



FUNCTIONAL OUTCOME OF PIRIFORMIS MUSCLE SPARING POSTEROLATERAL APPROACH IN BIPOLAR HEMIARTHROPLASTY: A RETROSPECTIVE STUDY.

Orthopedics

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ABSTRACT

INTRODUCTION: Hemiarthroplasty for hip fracture is a common surgical procedure and is the treatment of choice for displaced intracapsular neck of femur fracture. Numerous approaches are used to access the hip joint. The standard posterior approach is used by many surgeons to preserve the abductor complex but is associated with higher dislocation rate. In this study we assess functional outcomes of piriformis sparing posterolateral approach for hemiarthroplasty of hip.

MATERIAL AND METHODOLOGY: We retrospectively reviewed 96 patients who underwent bipolar hemiarthroplasty of hip performed by chief surgeon between May 2018 to September 2020. All the database was retrieved from institutional database of tertiary care hospital. Functional outcome was measured by modified HARRIS HIP SCORE.

RESULTS: Till minimum 1 year follow up we noticed that there was no single case of hip dislocation. Joint proprioception was preserved. In the final follow up average Harris hip score was 92.2. No infection, nerve injury, implant migration occurred in our study.

DISCUSSION: The main aim of the arthroplasty procedure is to decrease pain, to achieve mobility and restore anatomy. The piriformis sparing approach not only preserves abductor complex but also piriformis muscle. The muscle works like cradle, at the posterosuperior part of the joint, an area with a high risk of dislocation. The only disadvantage was noted in this approach was increased exposure difficulty in obese patients

CONCLUSION: From this study we conclude that Piriformis sparing posterolateral approach is safe, demands some technical aspects and should be used by surgeons using posterolateral approach.

KEYWORDS

Hemiarthroplasty, posterolateral approach, piriformis sparing, dislocation.

INTRODUCTION:

Hemiarthroplasty for hip fracture is a common surgical procedure and is the treatment of choice recommended by the National Institute for Health and Care Excellence (NICE) for a group of elderly patients with a displaced intracapsular neck of femur fracture^[1]. Numerous approaches are used to expose the hip joint. The most commonly used approaches are posterior approach, direct lateral approach and direct anterior approach. The standard posterior approach popularized by Austin Moore in 1950s for hemiarthroplasty is used by many surgeons to preserve the abductor complex.^[2] However, The Posterior approach to the hip is associated with higher dislocation rate of 4.5%^[3], but it has number of advantages like low incidence of heterotrophic ossification, decreased surgery duration and minimal blood loss. Dislocation after hemiarthroplasty can reduce quality of life and will require further surgical interventions which can produce poor outcome in patients. The increased risk of dislocation is because of damage to posterior soft tissue which mainly includes short external rotators of the hip and posterior capsule. The technique to preserve piriformis in hemiarthroplasty of hip offers the benefits of the posterior approach with less chances of dislocation. It allows the patients for early mobilisation and rehabilitation.

The purpose of this study was to assess functional outcomes of piriformis muscle sparing posterolateral approach for hemiarthroplasty of hip.

MATERIAL AND METHODOLOGY:

We retrospectively reviewed 96 patients who underwent bipolar hemiarthroplasty of hip with piriformis sparing posterolateral approach. performed by chief surgeon between May 2018 to September 2020 All the database was retrieved from institutional database of tertiary care hospital. Parameters like dislocation rate, age, gender, weight, BMI (body mass index), operative time, preoperative

and 1 year postoperative Harris hip score were analysed to assess functional outcome. The minimum follow-up of 1 year was taken.

PIRIFORMIS SPARING APPROACH IN BRIEF:

The patient is positioned in the lateral decubitus with proper sacral and pubic padding to stabilize pelvis. Leg length of both limbs are noted and operative leg positioned in 45 degrees of flexion at hip joint and 90 degree flexion at knee joint. Landmarks for skin incision are identified.

Incision:

Incision is started approximately 7-10 cm distal to greater trochanter on lateral aspect of thigh in line with shaft of femur. Then extended proximally up to the centre of greater trochanter and extended 5-7 cm proximally curved posterolaterally in the direction of posterior superior iliac spine as per shown in figure no.1. Longer incisions were needed in obese patients or high muscular patients. Surgeon had no hesitation in extending the incision in these cases.

Surgical Dissection:

Fibres of gluteus maximus are separated by blunt dissection and tensor fascia latae cut with sharp dissection. After exposing greater trochanter, the hip is internally rotated to stretch and visualise the short external rotators (SER) of the hip and stay sutures are placed in the short external rotators except piriformis. Joint is approached from the posterior aspect of the greater trochanter by detaching short external rotators except piriformis flush to the greater trochanter and posterior capsule of the hip. Short external rotators release involves, superior and inferior gemelli and obturator internus muscle. The piriformis can be identified as cord like tendon started at piriformis fossa just near the tip of greater trochanter. In piriformis sparing approach, tendon preserved from its attachment and rest of structure below are dissected as per shown in figure no.2. The capsule is incised along the proximal

edge of the piriformis and extended to the piriformis insertion. The incision is then extended distally to complete the SER and posterior capsular release. This results in an "L" shaped SER-posterior capsular flap. If extensive release is needed "L" shaped incision is converted to "T" shaped incision in the posterior capsule. The release can easily extend distally into the quadratus femoris muscle. Now hip is dislocated posteriorly.



Figure 1: Position Of The Patient And Incision



Figure 2: Preserved Piriformis After Dissection And Head Removal

Femoral Preparation:

Femoral neck fracture site is exposed with proper and adequate spike placement around the neck and osteotomy is done with an oscillating saw at approximately 1 cm proximal to lesser trochanter at 45° angle in relation to the shaft.

Femoral Reaming:

The next step is access to the femoral canal with help of box osteotome, then pilot reaming of the shaft is done with 8 no. reamer. This reaming will help to keep the placement of the rasp in proper vertical alignment. Femoral ante-version is decided according to the long axis of the leg. A virtual line is drawn perpendicular to its axis, and femoral rasping was done approximate 15-20° of ante-version which is nearer parallel to the anterior and posterior surfaces of the femoral neck. The femoral canal is broached serially with appropriate ante-version and depending on the canal. The last broach is decided per-operatively by its fitness in the canal and stability checked by giving torsional movement. The vertical offset of the broach is decided by the length of the tip of the broach from the superior part of the lesser trochanter which is approximately 5.5-6.5 cm. This length is judged preoperatively from the digital x-rays and reproduced per-operatively. The other technique used per-operatively was to see the centre of rotation of hip in line with the greater trochanter.

Removal Of The Head:

The femoral head is removed with the help of corkscrew or bone holding forceps cutting out the capsule and ligamentum teres and the size is determined using the head measuring gauge. The head is passed through a measuring gauge. One size lesser than the size of the gauge through which the head cannot pass through is used as head diameter of the head prosthesis.

Acetabulum preparation:

The acetabulum is prepared; ligamentum teres is completely excised and the remaining soft tissue and excessive fibrosis if present is removed. The trial head is then mounted on to the stem and reduction is

done and stability is confirmed. Shuck test is done to confirm the reduction and stability. With the trial prosthesis in situ, the length of the affected limb was compared with the opposite leg using Galeazzi test with keeping the pelvis straight in lateral position. The stability of the implant was checked by assessing the hip movements.

Stem Insertion:

The appropriate original stem is then inserted in the canal with maintaining anteversion. Now, the appropriate original neck and head size is selected and is press fitted over the stem. Reduction is done and the stability of the prosthesis is confirmed.



Figure 3: Preserved Piriformis Muscle After Insertion Of Bipolar Prosthesis.

Closure:

The short external rotators with the capsule are then sutured back to the greater trochanter. Piriformis muscle kept intact as per shown in figure no.3. Closure of the superficial layers was done over a suction drain after achieving haemostasis. The wound is closed in layers and a sterile dressing is applied using aseptic precautions.

Patients were advised to keep the lower limbs in abducted position. All the patients were mobilized on 2nd post operative day with walker support and advised walking aids till adequate abductor power and quadriceps power was achieved.

RESULTS:

In this study piriformis sparing technique was performed on 96 patients. In our study we included 57 men and 39 women with mean age of 68.18 years. The mean BMI (Body mass index) was 21.2 (range 18.5-28.9). Mean operative time was 68 minutes. In intraoperative period posterosuperior stability was much better. Moreover, till minimum 1 year follow up we noticed that there was no single case of hip dislocation with this technique. Joint proprioception was preserved.

In the final follow up average Harris hip score was 92.2 (range 85-99). No infection, nerve injury, implant migration occurred in our study.

DISCUSSION:

The main aim of the arthroplasty procedure is to decrease pain, to achieve mobility and restore anatomy. The piriformis sparing approach not only preserves abductor complex but also piriformis muscle. In a cadaveric study by Roche et al noted that the tendon of piriformis assumed a progressively posterior position, such that at 90° of flexion the tendon lay directly posterior to and abutting the joint^[4]. To prevent dislocation after hip hemiarthroplasty with the posterior approach, repairing of the short external rotator muscles had been tried for many years, but only repairing the short external rotators is not enough in terms of dislocation. The piriformis muscle is an important surgical landmark for the posterior approach to the hip as it has a close relationship to the sciatic nerve and to the entry point for the femoral

canal. Piriformis takes its origin from the anterior surface of the second to fourth sacral vertebrae, greater sciatic notch and Sacro tuberos ligament. It exits the pelvis through the greater sciatic foramen and inserts as a rounded tendon into the upper border of the greater trochanter^[4]. The piriformis is a coaptation muscle of the hip. It is a postural muscle, fatigue-resistant and containing a great quantity of slow muscular fibres (56%)^[5].

In several clinical studies, lower dislocation rates (0.5%–2%) were reported when these soft tissues were repaired compared with when they were not repaired^[6]. The advantages of soft tissue repairs for postoperative stability after Hip Arthroplasty also were demonstrated in a mechanical study^[7]. However, Sta'helin et al. have reported failures of repaired short external rotator muscles in 15 of 20 hips, suggesting the repair of capsular-enhanced short external rotator muscles after hip arthroplasty is not sufficient to allow it to reliably withstand the forces that occur during the process of healing^[8]. The early failure of repaired tendons is closely related to high dislocation rates.

In our study, the piriformis tendon is kept intact. It works like cradle, at the posterosuperior part of the joint, an area with a high risk of dislocation. In our study there was no dislocation case.

With regards to the treatment of neck of femur fractures and hemiarthroplasty, Han et al reported good results with dislocation rate of 0% with the use of external rotator sparing technique in their series of bipolar cementless hemiarthroplasty in older patients and patients with neurological disorder^[9].

Mikonawa et al using MRI in the study suggests that the preservation technique of the piriformis tendon is superior to the reattachment technique in terms of contiguity and muscle atrophy^[10].

The only disadvantage was noted in this approach was increased exposure difficulty in obese patients; the same results were perceived by Khan et al. in previous study^[11]. In our study we had extended the skin incision to achieve proper exposure either in thin or obese patients but the BMI of the patient didn't affect outcome. Proper sized implant is also necessary, because implant with greater offset might impinge sciatic nerve similar to piriformis syndrome because of overstretching. In our study there was no nerve paralysis.

The main limiting factor in our study is study duration is short, a smaller number of patients and long term follow up is awaited.

CONCLUSION:

From this study we conclude that Piriformis sparing posterolateral approach is safe, reliable and maintains good proprioception. It doesn't increase the operative time significantly. It demands some technical aspects and should be used by surgeons after proper training of this approach to reduce dislocation rate irrespective of BMI and age of the patient.

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