Introduction

The direct lateral approach provides a number of distinct advantages over the others approaches most commonly used. It allows for excellent exposure of the acetabulum and femur with the option for extension in revision and complex primary cases. The advantages of the direct lateral approach include: preservation of the posterior capsule, a dislocation rate <1% and a low incidence of sciatic nerve injury. Its main drawbacks are a reported increased risk of heterotopic ossification and superior gluteal nerve injury with resultant abductor weakness and limp.

Evolution of the Lateral Approach

The direct lateral approach and numerous modifications have become popular since the 1982 publication by Hardinge; the technique combined in a reproducible manner specific technical points of exposures described by Kocher, McFarland and Osborne, and Bauer. Hardinge described a gluteal sparing technique that splits the muscle anterior and inferior, preserving the proximal insertion. The Hardinge technique did not describe handling of the gluteus minimus muscle detachment and reattachment to the trochanter. A modification of the Hardinge direct lateral approach used and taught by the senior author for the past 15 years is subsequently described. The modifications limit disruption of the abductor mechanism, preserve the tissue integrity, allow wide femoral and acetabular exposure and result in an anatomic tissue repair. The modified direct lateral approach is appropriate for all primary and revision cases, and can be easily extended in complicated situations. Limited skin incisions less than 10 cm can be performed in thin patients, but difficulties can arise in muscular or obese individuals, given the fact that this is a muscle-splitting procedure.

Technique

Operating Room

No specific modifications to the operative setting are needed for the procedure. A beanbag or pegboard positioner is used on a standard operating-room table. The use of laminar flow and surgical hoods is dependent on the surgeon's preference and availability.

Instruments

A standard hip tray including a variety of sharp and blunt Hohmann retractors, Cobra retractors, and a Charnley self-retractor are preferred for this procedure. In general, no gross modifications to the oscillating saw, acetabular reamers or broach handles are necessary to perform this approach, although offset acetabular reamer handles and acetabular insertors are helpful.

Positioning

This approach is performed in a lateral decubitus position, and is dependant on knowledge of the patient and the pelvic orientation prior to sterile preparation and
dрапинг. Установка и стабильность таза критичны для выравнивания, и они могут быть обеспечены с помощью различных методов стабилизации, включая, но не ограничиваясь, палец-плиту, почечные подушки или вакуумную позиционную сумку. Палец-плита — простой и воспроизводимый метод обеспечения стабильности таза. Четыре пальца размещаются в следующем порядке:
1. затемник нижнего переднего, на уровне пубического симфиза,
2. затемник верхнего заднего, на уровне юбки-сакральной линии,
3. затемник нижнего переднего, на уровне хиазмы,
4. затемник верхнего заднего, на уровне нижнего подвздошного угла.

**Skin Incision**

Могут использоваться разнообразные методы для установления и стабилизации. Четыре пальца размещаются в следующем порядке:
1. затемник нижнего переднего, на уровне пубического симфиза,
2. затемник верхнего заднего, на уровне юбки-сакральной линии,
3. затемник нижнего переднего, на уровне хиазмы,
4. затемник верхнего заднего, на уровне нижнего подвздошного угла.

**Superficial Muscle Dissection**

После диссекции подкожных тканей, подкожная клетчатка становится доступна и разрезается вдоль направления мышц. Расстояние до большого бугра варьируется от 6-15 см, и определяется телосложением пациента; длина прямо пропорциональна глубине бугра. Прямой или криволинейный разрез, центральный на уровне большого бугра, используется (рис. 6.5). Прямая часть тянется вдоль переднего края бугра, а косая часть - вдоль переднего края крестца. При 90° гибке бедра, разрез становится прямым, и бугр должен оставаться в центре. Поперечная часть разреза, выполненная в положении гибкости бедра, открывает доступ к верхней прямой и может быть использована для последующего сшивания. Ожирение пациента улучшает доступ, уменьшает потребность в дополнительной ретракции, и ограничивает необходимость в длинном разрезе.

**Deep Muscle Dissection**

В области верхней медиальной мышцы начинается разрез на перекрест между средней и передней третью большого бугра, и продолжается вдоль направления мышцы; бугр должен оставаться в центре. Поперечная часть разреза, выполненная в положении гибкости бедра, открывает доступ к верхней прямой и может быть использована для последующего сшивания. Ожирение пациента улучшает доступ, уменьшает потребность в дополнительной ретракции, и ограничивает необходимость в длинном разрезе.
A longitudinal incision should be made through the minimus and capsule at the superior aspect of the greater trochanter, traveling vertically and superiorly in line with the muscle fibers to the posterior superior corner of the acetabulum (Fig. 6.7). It is important that this incision is properly placed since it will be critical for acetabular and femoral exposure, as well as for later repair. The minimus incision/release requires gentle retraction of the remaining anterior edge of the gluteus medius as excessive retraction can lead to heterotopic ossification within the muscle. A second capsular incision is then made horizontally along the inferior border of the minimus along the femoral neck from the trochanter to the acetabular rim. The minimus and capsule between these two splits should then be elevated off the femoral neck and reflected anteriorly. The inferior capsule can be removed in its entirety if contracted, or retained if compliant for later repair. The hip is dislocated with a combination of forward flexion and gentle external rotation. If the hip does not dislocate with gentle manipulation, then the superior capsular split and the inferior excision of the capsule should be revisited. Failure to release a contracted anterior capsule can result in a difficult dislocation and may increase the risk for fracture of the proximal femur in patients with osteoporotic bone.

**Femoral Exposure**

With firm but gentle adduction, flexion and external rotation, the head may be placed within the surgical field. Cobra retractors are then placed around the femoral neck to protect the underlying soft tissues while the neck cut is made, and the posterior impinging osteophytes are removed. Any remaining inferior capsule that is tethering the femur can be released to facilitate exposure and to prevent anterior soft-tissue impingement.

Preparation of the femoral canal can occur before or after acetabular preparation, but in our opinion is more easily performed afterwards. With the hip flexed, adducted and externally rotated, the foot and lower leg are placed in a sterile leg bag. The femoral canal is then accessible through the proximal portion of the incision (Fig. 6.8). One retractor should be placed behind the greater trochanter to keep the skin and fascia lata retracted while a second retractor is placed around the anterior portion of the neck cut to retract the psoas muscle and anterior soft tissues. The posterior retractor should be placed prior to externally rotating the femur in order to avoid inadvertent placement of the retractor on the sciatic nerve. This exposure allows the final preparation of the femur, using reamers and broaches under direct visualization.
Acetabular Exposure

Acetabular exposure is typically accomplished using a combination of Hohmann retractors. A blunt Hohmann can be placed posteriorly and inferiorly around the edge of the acetabulum just posterior to the insertion of the transverse acetabular ligament. This retractor will create leverage on the osteotomy to move the femur distally and out of the way. This maneuver is critical for acetabular exposure and works best with the leg in a slightly flexed and externally rotated position. It is important that this retractor is placed directly on bone and not posteriorly where it could potentially injure the sciatic nerve. A sharp narrow Hohmann retractor is placed beneath the minimus and capsular sleeve at the most superior position of the acetabulum between the margin of the labrum and the superior capsule. This retractor can be tapped into the ileum, freeing the assistant’s hands. If necessary, a third blunt Hohmann can be carefully placed over the anterior medial edge of the
acetabulum and retracted gently to avoid injury to the femoral nerve and artery. The labrum is excised circumferentially, and the transverse acetabular ligament is retained unless it compromises exposure or reamer access.

Acetabular reaming (Fig. 6.9) can then be undertaken in a straightforward manner under direct visualization. The retractors should not interfere with the reamer and cause an undesired deflection. After preparation of the socket, trials or final components can be placed. Orientation of the components is dependent on stable and appropriate patient positioning, performed at the start of the case, and bony landmarks (Fig. 6.10). Acetabular osteophytes should also be removed to prevent impingement; the posterior inferior osteophytes are most critical as they can create anterior instability. The cleared ischium is also an excellent landmark for proper acetabular flexion.

**Wound Closure**

Proper closure is critical for implant stability and restoration of muscular anatomy. After final hip reduction, the remaining anterior superior portion of the joint capsule and the overlying gluteus minimus muscle are re-attached to the anterior portion of the greater trochanter with trans-osseous monofilament absorbable suture (Fig. 6.11). As these are pulled and tied snug, the leg will need to be brought into slight abduction and internal rotation to take tension off the repair. The longitudinal split up the minimus and capsule should also be repaired to the remaining cuff of capsule and muscle just under the attached edge of the gluteus medius. The medius is then repaired as a separate layer by bringing the tagged corner to its anatomic position, and then suturing the cuff of tendon to the remnant on the antero-lateral trochanter (Fig. 6.12). Suturing the overlying fascia, avoiding deep stitches...
that will damage the muscle, closes the proximal split in the medius. The fascia lata, subcutaneous tissue and skin are then closed. In most cases a drain is not required.

**Challenges**

The direct lateral approach is an extremely versatile approach. It allows direct visualization of both the acetabulum and femur during preparation. It can be readily extended distally along the femur to allow for cabling, strut grafting, plating etc. as may be needed in more complex or revision cases. It has an inherently low risk of dislocation or nerve palsy. The greatest concern has been over abductor weakness, but with appropriate tissue-handling and repair of both the gluteus minimus and gluteus medius it can be avoided.

Inadequate removal of the inferior capsule as well as an inadequate longitudinal split along the superior-posterior portion of the capsule are the two biggest impediments to acetabular exposure. Retraction of the femur out of the field of the acetabulum can be particularly difficult if a portion of the inferior capsule remains. The sciatic and femoral nerves are at minimal risk as long as retractor placement is done carefully and with a good understanding of the anatomical position of these nerves.

**References**