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Modified Posterior Approach to the Hip Joint

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Abstract

The Modification offers greater visibility and decreased blood loss to the Hip Joint, there by conferring greater stability posteriorly as compared with the conventional Posterior Approach as described by Austin Moore in 1957.This Modification was devised at a time when the cause of dislocation was being blamed on the Posterior Approach to the Hip Joint [1,2] In this Approach, since bone is attached to bone, it confers greater stability than an ordinary suture through soft tissues and hence reduces dislocation of the Hip Joint [3].

Keywords: Trochanteric Osteotomy; Dislocation.

Introduction

The Posterior Approach is the most commonly used approaches to the Hip Joint for Endo prosthesis, total Joint replacement or Revision Hip Surgery wherein it gives excellent visibility to the entire joint, when compared to other approaches to the Hip Joint [4]. The author's original paper [5] written 35 years ago presented an original technique designed after taking into consideration the surgical anatomy of the Hip Joint, where by the posterior overhanging part of the greater trochanter was osteotomised to include the short lateral rotators along with the posterior one-thirds of the gluteus medius and the capsule of the Hip Joint, which was then turned back as a single flap to expose the acetabulum in detail along with a bloodless exposure. This was also confirmed before any clinical application of this approach on cadavers, which concluded greater stability as compared with routine suture or reattachment of the short lateral rotators

Technique and Introduction

In all, many approaches to the Hip Joint are described in literature. The author's original technique was implemented after a detailed cadaveric study (Figures 1-3), where the forces required to dislocate the Hip Joint was considerably more when compared to the routine suture or reattachment of the short lateral rotators.

Clinical Technique

The patient is placed on the sound side. The skin incision extends from just distal and lateral to the posterior superior iliac spine towards the lateral edge of the greater trochanter, with a curve in the direction of the fibres of gluteus maximus, and extends down the shaft of the femur for about 10 cm. The gluteal fascia and the ilio-tibial tract are exposed; the deep fascia

Figure 1: Device used to test stability of the hip joint showing pelvis fixed and protactors to measure the angle of flexion/extension, adduction/abduction and internal/external rotations (Courtesy: Photograph reproduced with the kind permission of Injury/Elsevier).

Figure 2: Device used to test stability of the hip joint showing pelvis fixed and protactors to measure the angle of flexion/extension, adduction/abduction and internal/external rotations (Courtesy: Photograph reproduced with the kind permission of Injury/Elsevier).

Figure 3: Internal rotation torque being applied when the hip joint was standardized to a fixed angle of flexion and adduction (Courtesy:Photograph reproduced with the kind permission of Injury/Elsevier).

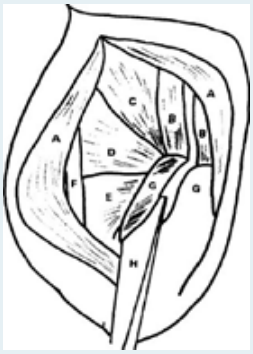

Figure 4: Line Diagram showing the osteotomy of the posterior overhanging part of the greater trochanter: (Courtesy: Line Diagram reproduced with the kind permission of Injury/Elsevier): A: Gluteus Maximus; B: Gluteus Medius; C: piriformis; D: Triradiate tendon; E: Quadratus Femoris; F: Sciatic Nerve; G: Greater trochanter; H: Osteotome.

incised vertically in the lower part of the incision and the incision is curved upwards through the middle of the fibres of gluteus maximus.

The muscles now seen converging on the greater trochanter from above downwards are gluteus medius; piriformis; obturator internus, flanked by the superior and inferior gaemelli; quatratus femoris, and the upper edge of the adductor magnus. All these muscles lie edge to edge, with the sciatic nerve well away from the insertion of the short lateral rotators (Figure 4).

The posterior border of the gluteus medius in the upper part and the quadrate tubercle with the lower border of the quadrate femoris in the lower part is then identified.

The greater trochanter is cut through so that the detached part includes the insertion of the following structures. From below upwards these are quatratus femoris, obturator internus with the inferior and superior gaemelli, piriformis and the posterior third of the fibres of the gluteus medius. The osteotomy extends from the junction of the posterior third and anterior two-thirds of the lateral border of the greater trochanter obliquely downwards and posteriorly to the shaft of the femur just distal to the quadrate tubercle.

The posterior triangular flap containing the overhanging posterosuperior part of the greater trochanter at its apex is then dissected free and turned down to expose the capsule of the hip joint (Figure 5). The capsule is then incised to expose the joint.

Iyer et al. [6] reported on early results in 44 patients who had a hemi-arthroplasty done with no dislocation in this series.

The weakest part of the Hip Joint is the posterior envelope which contains the short lateral rotators. This point has been reinforced by various authors on dislocation of the Hip Joint. There are certain anatomical variations in the tendons of piriformis and obturator internus which could result in piriformis sparing approaches to the hip [7,8] the most posterior margins of the piriformis and obturator internus attachments are located more than one-third of the way along the greater trochanter, suggesting that osteotomies would not include these external rotators in the majority of cases.

A modified dorsal approach with osteotomy of a bone shell with the attached short external rotator muscles which are resutured, is described. The advantages have been less dislocations, less sciatic nerve injuries, and an increased operative access.

The Modified Posterior Approach follows the anatomical intermuscular plan and permits full exposure of both the proximal femur and the acetabulum. Compared to the literature, preserving the piriformis tendon seems to be superior to repairing it as is done in the Southern Approach in terms of dislocation of the Endoprosthesis or THR.

They vary mainly as to whether the deep posterior compartment is entered by incising the iliotibial band and the gluteus maximus muscle in line with the axis of the shaft, or by separating the muscle fibres of the gluteus maximus proximally. They also vary depending on whether the abductors are released from the greater trochanter and, if released, whether the

Figure 5: Line Diagram to show that the Osteotomy is completed and the flap retracted, after incising the capsule to expose the Hip Joint, (Courtesy: reproduced with the kind permission of Injury/Elsevier).

Figure 6: Trochanteric Wiring: (Courtesy: reproduced with the kind permission of Injury/Elsevier).

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tendinous attachment is transected or the greater trochanter is osteotomized.

Almost all of the Posterior approaches have the option to release the abductors, depending on the need for added exposure.

After I described this Approach, it was quite encouraging that my respected teacher (Mr. F.H. Beddow) in Liverpool, UK did a series of 220 Primary Total Hip Replacements by my technique and noted only 2 dislocations throughout his series.

Beddow and Tulloch reported on their experience using this approach in 220 cases of primary total hip replacement in which there were only 2 cases of dislocation [9].

Terry Canale [10] does make a reference to this approach in their chapters on Surgical Approaches and Complications after Total Hip Arthroplasty with respect to dislocations [10].

Callaghan et al. [11] mention the advantages of preserving the original soft tissue attachments of the posterior aspect of the hip joint, as obtained with this approach. They also stress on the excellent exposure of both the acetabulum and femoral shaft achieved with this approach in being applicable to both revision arthroplasty and complex primary Arthroplasty [11].

Thomas Stahelin et al. [12]have stated that the failure rate of reinserted short lateral rotators was extremely high at 70% with majority of failures occurring within the first postoperative day. They also concluded that bone to bone reattachment as done in this approach is more secure,as proved by the cadaveric study [12].

Deepa lyer (2006) was fascinated by this Orthopaedic Dilema in the elderly that she studied this fracture in detail and noted its importance for the junior doctors in training, thereby decreasing morbidity by early diagnosis and treatment [13].

Robert H. Cofield [14]of Mayo Clinic in Rochester, Minnesota, USA has been using this approach for the last 25 years with no regrets. He is extremely happy using this approach since I presented it during the Scientific Congress of the Asean Orthopaedic Association in Singapore in 1984 [14].

Mayo Clinic conducted a study of 68 consecutive cases by the Modified Posterior Approach to the Hip posterior trochanteric osteotomy is associated with high union rates and a low rate of late instability after hip replacement [15].

They concluded one disadvantage of the posterior trochanteric osteotomy is the potential for injury to the superior gluteal nerve if the gluteus medius muscle split is extended proximally more than 5 cm from the tip of the trochanter.

The Posterior approach that Moore popularized, and which is often referred to as the “Southern approach”, is a variation of the original Henry approach and of the modifications subsequently made by Kocher, Osborne and Gibson.

The Moore approach is the most commonly used approach for endoprostheses, total hip arthroplasty, open reduction of hip dislocation, removal of loose fragments in the joint, repair of acetabular fractures, drainage of the hip and vascular muscle pedicle graft procedures.

Here the capsule is sectioned along with the short lateral rotators to gain entry into the Hip Joint, thereby leaving the closure of the Hip Joint vulnerable to dislocation.

In procedures in which the femoral head is not sacrificed, such as drainage of the hip, reduction of a posterior dislocation, removal of fragments from the joint, repair of acetabular fractures, or resurfacing procedures, special care must be taken to avoid injury to the medial circumflex and retinacular vessels.

The short external rotator muscles are sectioned close to the edge of the acetabulum, rather than at the insertion in the trochanter, and the capsular incisions are made near the acetabular edge rather than near the attachment of the capsule to the neck. The medial circumflex vessels are at risk during the dissection near the attachment of the psoas tendon to the lesser trochanter .

In the Modified Posterior Approach to the Hip Joint, bleeding is minimal, because the plane of cleavage through the gluteus maximus is through its middle thus leaving intact the branches of the superior gluteal artery in the proximal half and branches of the inferior gluteal artery in the distal half, and hence there is no need to worry about the amount of blood lost. Bleeding is further reduced as the leash of vessels which lies at the inferior border of the short lateral rotators is neither cut nor handled.

The most important advantage is that the sciatic nerve is not isolated at any step in this approach, as corresponding to the level of the greater trochanter, it lies well medially. Above all, it is firmly held between the piriformis tendon and the triradiate tendon, when the greater trochanter is turned posteriorly, thereby preventing any movement of the nerve.

With this modified posterior approach to the Hip Joint, the gluteus medius is neither cut at its origin nor insertion, thereby leaving the abductor mechanism intact.

In this Modified Posterior Approach, Union of the trochanteric fragment should normally occur, as it is through cancellous bone and in close proximity to the anastomosis in the trochanteric fossa.

The concept of trochanteric osteotomy was mainly used in difficult exposures and soft tissue tensioning. Contemporary THA accentuates a streamlined approach to surgery and recovery while maximizing long-term success. Hamblin estimated that 10% to 20% of hips require TO for restoration of normal joint anatomy [16]. Rates of trochanteric osteotomy reflect geographic trends and surgeon preferences.

Trochanteric Osteotomy techniques can be generally divided into standard, slide, and repeat osteotomy groups. The standard osteotomy may be oblique or posterior. The standard TO was originally popularized for use in hip arthroplasty by Charnley [17]. After exposure of the hip, a Cushing elevator is inserted from anterior to posterior in the interval between the tendon of the gluteus minimus and the superior part of the hip capsule. Next, the origin of the vastus lateralis is elevated from the vastus tubercle. The osteotomy cut traverses the sulcus between the lat-

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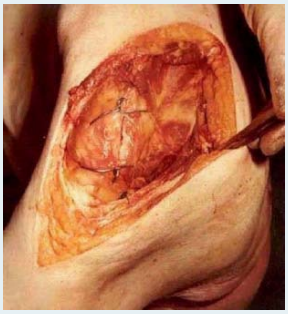

Figure 7: Reconstitution of the Hip Joint: (Courtesy: reproduced with the kind permission of Injury/Elsevier).

Figure 8: Radiograph of Total Hip Prosthesis: (Courtesy: reproduced with the kind permission of Injury/Elsevier).

eral portion of the origin of the vastus intermedius muscle and the insertions of the gluteus medius and minimus. The osteotomy is started 1 cm distal to the vastus tubercle and is performed with an oscillating saw or osteotome, which is aimed at the Cushing elevator [18].

Complications of trochanteric osteotomy can be divided into two broad categories: those related to osteotomy healing and those related to the mode of fixation. Nonunion or a fibrous union of the trochanter is not necessarily a complication with clinical significance. 'lf the trochanter does not heal by bony bridging, however, associated issues of pain, hardware breakage, or abductor dysfunction may manifest as impaired gait, Trendelenburg lurch, subluxation, or dislocation of the hip replacement. Even when union of the trochanter occurs, the patient may still have problems. Trochanteric pain and bursitis may be related to a prominent trochanter or to irritating hardware. Fraying and breakage of hardware can lead not only to pain, but also to wear and the need for early revision.

In comparison to the conventional sliding trochanteric or extended trochanteric approach, which are more helpful by improving biomechanics of the abductor mechanism in work done on in difficult primary total hip replacement, or failed total hip replacements and in well fixed stem components or in previously osteotomised trochanters., this modification is adequate to carry out routine work on the hip joint.

Though Surgeons may adopt any approach to the hip joint in which they are familiar or trained, this modification may be helpful when the greater trochanter is intact in cases when treating a dislocated hip joint, when the blame for the dislocation may be avoided on the posterior approach to the hip joint.

Instability following weakening of the already weak posterior capsule and short lateral rotators of the Hip leading to dislocation has been a cause for concern and controversy in the past. The main purpose of this modification is to overcome this danger and yet retain the advantages of the posterior approach.

Bleeding is slight in this approach because the plane of cleavage through the gluteus maximus is through its middle, which leaves intact the branches of the superior gluteal artery in its proximal half and branches of the inferior gluteal artery in its distal half. The blood loss is reduced considerably, as the leash of blood vessels which lies at the inferior edge of the lateral rotators is neither cut nor handled.

The other advantage is that the sciatic nerve need not be isolated at any step in this modification, and corresponding to the level of the greater trochanter the sciatic nerve lies well medially. Secondly, it is held between the piriformis and the triradiate tendon when the greater trochanter is turned posteriorly, thus preventing movement of the nerve.

Union of the trochanteric fragment should occur because the osteotomy is through cancellous bone and in close proximity to the anastomosis in the trochanteric fossa.

With this modification, though turned aside, the gluteus medius is cut neither at its insertion nor its origin, thus leaving the abductor mechanism intact.

There are certain disadvantages which we have to bear with and which is not in every case treated by this modification, such as heterotrophic ossification, trochantric Osteotomy where the bone takes more time to unite resulting in non-union or fibrous union along with greater trochantric bursitis and also breakage of the wires.

Certain unsolved controversies still exist with regards Trochanteric Osteotomy as follows:-

1. Although the indications of exposure and soft tissue tensioning are well accepted, the exact application of these indications is somewhat controversial.
2. Greater trochanteric osteotomy is rarely used in contemporary hip replacement, and its application is likely related to both the type of surgery and the surgeon's predisposition. Some surgeons apply the approach more liberally than others. Likewise, the type of internal fixation needed to maximize healing is not universally agreed upon.
3. Based on newly available literature, I would recommend avoiding or removing multifilament cables; this advice will likely be considered controversia.
4. Various options are available, and surgeon preference dominates their application
5. Also, newer unproven technologies such as locking plates and nonmetallic tensioning wire may prove beneficial,

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but objective studies will be required if their usage is to be endorsed.

In this method of Modified Posterior Approach to the Hip Joint, the fixation is carried out in a simple manner using two gauge 18 wires to hold the trochanteric osteotomy and reconstitute the Hip Joint (Figure 6-8).

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