VIDEO OF ORTHOPAEDIC TECHNIQUE

Total Hip Arthroplasty via Lateral Approach in Supine Position

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With patients becoming more affluent and progression in development of bioengineering materials, total hip arthroplasty (THA) has become popular for serious hip diseases such as aseptic necrosis of the femoral head¹, osteoarthritis of the hip², developmental dysplasia of the hip³ and failed internal fixation for femoral neck fractures⁴. There are several different approaches and positions for performing THA⁵. Generally, surgeons use a specific approach and position only because that is what they were taught. In China, nowadays most surgeons use a posterior-lateral approach with the patient in a lateral position. In our unit, we have been using a lateral approach with a supine position for THA for almost 20 years. We have found that the total time for preparation and operation is shorter than for other approaches and that the surgeons can more easily control the angle and length, thus decreasing the risk of dislocation.

Case Presentation and Surgical Procedure

A 57-year-old man presented with bilateral hip pain of 5 years duration. About 5 years previously, he had begun to experience pain, initially in the right hip and later in the left. Since then, his symptoms had gradually worsened even though he had tried many therapies in different hospitals. Before admission to our hospital, he had been diagnosed as having bilateral necrosis of the femoral heads based on his typical medical history and imaging studies. He had no comorbidities. According to Ficat's classification, his left side was stage III and right side stage IV. After establishing an accurate diagnosis and thorough assessment, THA was considered the optimal treatment for this patient.

Exposure is the most important aspect of this procedure. A longitudinal incision about 10 cm long is made with the greater trochanter as the center. Incision of the skin and subcutaneous tissue clearly exposes the iliotibial tract. To prevent liquefaction necrosis, scissors rather than an electrotome are used to incise the iliotibial tract. Two Hohman retractors are used to expose the greater trochanter and gluteus medius: one

is placed behind the greater trochanter and the other one in the gap between the gluteus medius and vastus lateralis muscles. Once the gluteus medius has been exposed, it needs to be stripped from the greater trochanter in order to make the anterior aspect of the capsule visible. One Hohman retractor is then placed above the femoral neck, another anterior to the acetabulum and a third below the femoral neck to expose the anterior aspect of the capsule. After excising the capsule and other soft tissue, the femoral neck is clearly visible. The next step is osteotomy of the femoral head. The most superior point of the greater trochanter is identified, then from this point a saw is placed perpendicular to the axis of the femoral neck and it is severed. This approach ensures that 1 cm to 1.5 cm of bone in the femoral calcar is retained above the lesser trochanter, which is optimal for this procedure. An osteotome is then placed in the resultant gap and the femoral head removed by leverage. After the head has been removed, much of the soft tissue around the acetabulum, such as the capsule and labrum, block the view and should then be cleared to facilitate reaming⁶.

After obtaining such clear exposure, reaming the acetabulum is very easy. It is reamed until the cartilage and inner cortex have been removed enough for cancellous bone to be visible. The most important aspect of this stage of the procedure is controlling the angle of the acetabular cup precisely to prevent dislocation happening. With the lateral approach, the anterolateral structures are injured and therefore weakened; thus, the possibility of anterior dislocation is greater than with a posterior-lateral approach. It is necessary to decrease the anteversion angle and abduction angle of the cup's axis. Usually, the anteversion angle should be 10° to 15° and the abduction angle 35° to 40°. After this has been achieved, the acetabular cup and insert can be placed correctly⁵.

In order to expose the relevant part of the femur, the limb needs to be placed in a figure "4" posture because of obstruction by the operation table. In this posture, the femur has an extorsion of 90° and the macro-axis of the osteotomy

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surface of the femoral neck will be in the direction of the intramedullary awl. Intramedullary files progressing from small to large in size are used until the femoral medullary space is adequately prepared for the prosthesis. At this stage, a suitable size of stem should be selected according to several principles that will be discussed later. Then, trial implant components, including the stem and head, are installed and tested for any possibility of dislocation or length discrepancy⁷.

Finally, the real prosthesis is installed, drainage put in place and the incision closed.

Discussion

Prosthesis Selection

Before performing THA, planning of the operation is extremely important⁸, bearing surface selection being one of the key points. If the cost is not taken into account, age is the crucial indicator of which type of bearing surface combination the patient needs. The first principle is to avoid revision required because of wearing between the insert and head. Nowadays, we must assume that every patient could survive to the age of 90–95 years. Thus, in young patients a prosthesis that can provide support for as long as possible should be selected. Different types of bearing surfaces have different lifetimes. Metal-on-polyethylene wears most quickly whereas ceramic-on-ceramic has the slowest wears. Therefore, the younger the patient, the more strongly ceramic should be considered⁹. In this case, because the patient was only 57 years old, ceramic-on-ceramic would have been the best choice for him according to this principle. However, because of cost considerations in his case, metal-on-polyethylene was the final selection. In his procedure, we implanted a EP-FIT cup (Smith & Nephew, Rotkreuz, Switzerland) and SL stem (Smith & Nephew Orthopaedics AG, Baar, Switzerland) and no cement or screws were used.

Control of Angle

First, we will discuss the angle of the acetabulum. As described above, generally the anteversion angle should be 10° to 15° and the abduction angle 35° to 40°¹⁰. The most important consideration is how to verify the angle. This requires a reference: the operation table can be used as this reference. All angles can be measured according to the operation table. However, during surgery the patient's pelvis often rotates. Therefore, if the horizontal plane is still used as the reference, errors will occur. Under these circumstances, a new reference is required: this can be the plane defined by three points, namely both anterior superior iliac spines and the symphysis pubis.

There is a collar in polymethylene inserts to prevent dislocation; we often place the collar in the anterior or anterolateral position to increase the anterior covering. If a ceramic insert is selected, the anteversion and abduction angles should be decreased because ceramic inserts do not have a dislocation-preventing structure¹¹.

Second, we will discuss the anteversion angle of the stem. Can the surgeon control the anteversion angle of the intramedullary awl? In normal anatomy, the answer is “No”, because there is a fixed axial direction in the proximal medullary cavity. If an attempt is made to control the awl at a certain angle, it will eventually go into the fixed position out of the surgeon's control. This is particularly apparent when instruments for SL stems are used. Medullary preparation is very important because it may affect the varus or valgus. The greater trochanter needs to be debrided to a certain extent because a lateral starting point helps prevent varus malposition.

After assembly of the prosthesis, it is necessary to test if the angles are correct. First, an anterior dislocation test is performed, the limb being placed in adduction of 15° and extension of 30°. Next, posterior dislocation is tested with the limb in flexion of 90°, adduction of 15° and intorsion of 30°. Of course, some extreme tests can also be performed to test the stability of the prosthesis, such as the “figure 4” posture and extreme flexion¹². If dislocation does not occur as a result of these tests during the operation, there is no need to be cautious about the posture of the limb postoperatively.

Control of Limb-length

Under normal circumstances, the rotation center should be at the same level as the most superior point of the greater trochanter. The aim is for the rotation center of the prosthesis to mimic this. However, in some patients, especially most patients with hip dysplasia, the cup will have moved superiorly or medially. When the femoral stem has been implanted in the standard way, the cup moves superiorly, leading to a shorter limb length. When the cup has moved medially, the offset will be smaller, making the soft tissue around the joint looser. Thus, a larger stem should be used to balance the soft tissue. Obviously, the limb length will be longer^{13,14}.

The effects of the femoral components depend on the location of the cup. Ideally, the rotation center of the cup is at its original point. When the superior point of the intramedullary awl is at the same level as the superior point of the greater trochanter, the trial prosthesis is the right size. When the cup is implanted higher, a larger stem or ball should be used to match the length of the contralateral limb. When the cup is implanted more medially, a special stem with different offset and collodiaphyseal angle can be used. However, if this type of stem is not available, a larger stem or ball can be used to maintain the stability of the joint. Under these circumstances, the limb will be longer than the contralateral limb; however, stability is always more important than length^{15,16}.

A tension test is another method for evaluating the limb length. When the prostheses have been set up and the joint has been relocated, the limb can be pulled with one hand and the other hand placed in the joint to touch the ball and feel the distance between the ball and the insert. This distance is 3 to 5 mm when the limbs are the same length.

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