those complications are related to prolonged procedure time or poor visualization or inappropriate co-ordination. We suggest all orthopaedic surgeons who perform hip arthroscopy to use this approach (establish accessory portals within 3cm around anterolateral portal) due to it's advangates over other approach.

Conclusion

The accessory portals we establish not only makes the hip arthroscopy easy but also help us avoid use of fluoroscopy and prolonged traction. The visualization within the hip joint of anatomical structure is more precise and accurate, and injury to anatomical structures and NVS is avoided completely [1-39].

Acknowledgement

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