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Review Article

Antero-Lateral Approach to Hip Replacement: 45 Degree Oblique Patient Position Improves the Features of the Implant

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Abstract

There are numerous approaches to prosthetic hip surgery and the surgeon favors a specific procedure according to his personal experience. The Watson Jones anterolateral approach in recent years shares the direct lateral approach, the primacy method used in prosthetic hip surgery, with a minimally invasive procedure that guarantees better post-operative results.

To improve the surgical approach in the exposure of the femur and above all of the acetabulum both in primary implants and in revisions, a variation has been made by positioning the patient in the lateral decubitus position with an obliquity of 45 degree, giving a broader and more complete visibility of the acetabulum and with better post-operative clinical results than the traditional technique; the positioning of the limb to be operated on has also been adapted to avoid stress on the ipsilateral knee especially if prosthetic or in patients with severe osteoporosis. This therefore has an important pathogenetic role with interesting perspectives for rehabilitation.

***Keywords**: Hip; Prosthesis; Surgical Approach; Acetabular Exposure*

Introduction

Prosthetic hip surgery, which began in the 1950s, with Charnley's low friction total hip arthroplasty (THA) [1], has recently attracted scholars' interest in surgical access routes. Today the direct lateral route, in the Mc Farland Osborne variant, modified by Hardinge [2] in 1982, is used by at least 50% of orthopedic surgeons [3] with subsequent modifications [4] and over time has replaced the Watson Jones (WJ) anterolateral approach because it is considered to have better visibility of the acetabulum and the femur with a low incidence of dislocation [5]. Over the years, the minimally invasive (MI) approach has become remarkable achievement due to greater respect for the integuments and osteo-articular-muscle structures and for the most effective clinical results in the post-operative period, even though in all surgical approaches an equal clinical efficiency and ambulation has been documented from the post-operative period onwards [6] or according to other Authors the persistence of limping in numerous patients after a two year period [7]. The WJ MI approach is considered suitable for expert surgeons [8,9]. The duration of the operation is shorter with a smaller incision and less tissue damage, without however any differences in post-operative complications and clinical outcomes compared to the other access routes

[10]. The disadvantage associated with the anterolateral approach is sometimes a small temporary pain in the gluteus medius muscle, while the transgluteal and posterolateral approaches are often linked respectively to a greater risk to the sciatic nerve and to the sacrifice of the external rotators. Although the WJ MI approach allows a good exposure of the acetabulum and the femur in primary implants and in revisions, in our opinion the visibility of the implant surfaces improves by positioning the patient in a lateral decubitus position with a 45 degree obliquity resulting in better clinical post-operative results and minor complications (torsion on the hip and on the inguinal vascular nerve fascicle, torsional stress on the knee especially if prosthetic). We describe this technical variant specifying its advantages and influence on post-operative radiographic and clinical data.

Access of WJ MI and a 45 degree obliquity of the pelvis

The experience with the WJ MI has developed the need to improve the approach to the acetabulum and the femur and above all to better control the position of the lower limb as a whole, avoiding torsional stress on the distal joints, in particular on the knee. The elective indication of this technical variation concerns patients with ipsilateral knee prostheses.

Positioning of patient: The anterolateral route performed by us retraces the traditional approach of WJ with the MI procedure and the variant of the lateral oblique position at 45 degree facing the first surgeon, without a traction bed or a forced external rotation flexed position of the limb. With this approach you have an optimal visibility of the acetabulum and an easier exposure of the femur.

Surgical technique: the patient is positioned in a decentralized lateral decubitus position on the operating bed, with posterior vertical sacrolumbar support and vertebral support for greater stability of the entire sacroiliac region (Figure 1). A silicone cushion (8.5 x 5.5 x 2 cm) is positioned under the greater trochanter of the supporting limb to abduct and stabilize the pelvis, with the limb itself protected by a silicone sheet and held with a strap lightly flexing the knee (Figure 2).

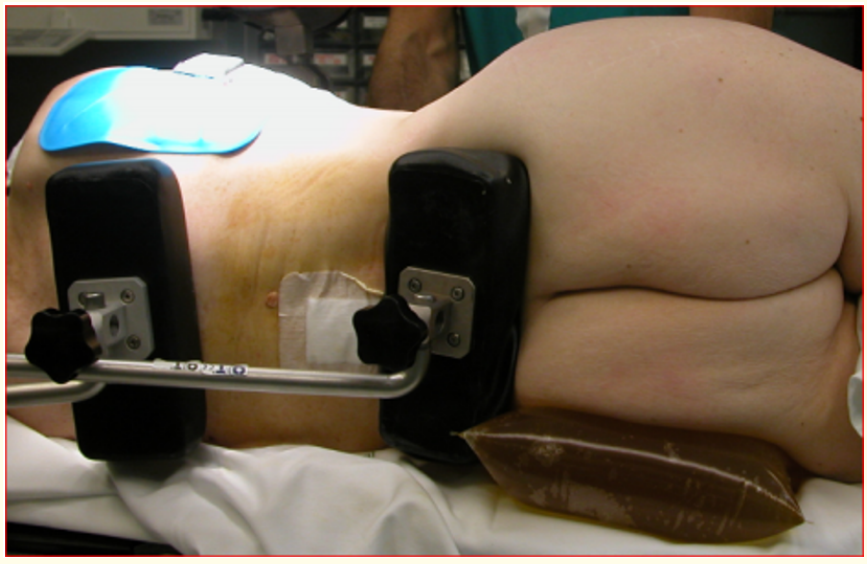

Figure 1: *Positioning of the posterior supports to the sacro-lumbar region with subtrochanteric pillow and to the dorsal region.*

Figure 2: *Full positioning of the patient. The lower limb of support is anchored by a strap to the bed. The limb to be operated on will then be placed on a Mayo servant.*

Once stabilized on the surgical bed the patient is then placed at an angle of 45 degree facing the first surgeon (Figure 3). The limb to be operated on is positioned on a Mayo serving trolley in a neutral or slightly abducted position, avoiding forced adduction as if in the absence of the support trolley.

Figure 3: *Obliquity of the bed and the patient at 45 degree.*

An anterolateral incision of WJ MI is performed, starting two cm. below and lateral to the SIAS and ending at the greater trochanter. Once the integuments have been spread apart, the tensor of the fascia lata (TFL) appears, recognizable by the direction of its fibers and an

incision is made in it passing between the TFL and the middle gluteus (MG), with the hemostasis of the blood vessels in the interstice, paying attention to the branches of the superior gluteal nerve [11]. On the supratrochanteric dimple, the first lever is positioned proximal to the femoral neck, the second lever on the lower edge of the neck and finally the third lever medially to the cotyloid edge, paying attention to the femoral nerve. An open-book capsulotomy is carried out, with a lower hinge, paying attention to the vascularization and facilitating the final suture. With the limb in slight external rotation, the osteotomy of the neck and removal of the femoral head are carried out. By positioning the limb on the Mayo trolley, the acetabulum is exposed using a lever positioned between the posterior edge of the acetabulum and the femoral neck. The subsidence of the greater trochanter and femoral neck at the back of the acetabulum, facilitates access. The acetabular exposure is perfectioned by placing one or more levers in the surrounding area (Figure 4).

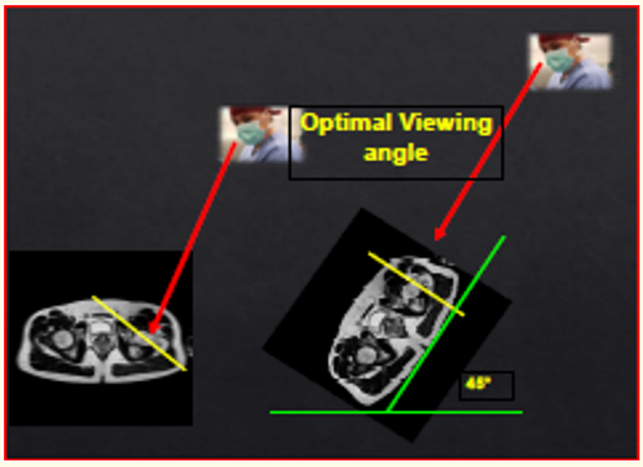

Figure 4: *Projection and visualization of the acetabulum with the supine position and with the obliquity at 45 degree.*

The acetabulum is therefore frontally exposed at 360 degree allowing optimum direct visibility thanks to the 45 degree obliquity of the patient; the periacetabular osteophytes are removed with accuracy, displaying the entire edge of the cotyle for the precise positioning of the prosthetic cup (Figure 5).

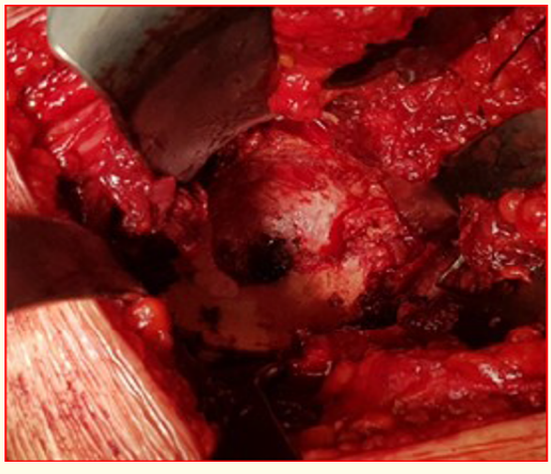

Figure 5: *Exposure of the acetabulum in a total front view, highlighting the entire joint perimeter.*

The exposure of the proximal femur: The limb is adducted and externally rotated with the extension of the knee, avoiding the housing of the limb in the sac adjacent to the bed and the forced rotations necessary to extricate the osteotomy area and proceed to canal rasping. Two Hohmann retractors are positioned around the proximal femur and a third Hohmann retractor positioned at the back in line with the axis of the femur to protect the abductors during the femoral preparation. Once the prosthetic components are positioned, the trial components are tested for mobility, stability and length of the limb. Closing the planes is simple; the capsule, open and intact, is sutured without reinsertion of the muscles, having been simply spread apart in the approach.

Discussion

THAs guarantee a high standard of results and a level of patient satisfaction of approximately 90% in the medium to long term [12].

Today they are essentially the direct anterior (Heuter), the antero-lateral (Watson Jones), the direct lateral (McFarland Osborne) and the posterolateral approach, with numerous variations over the years. The surgeon uses a preferred access route according to his personal experience, whilst being aware of the characteristics of each one and the particular indications and any contraindications or possible complications [13].

A prospective randomized study in patients undergoing THA with the WJ MI procedure compared to the conventional approach did not reveal any significant medium-term clinical and functional benefits [14].

Systematic reviews have assessed that the lateral and anterior routes outperform the anterolateral and posterior routes regarding clinical results (Harris Hip Score) (HHS) and VAS [15]. Restrepo., *et al*. report improved scores with several clinical scores, such as HHS, Western Ontario, McMaster Osteoarthritis Index and Short Form-36 scores in the postoperative period and after 1 year, with the WJ approach compared to the direct lateral approach [16] and in the same way Barrett., *et al*. reported an improvement in HHS at 6 weeks with the direct anterior route versus the posterior approach [17], without however reciprocal long-term statistical differences regarding the outcomes of the three approaches [18].

The orientation of the cup is the most important surgical stage, because it influences the kinematics of the implant over time; it depends not only on the orientation that the surgeon gives to the component in the implant, but preliminarily on the orientation of the pelvis when preparing the patient and on any changes during the operation. There is a wide variation in pelvic orientation in the lateral decubitus position and frequent discrepancies in the pelvic inclination in the pre and post-operative X-rays [19].

Grammatopulos., *et al*. with a photogrammetric technique assessed the initial orientation and intraoperative variations of the position of the pelvis and the influence on the final orientation of the cup. Factors capable of influencing pelvic movement included the surgeon, the access route, the primary or revision procedure and the type of support used ($p < 0.001$). These explained the considerable variability (2sd ± 16) in the orientation of the components; the positioning of the patient in preparation and the movement of the pelvis during the operation were the main causes of the change in orientation of the cup [20]. The position of the acetabular cup has a significant impact on the results of PTA as it affects the dislocation, muscle strength, limb length, impingement, the source of noise in ceramic-ceramic prostheses, the range of motion (ROM), wear and loosening. The implantation of the cup constitutes the key point of the operation due to the important influence it will have in the survival of the implant. It is therefore necessary to plan a correct and stable position of the patient on the operating table, without intraoperative modifications that alter the morphometric parameters of the implant [21]. The position of the cup with the patient placed at a 45 degree obliquity in relation to the basal plane was supported by an MRI study of the pelvis where the main access routes and the angle of visibility with respect to the tangent to the cotyloid edge were reproduced. The front and rear access shows the outline of the acetabulum at an angle of 45 degree, while the WJ route is orthogonal. Rear access gives better visibility to the rear edge, the Heuter approach gives better visibility to the front edge and the WJ approach gives an optimal visibility of both. The

WJ MI approach with the patient in a 45 degree oblique position allowed the widest possible view of the acetabular contour, allowing an implant superimposable on the anatomy of the native hip, especially in the presence of abundant osteophytes that alter the acetabular contour and that modify the anteversion and inclination of the cup [22]. This position also allows you to keep the operated limb extended and resting on the bed, avoiding the use of the traction bed or forced 4 positions with easy maneuverability of the lower limb with the following advantages. It avoids forced rotations and flexions of the knee, or twisting of the vascular-inguinal nerve fascicle, limiting possible vascular complications. In particular, in the presence of knee prostheses ipsilateral to the hip prosthesis, torsional stress between the tibial femoral components is avoided without overstressing the poly insert, especially in patients with severe osteoporosis. It allows a greater adaptability for the surgeon and the assistant during the entire operation. Finally, this procedure facilitates the maneuvers for the insertion of revision cotyle, bone grafts, technoplastics, etc.

Conclusion

In conclusion, the WJ MI approach for THA, often modified with respect to the original WJ technique [23], in most studies did not indicate the disadvantages compared to other approaches regarding surgical time, blood loss, pain, muscle complications and damage, especially in elderly patients [24,25]. The MI WJ route in our opinion also meets all the requirements for a correct prosthetic implant, in particular of the cup. The positioning of the patient in an oblique lateral decubitus position of 45 degree allows a 360-degree view of the acetabulum for an optimal implant of the prosthesis, without torsion damage to the knee, especially with an ipsilateral prosthesis.

Conflict of Interest

No author declares conflicts of interest.

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