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Total Hip Arthroplasty through MIS approach-----Early results and surgical technique

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Abstract
Purpose:To compare the results of mini-incision total hip arthroplasty(MITHA) to the conventional posterior approach and evaluate the pros and cons of MITHA.
Methods:30 patients with osteoarthritis of the hip underwent total hip arthroplasty using a mini-incision procedure.Comparision to a matched cohort of patients who received the conventional posterolateral approach.The average follow-up was 12 months.Comparision was done with respect to the length of incision,surgical time,intra-operative blood loss,pain requirements,length of hospital stay,need for walking aid,Harris hip score and complications.
Results:The length of the skin incision for MITHA,at an average of 9.5 cm,was half that of the conventional approach.Statistically significant differences were found between the two groups in terms of intra-operative blood loss,length of the hospital stay and use of walking aids,all in favour of MITHA.There were no differences between the two approaches with regard to operating time,pain requirements,or Harris hip score.There were no cases of component malpositioning or major complications in the MITHA group.
Conclusion:Noncemented total hip replacement can be effectively performed through a smaller incision using MITHA without increased risk of complications.Significant benefits include less intraoperative blood loss,shorter hospitalization and cosmesis.

Key words: *Replacement,arthroplasty,hip,hip prosthesis,treatment outcome,prospective studies;surgical procedure,minimally invasive.*

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I. Introduction

Total hip replacement has been the most successful operation of the century with a high degree of patient satisfaction and reproducible results.Last decade has focused on implant fixation,tribiology,and bearing surfaces such that indications have now been extended to include younger patients.Yet the standard surgical technique has changed little over the past several decades.

In the present study,we describe our surgical technique for the mini-incision total hip arthroplasty(MITHA) and review the early results of the first 30 cases in which this technique was done.

II. Material and Methods

Thirty patients who were operated though MITHA were reviewed.This group was compared to a matched cohort of patients who were operated with the conventional posterior approach.All surgeries were done by one surgeon [JAB] and were matched for age ,weight,and diagnosis.Patients suffering from ankylosing spondylitis,dysplasia ,protrusion and morbid obesity were excluded.The study was prospective but not randomized.Patients with osteoarthritis requiring total hip arthroplasty who fulfilled above criteria were distributed alternately to either mini-incision or conventional approach.

Comparisions were made with respect to length of the skin incision,operarating time,intra- operative blood loss,postoperative pain requirement,length of hospitalization,and the use of walking aids.Complications and the incidence of component malalignment were also recorded for each group.

The patients were placed in the lateral decubitus position for both approaches.The mini-incision technique involves a posterolateral approach,with the skin incision based more distally than usual over the proximal femur.Placement of the incision with two thirds distal to the tip of greater trochanter allows insertion of the acetabular instrumentation without undue tension on the skin.we found the incision length to be approximately 30% longer than the acetabular diameter(estimated from templating the X-rays).Partial release of the gluteus maximus tendon from the femur is done,along with a limited quadrates femoris, and appropriate anterior capsule release and piriformis tendon is spared.No specialized equipment is required.However, it is important to avoid excessive hip flexion when dislocating the femoral head or working on the femur or acetabulum.Also removing acetabular osteophytes also help in exposure.The conventional posterior approach was done as per the Southern approach.1

All patients underwent the same operative regimen.Hypotensive anaesthesia was used during surgery.Proper haemostasis was ensured prior to closure.The implants were either from Depuy orthopaedics/Johnson and Johnson or Stryker.No drains were used.Aspirin 150mg BD was used for thromboembolism prophylaxis.Prophylactic antibiotics were given with anaesthetic induction and continued for 24 hours.The incision length was measured using a ruler at the completion of closure of the wound.Intraoperative blood loss was calculated as the sum of volume in the suction bottle plus blood weight in the sponges.Operating time was recorded as the period from initial skin incision to completion of wound closure.

Same postoperative protocol was followed for both group of patients.Mobilisation of patients was done on 2nd postoperative day with walking aids and weight bearing allowed as tolerated.Standard analgesic regimen was followed comprising of paracetamol 650mg thrice daily ,tramadol twice and pregablin 75mg at bed time and aspirin 150mg twice daily for 10 days followed by 75mg once for six weeks for DVT prophylaxis.Hospital discharge was based on the patient's ability to ambulate safely and independently,including climbing stairs.Following discharge from hospital,walking aids were weaned as dictated by the patient's progress and confidence.Requirement of walking aids was defined as the time period up to when the patient was completely free of any aids including walking sticks.

We recorded the results on specially designed templates and entered into an excel spreadsheet.The Harris hip score was recorded.In this study student *t* tests were employed to formally test the statistical significance of the results.These tests were based upon the difference of the mean values for the two groups of data.

III. Results

Of the 30 patients in each group,there were 12 males and 18 females in the mini-incision group and 16 females and 14 males in the conventional posterlateral approach group.The two groups were matched for age,weight and diagnosis,with all the patients having osteoarthritis.The mean follow-up was 12 months(range 8-24 months) and none of the patient was lost to follow-up.The mean length of the skin incision was 9.5 cms for mini-incision and 21 cms for the conventional posterior approach.Statistically significant differences were found between the 2 groups in terms of intra-operative blood loss,length of hospital stay,as well as the use of walking aids.The mean blood loss was 160 ml for mini –incision group as compared to 210 ml for the conventional approach.The length of the hospital stay was on an average one day less for mini-incision set of patients while the requirement of walking aids decreased from 29 days to 26 days. Operating time was 55 minutes in MITHA group shorter by 7 minutes and this was not statistically significant. No significant differences were found in terms of pain requirement or Harris hip scores.The mean Harris hip score,at the last follow-up,was 96.4 for MITHA group and 94.4 for the conventional posterolateral approach patients.One each case of DVT was seen in both groups.However,there were no dislocations in either group at short-term follow-up.All femoral stems were within 4 degrees of neutral alignment with respect to the femoral shaft axis,and all acetabular components were inserted within the 40-50-degree abduction angle range.

Fig 1 Mini-incision total hip replacement

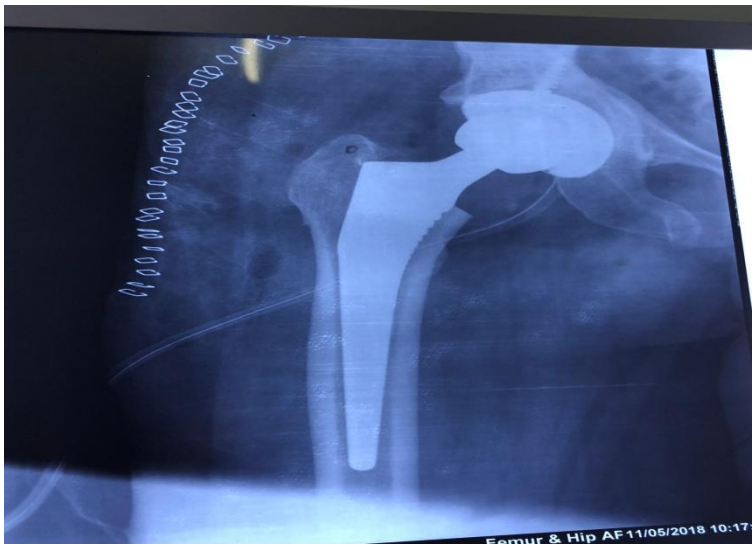

Fig 2 postoperative radiograph of mini-incision total hip replacement.

IV. Discussion

Total hip arthroplasty has figured the most successful operation,with predictably excellent and reproducible results.Hozack et al.2 used the Medical Outcomes Study Short Form-36 to show that primary total hip arthroplasty dramatically enhanced the patient's quality of life.Recent advances have focused on improving fixation of components and wear properties of the bearing surfaces in order to guarantee longevity.3 Long-term outcome studies are now available which prove the durability of both cemented and cementless components.4-6 Although improved anaesthesia and accelerated rehabilitation have reduced the morbidity and mortality associated with hip replacement,the surgical approach and technique has changed little in the past three decades.The rationale of a minimally invasive or mini-incision technique is that it is a less intrusive or destructive surgery.Possible advantages include less intra-operative blood loss,less post-operative pain,less soft –tissue scarring,shorter rehabilitation time,and cosmesis.However,concerns remain regarding the indications for the technique(in terms of weight limit and diagnosis),the operating time,fixation and alignment of implants given potentially a more limited view,and most importantly the increased risk of complications such as fracture and neurovascular injury.For a mini-incision technique to become widely accepted,it must show a clear benefit without an increased risk of complications,it must show a clear benefit without an increased risk of complications.

The mini-incision technique has been used by author[JAB].The average length of the incision was reduced by over 50% from 21cm to 9.5 cms.Compared to a cohort of patients who underwent hip replacement via the conventional approach by the same surgeon and were matched for age and weight,the MITHA approach has significantly reduced intra-operative blood loss,length of hospital stay,and the use of walking aids.There was little difference in the operating time,postoperative hip scores,or complication rates.Most importantly,the dislocation rate was not increased.There was one case of sciatic nerve palsy in mini-incision group which recovered after 10 weeks.There were no wound problems,or component malposition.Radiologically,all components were inserted within the limits of acceptability;all femoral components were within 4 degrees of neutral alignment and all acetabular components within 5 degrees of the 45 degrees abduction.We did,however,exclude obese patients and those with significant dysplasia or deformity.With this mini-incision technique,no special instruments are required.The important aspect of this technique is to base the incision more distally over the proximal femur than the conventional posterolateral approach.This aids reaming of the acetabulum without contusing the skin at the distal end of the wound.It also facilitates insertion of the acetabular component in the correct abduction angle.With a small incision,the tendency is to place the cup too vertically as the distal end of the wound restricts adduction of the insertion handle.

The present study comprised of a prospective cohort matched for diagnosis,age,weight,surgeon,prosthesis type,and postoperative protocol.The patients were allocated alternately to receive either an MITHA or conventional posterior approach.The hip score evaluator was blinded to the patient's treatment group and no patients were lost to follow-up,hence decreasing the chance of selection bias.The limitations of this series include unknown confounders which may not have been controlled for and measurement error resulting from patient bias as they were not blinded to the treatment group.A randomized controlled trial would be required to eliminate these possible errors.However,it would be extremely difficult to blind the patient and surgeon to the trial.In spite of the limitations of the study design,mini-incision technique has definite benefits.

There have been few reports in the literature on the minimally invasive technique.Wenz et al.7 published their series of mini-incision total hip arthroplasties.They found that the mini-incision group had less mean operating time,blood loss,and intra-operative blood transfusion requirements.In addition,the mini-incision patients ambulated sooner and required less assistance for transfer.They reported no increase in complication rates or component insertion errors with the mini-incision technique.Thier series,however,was a comparision with the direct lateral approach and consisted of both cemented and noncemented components.Pavone et al.8 prospectively randomized a group of 46 patients to receive incisions of either 8 cm or 15 cm.They found that the group with the shorter incision had significantly less intra-operative blood loss,post-operative drainage,and ,and total blood loss.Fewer patients in the small incision group were limping at 6 weeks.In contrast,Wright et al.9 described their abridged incision posterlateral approach and found no significant difference in the blood loss,length of surgery,and duration of hospitalization with thier first 42 cases.Sherry et al.10 described their technique through a 5 cm incision,utilizing cementing jigs,specialized reamers,and the SE-Hip system.Berger 11 presented a technique that utilizes 2 incisions and the aid of image intensifier to position the components.Specially designed instruments are used to place the acetabulum through an anterior incision and the femoral component via a lateral incision similar for a femoral intramedullary nail.He presented the results of his first 100 hips,and found that 80% could be performed as out –patients with discharge on the day of surgery..Dorr12 also presented a mini-incision technique using specifically designed retractors and a curved reamer.Analysis of 105 hips showed that gait was improved and less patients required rehabilitation.

The attraction of the minimally invasive technique is obvious,with the reduction of surgical morbidity and recovery time among the many possible benefits.The use of image guidance as well as new techniques,such as transfemoral acetabular preparation and cup insertion,need to be refined and then proved in clinical practice to be beneficial.Randomised controlled trials as well as long-term follow-up studies are required to prove its superiority over the standard approach.

In conclusion,mini-incision total hip arthroplasty can be effectively done through a much smaller incision than the conventional posterolateral approach without increasing the risk of component malposition or complications.Less intra-operative blood loss and shorter hospitilisation are significant benefits of this less intrusive surgery.

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