COMPARISON OF RESULTS OF TOTAL HIP ARTHROPLASTY DONE WITH MINI INCISION (POSTERIOR MODIFIED) AND TRADITIONAL POSTERIOR APPROACH

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ABSTRACT

BACKGROUND

Total hip arthroplasty is one of the most successful procedures introduced in twentieth century. In this study, we compared total hip arthroplasty with mini incision (modified posterior) and standard posterior approach.

MATERIALS AND METHODS

Total of 96 hips were studied, 48 hips in mini incision group and 48 hips in control group. 84 patients were selected with primary total hip arthroplasty performed on a total of 96 hips during a period of June 2012 to September 2014. Out of 96 hips, 66 hips were avascular necrosis of head of femur, 3 rheumatoid arthritis, 9 ankylosing spondylitis, 3 central dislocation, 3 fracture neck of femur with broken SP nail. 48 hips were operated with mini incision and 48 hips operated with standard incision. Average age of the patients is 56 years in standard incision group and 47 years in mini incision group. Harris hip evaluation (modified) was used for recording the status of hip before surgery and postoperative results. The patients were compared with respect to the length of incision, surgical time, blood loss, acetabular cup placement, femoral stem placement, and complications. Radiological parameters included were abduction angle, stem alignment, and quality of cement mantle. Average follow up was 12 months. Patients were followed up in OPD for regular examination in three monthly intervals and functional assessment of the hip was done using the Harris hip score (modified).

RESULTS

Thinner, healthier, and younger patient were included in mini incision group as compared to the control group. The final outcome was to be statistically insignificant expect surgical time and blood loss and cosmetically. 95% of the patients had excellent to good functional result in mini incision group and 100% had good result in standard incision group. In our series, 6 patients had intraoperative hypotension in standard group due to excessive blood loss. 3 patient had stitch abscess, which healed during subsequent dressing, 3 patient had peroneal nerve palsy, and 6 patients had dislocation in mini incision group.

CONCLUSION

Our study defies most of benefits of mini incision technique. However, no improvements were seen in any of the parameters studied. Long-term studies are required to investigate the impact of the use of minimally invasive approach on the durability of replacements.

KEYWORDS

Hip arthroplasty, Standard incision, Mini incision, Harris hip score.

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INTRODUCTION: Von Langenbach[1] first described the posterior approach for hip in 1874. Posterior approach to hip joint is one of the most commonly used approach in total hip replacement. Development of mini incision posterolateral approach to THR began in 1996. Minimally invasive surgery is poorly defined, heterogeneous group of procedures, which aim to limit soft tissue dissection. Some centres define minimal incision surgery by having a wound less than 10 cm (Goldstein).[2] We use the term minimally invasive THA for any procedure in which the incision and surgical access are modified in an attempt to reduce the tissue trauma. The different techniques have recently been classified into 2 main groups: the minimal approaches and micro minimal or two incision approach. These approaches are beneficial, but unfamiliarity with the approach has potential to increase complication. In this study, we are comparing mini incision posterior approach with standard incision posterior approach for THA.

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MATERIALS AND METHODS: 96 patients were included in the study out of which 48 were in the mini incision group and 48 were in standard incision group. Study group consists of patients undergoing mini incision and control group included patients undergoing standard incision.

The patients were compared with respect to the length of incision, surgical time, blood loss, acetabular cup placement, femoral stem placement, and complications.

The common indications for THA were osteoarthritis of hip joint, rheumatoid arthritis, injury, bone tumours, AVN of head of femur, non-united fracture neck of femur. Firstly, patients were put on conservative treatment for arthritis and physiotherapy.[3] On failure of conservative treatment, THA was indicated. Patient medically unfit for surgery were excluded.

During preoperative period, AP and lateral radiographs of pelvis with both hips were taken templating done to find out acetabular cup and femoral stem size.[4] Intravenous ceftazidime 1 gm was given the night before surgery and one more dose in the morning 1 hour before surgery. All patients were given either general or spinal anaesthesia using combined spinal and epidural set with epidural catheter for intraoperative anaesthesia and postoperative analgesia.

Surgical Technique:

Mini Incision Group: Patients were put in lateral decubitus position. After aseptic painting and draping, 10 cm curvilinear skin incision made centring over the tip of trochanter splitting the gluteus maximus bluntly. The sciatic nerve was identified and protected. The lower extremity was held in neutral extension, gravity adduction, and forced internal rotation. The short external rotator tendons were divided from the piriform fossa. The superior border of the piriformis was identified and elevator is placed anteriorly to separate the gluteus minimus from the hip capsule. After it piriformis tendon was then divided at piriformis fossa and a radial capsulotomy is performed along superior border of piriformis to the acetabular rim. Next, superior capsule was divided was incised to the zenith of the acetabulum (for right hip this is from the 10 o'clock to the 12 o'clock position). After the hip was dislocated in flexion, adduction and internal rotation with the hip dislocated, the lesser trochanter was identified on hyperextension of the hip and the femoral neck cut was marked. The neck was then cut using a reciprocating saw from the medial calcar towards the greater trochanter. The vertical limb of the neck cut then made extending distally along the piriformis fossa and medial border of the greater trochanter. The femoral head removed and limb returned to a neutral position. A right angle Homan retractor was placed on the transverse acetabular ligament as a guide for the placement of cup, another was placed anteriorly and other superiorly to expose the acetabulum adequately. Acetabular reaming done so as to obtain an appropriate acetabular component depth and to return the patient's hip centre to normal. The acetabular component selected was generally 2 mm larger than the size of the final acetabular reamer in cases of uncemented THR or hybrid THR. The acetabular component is inserted with an ideal lateral opening of 45° and an ideal true anteversion of approximately 20°; 2 cancellous screws used to fix the cup placed in posterosuperior quadrant. The acetabular liner then is inserted. In cases of cemented THR, 2 mm smaller size cup is selected and inserted using 1st generation cementing technique to maintain 2 mm of cement mantle.[5]

Now, the preparation of proximal femur was done. Then, provisional reduction is performed with the trial femoral stem in place so as to fine tune leg length and offset. Then, the actual prosthesis was inserted in appropriate anteversion and reduction done. In cases of cemented, THR cement was used to fix the femoral stem. An enhanced posterior capsule closure done, short external rotators repaired, and all patients were treated with suction drainage system, gluteus maximus was repaired, and skin closed with staples.[5]

Postoperative analgesia and antibiotics were given. The patients were advised to sleep in supine position with pillow between the legs. Patients were instructed to do active mobilisation of toes and ankle to prevent deep vein thrombosis.

Sutures were removed after two weeks in all the patients undergoing THR. All patients were hospitalised till suture removal as part of our unit protocol.

All cemented THA patients were mobilised the next day, static quadriceps exercises taught, knee bending taught. These patients were allowed partial weight bearing after 7 days postoperatively with help of walker and full weight bearing with cane in opposite side after 1 month.

All patients with uncemented THA were mobilised the next day. Static quadriceps exercises taught. These patients were allowed partial weight bearing after 1 month with walker (to promote bone ingrowth into femoral stem). Full weight bearing started 2 months postop with cane in opposite side.

Surgical technique in another half patients is standard posterior approach.

Serial follow up were done at 1.5, 3, 6, and 12 months after surgery and Harris hip score was assessed and radiological evaluation.

Radiographic Analysis: The parameters recorded were cup abduction angle, stem alignment, and quality of the cement mantle. Stem alignment was measured as the angle between the long axis of the femoral stem and the anatomical axis of the femur on the anteroposterior radiograph. On AP view, stem alignments were classified as neutral, posterior, or anterior. The cement mantle around the femoral component was graded according to the criteria of Barrack et al.[6]

For cement less stems, metaphyseal and isthmus fill were measured using the criteria by Muliken et al. The isthmus fill is divided in percentage where >90% was considered as good fixation.

Radiological analysis also included study of both defects in Gruen zones.[7]

Grading of the cementation was done according to the grading system of Barrack et al.[6]

The data collected for analysis were age, built, preoperative diagnosis, type of anaesthesia, surgical time, intraoperative blood loss, blood replacement, complications. Statistical analysis was done using t test for continuous variables and chi-square test for dichotomous variables. P value <0.05 was as significant.

Harris Hip score[8]	Grade
90-100	Excellent
80-89	Good
70-79	Fair
<70	Poor

OBSERVATION AND RESULTS: 95% of the patients had excellent to good functional result in mini incision group and 100% had good result in standard incision group. In our series, 84 patients, 21 patients had hypertension (25%), 3 had diabetes mellitus (3%), 9 patients with ankylosing spondylitis (10%), and rheumatoid arthritis (3%). 2/3 patients were moderately built and 1/3 were with thin built. Average duration of surgery was 75 minutes in mini incision group and 90 minutes in standard incision group. Average amount of blood loss was 600 mL in mini incision group as compared to 750 mL in standard incision group. Most common procedure in mini incision group was uncemented and in standard group, it's cemented. Average preoperative Harris hip score was 35 in mini incision group as compared to standard incision group where it was 27. Postoperatively, Harris hip score was 89 in mini incision group and 90 in standard incision group. Average cup abduction was 44 degrees in standard incision group and 41 degrees in mini incision group. 3/4 of the stems were placed in central position in both mini incision and standard incision group. Postoperative limb lengths were similar in both the groups, average is 5 cm. Out of 18 cases of cemented and hybrid THR in mini incision group, 2/3 cases were graded as A and 1/3 cases as B as compared to 33 cases of cemented and hybrid THR 3/4 were graded as A and 1/3 as B in standard group. Out of 30 cemented THR in mini incision group, 95% of patients had isthmus fill, only 3 case had fair fill due to poor visualisation as compared to 100% good isthmus fill in standard group. 6 patients had intraoperative hypotension in standard group due to excessive blood loss. Three patients had stitch abscess, which healed during subsequent dressing. 3 patients had peroneal nerve palsy and 6 patients had dislocation in mini incision group.

DISCUSSION: The rationale behind mini incision THR is to reduce operative time, intraoperative complications, and improve recovery.

Less invasive total hip arthroplasty surgery originated with the work of Heuter, Judet, and Kegi.[9] Recently, it has been popularised by Sculco,[10] Berger,[11] and Dorr.[12] Berger defines MIS as surgery where "muscles and tendons are not cut."[13]

Most authors we have reported results in this field have used a wound of 10 cm or less and this is emerging as upper limit of incision length for MIS.

We analysed a consecutive series of 96 hips in 84 patients undergoing primary total hip arthroplasty performed through a posterior approach with use of either a standard length incision or a mini incision. To our knowledge, this is one of the few studies that have used a consecutive series of patients with a concurrent control group. The present study was different from all other reports because the operating surgeon has used unique modified posterior mini incision to compare it with standard posterior incision.

In our series, most common preoperative diagnosis was AVN of femoral head in both study groups as compared to the study done by Woolson et al where they noted osteoarthritis as most common diagnosis.[14] The preoperative diagnosis influenced the length of the incision since more deformed head requires larger incision. Average age of patients in our study was 47 years in mini incision group and 56 years in standard incision group. Similarly, mean age in Swanson's study was 62.5 years.[13] It was found that patients in mini incision were younger and thinner.

It was noted that all patients either moderately or thinly built (BMI <30) in mini incision (P= 0.0484) as compared to Woolson et al where they noted patients with BMI >30 were 30 out of 35 in mini incision. This was significant that patients undergoing mini incision were younger and thinner. This shows that mini incision is difficult in healthy patient because of increased fat and difficulty in identifying the plane of dissection with small incision.[14]

We noted that number of males dominated in both the groups, however, there were small number of female patients in mini incision (4) who were satisfied the smaller scar as were the male patients, which was cosmetically better. Similarly, Mow CS et al[15] compared scars for total hip replacements done with a standard or a mini incision and found that mini incision scar was better even Wright et al found out that patients undergoing mini incision expressed considerable enthusiasm regarding cosmetic appearance of the surgical incision.[9]

We found that right and left was almost equally involved in either group; apparently, side involvement had no significance in the final outcome. It was seen that the most common procedure in mini incision was uncemented (62.5%) and in standard group it was cemented (50%) as compared to Woolson et al who noted similar findings, 64 out of 75 cemented THR in standard group and 48 out of 50 uncemented THR in mini incision group.[14]

It was noted that the average duration of surgery was 75 minutes in mini incision as compared to 90 minutes in standard incision (p value <0.0001), which in statistically significant as compared to Wenz et al[16] who also have shown reduced surgical time in MIS posterior approach, which is significant since it reduces the duration of anaesthetic complication, duration of the tissue exposure, and blood loss.

Average blood loss in mini incision group was 600 mL as compared to 750 mL in standard incision group. (p value <0.001), which is statistically significant as compared to Swanson et al[17] who found out that mean blood loss was 324 mL in mini incision group, which was comparatively lesser than standard group. This reduction in blood loss was obviously significant in a sense that decreased blood loss leads to decreased need for blood transfusion and transfusion related complications and also less chances of intraoperative hypotension.

We and Chimento[18] found no difference in narcotic analgesic requirement in both the groups.

In our study, the average preoperative Harris hip score in mini incision was 35 and in standard was 27 (p=0.12), which is very much similar to Swanson[19] who found that average preoperative Harris hip score was 34 in mini incision. There is no statistically significant difference, which shows that preoperative disability was similar in both the groups.

We noted that average postoperative Harris hip score was similar in both the groups. Average postoperative Harris hip score was 89 in mini incision and in standard was 90 as compared to Sulco[10] who noted no difference (p=0.2101). Wright[8] found that postoperative Harris hip score was slightly higher in mini incision group (p=0.042) as compared to standard group. Similarly, Woolson et al[14] found that postoperative Harris hip score in both the groups were identical.

We found that average postoperative limb discrepancy was 0.5 cms in both the groups as compared to Woolson et al[14] who found that average postoperative limb length discrepancy was 0.2 cms in standard and 0.6 cms in mini incision group.

Radiological Evaluation: In our series, the average acetabular cup abduction angle was 44˚ in standard incision as in 41˚ in mini incision (normal safe range 35-55˚) and there were three outlier (<35˚) in mini incision group as compared to Hartzband et al[19] who found out that the average acetabular cup abduction angle was 45.2˚(range 30-56˚) in mini incision, none were in unsafe range, and also Woolson[14] found out that average abduction angle of acetabular component was 40˚ in standard incision group and in mini incision group, it is 40.5˚, 15% of the component was outside the safe limit in standard group as compared to 30% in mini incision group, which showed that malposition of both the acetabular and femoral component was also more frequent in mini incision group. This was due to poor visualisation during surgery.

We also found that 3 stems were placed in varus in mini incision group and 3 in standard group as compared to Woolson[14] who found out that 4% of stem was placed in varus in standard group and 12% varus placement in mini incision group (p=.02), which is significantly higher. This was due to poor visualisation during surgery.

In our series, cement fixation was comparable in both the groups where none was noted poor. 60% was good (Grade A) and 34% fair (Grade B) in mini incision. It was 81% good (Grade A) and 19% fair (Grade B) in standard incision group as compared to Sulco et al[10] who showed that cement mantles were grade A in 53%, grade B in 44%, grade C in 3% hips, and femoral in 99.55% in hips. Poor cement mantle implicates deficient cement techniques and postoperative loosening of implant.

Complications:

Intraoperative: 6 cases had intraoperative hypotension in standard group due to excessive blood loss, which was treated with immediate blood transfusion, colloids, and crystalloids, which was not found in mini incision group.

Postoperative: 6% cases had superficial infection and 6% cases had posterior dislocation in standard incision group as compared to mini incision group where 6% cases had superficial infection, 6% cases had peroneal nerve palsy, and 12% cases had posterior dislocation, which is double the complication in standard incision group. Sulco et al[10] noted 1 case of subluxation, 1 case of cellulitis, 2 cases of fat embolism in mini incision group. Similarly, Swanson et al found that 1 patient had deep infection, 1 had dislocation, 3 had loose acetabular components, 5 patients underwent revision.

In our study, there was no difference in duration of hospital stay in both the groups, which is similar to Howell et al[20]. Hartzband et at[19] noted a concomitant decrease in hospital stay in mini incision group.

Follow Up: In our study, follow up was up to 2 years, which was very short as compared to C S Ranawat et al (5 years). As it is a well-known fact that the major complication of THR such as aseptic loosening and implant failure occurs late. We found no difference in Harris hip score at 6 months and 12 months follow up in both the groups, but Sulco[10] found slightly higher scores in mini incision group (p=0.042). We found that 95% of the patient had good to excellent functional results in mini incision group and 100% had good to excellent functional results in standard incision group as compared to DiGoia[21] who found no difference in functional outcome in their in both the groups 1 year after surgery.

No significant difference was noted in rehabilitation in both the groups, but according to Hartzband[19] the patients of mini incision group had more prompt return to activities of daily living. Similar results were noted by Berger et al[13] noticed significant improvement in rehabilitation in mini incision group as compared to standard.

Wright et al[8] concluded "this investigation confirms no dramatic clinical benefit of an abridged surgical approach other than cosmetic appeal to the patient" similarly Goldstein et al[2] and Dorr et al[22] also reported favourable patient attitudes towards the scars that result from MIS THA.

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