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Comparison of short term functional outcomes of anterolateral and posterior approach of hemiarthroplasty neck of femur fractures in elderly patients

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Abstract

Objective: To compare the clinical outcome of anterolateral and the posterior approach of hemiarthroplasty for treatment of neck of femur fractures in elderly patients

Methods: The study was carried out on 84 patients who suffered from displaced femoral neck fractures (48 cases of Garden type III, 36 cases of Garden type IV) treated by hemiarthroplasty either by anterolateral (Watson Jones) approach or posterior (Southern Moore's). The average age of the patients was 68.1 years (range: 55-79 years). They were divided into anterolateral group (44 cases) and posterior group (40 cases). The average time of follow-up was 6 months. The anterolateral approach as popularized by Watson and Jones goes through the interval between the gluteus medius and the tensor fascia latae, to reach the femoral neck from anterior capsule. The traditional posterior approach as described by Moore (Southern incision) includes dividing the insertions of short external rotator muscles (the obturator externus and superior and inferior gemeli), approaching the femoral neck from posterior capsule. The variables under observation were length of incision, operative time, post operative pain, length of hospital stay and bed stay and post-operative dislocation rate.

Results: The length of the skin incision ranged from 8 cm to 12 cm with the anterolateral technique, against 13-20 cm in the posterior approach. It took average 3 minutes lesser to complete the anterolateral approach (32min±9min), compared with the conventional approach (35min ±10 min). The average post operative Harris hip score was 90.03±11.05 in anterolateral approach against 85.23±10.05 in the posterior approach. The average length of hospitalisation for patients with the anterolateral approach was (9.4±2.2) days (range: 6-12 days), which was (12.2±3.1) days (range: 9-15 days) in the posterior approach. The average length of bed stay was (4.4±1.1) days (range: 3-6 days) in anterolateral group and (6.2±2.8) days (range: 3-10 days) in posterior group. No patients in anterolateral group experienced dislocation. Two patients (5%) hip in posterior approach had dislocation.

Conclusions: Anterolateral mini-invasive approach can decrease operative trauma, operation time, length of hospital stay and bed stay and rehabilitation time. The stability and minimal muscular damage permit faster postoperative rehabilitation, which can in turn reduce the perioperative risk in the treatment of femoral neck fractures in the elderly undergoing hemiarthroplasty.

Keywords: Hemiarthroplasty neck, treatment, patients, anterolateral

Introduction

Intracapsular fracture involving femoral neck is a common injury in the elderly with an incidence of 957.3 per 100,000 people, with a higher predisposition towards females, high associated perioperative mortality (14%-47%) and morbidity^[1-5]. The treatment of femoral neck fracture in elderly patients is complicated due to presence of severe medical comorbidities and associated osteoporosis. Although hemiarthroplasty results in satisfactory patient outcome, there is always search going on for techniques which can reduce the high perioperative mortality around 10% and upto 40 percent perioperative morbidity from the fracture and operation. The majority of fatalities are related to prolonged bed stay, such as bedsores, pneumonia and fatal pulmonary thromboembolism. Therefore, reduction in the operative injury and time of bed-stay is essential for the favourable outcome of this procedure.

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The minimally invasive hemiarthroplasty has been shown to be safe and effective in achieving early postoperative improvements in pain, function and accelerated postoperative recovery [6-15]. Minimally invasive hemiarthroplasty has been defined by an incision length of 10-12 cm or less [16]. The Watson Jones approach is supposed to offer excellent results because it leaves the abductor function (gluteus medius and minimus) intact, as well as all the posterior tendon and capsule elements [17]. Because of this, it can offer excellent clinical results, permitting more rapid functional recovery. Therefore, we made a comparative study of the anterolateral approach versus traditional posterior approach for hemi hip replacement of femoral neck fractures in elderly patients.

Methods

Patient population

Eighty-four patients with displaced femoral neck fractures (46 cases of Garden type III, 38 cases of Garden type IV) treated in our hospital were included in this study. There were 32 males and 52 females, with an average age of 68.1 years (55-79 years), which were randomly divided into anterolateral group (44 cases) and posterior group (40 cases). The average time of follow-up was 6 months. In all cases, there was no selection with respect to weight, size, body mass index or comorbidities such as hypertension, diabetes, arteriosclerosis, deranged lipid profile, history of cerebral thrombosis, cerebral infarct, cardio-respiratory dysfunction.

Surgical technique

In order to minimize the influence of technical skills of different surgeons, all surgical procedures were carried out under spinal anesthesia by similarly skilled orthopaedic surgeons. In order to minimize the influence of prosthesis type, the prostheses of all patients in our study consisted of non-cemented bipolar prostheses.

Watson Jones anterolateral approach

The patient is placed lateral on the operating table with the affected limb on the top. The skin and subcutaneous tissue are incised with an incision on the anterior aspect of greater trochanter. The distal half to the incision was straight; the rest of the incision was curved anteriorly. The length of the skin incision varied between 9 and 14 cm, depending on the physical condition of the patient and the anticipated size of the implanted components. Create a plane between the anterior border of the gluteus medius and the tensor fascia lata. Retract the tensor fasciae latae anteriorly and the gluteus maximus posteriorly exposing the origin of the vastus lateralis and the insertion of the gluteus medius. Instead of releasing the abductor, keep it in situ attached to the greater trochanter and access the joint capsule through the interval between the gluteus medius and the tensor fascia lata. Distally, carry the incision anteriorly in line with the fibers of the vastus lateralis down to bone along the anterolateral surface of the femur. The neck is exposed with two Hohmann retractors. After making an opening in the capsule, remove the head-neck fragment in situ. With the leg in slight hyperextension, adduction, and external rotation, further capsule release was performed with preservation of the posterior capsular structures and sparing of the major attachments of gluteus medius and minimus. After capsulotomy, the femur is placed in adduction, and external rotation, and neck and femoral preparation is done. The head size is measured and the prosthesis is placed and reduction is done and checked for stability and limb length discrepancy. Closure of the wound is done.

Traditional posterior approach (Southern approach)

The patient is positioned laterally with the affected side upwards. The incision is taken approximately 10 cm distal to the posterosuperior iliac spine and extended it distally and laterally along the posterior margin of the greater trochanter. Then direct the incision distally for 10 to 13 cm parallel over the femoral shaft. The soft tissue is dissected and deep fascia is cut in line with the skin incision. By blunt dissection, the fibers of the gluteus maximus are separated and the proximal fibres retracted proximally to expose the greater trochanter. The distal fibers are retracted distally. The trochanteric bursa is removed and short external rotators are divided along with tendon of the piriformis at their insertion on the femur the muscles are retracted medially. The posterior part of the joint capsule is well exposed. Capsulotomy is done in T shape. The thigh and knee are flexed by 90°, internally rotated at the thigh, and the head of femur is removed. The prosthesis is inserted using the conventional surgical technique after the neck and femoral preparation.

Patients were evaluated for limp and dislocation using the Harris hip score. All patients who were seen in clinic for a 6 month follow-up were included in the study.

Postoperative management

All cases were observed closely in an ICU with continuous monitoring to make sure that their vital signs were stable. Prophylactic antibiotic and prophylactic anti-thrombosis treatment was given post operatively. Rehabilitation treatment began on the third postoperative day under the direction of a physiotherapist.

Statistical analysis

A chi-square test was used for dichotomous values, and *t* tests were done for continuous values. $p < 0.05$ was considered as significant difference

Results

Length of incision

The length of the skin incision varied between 8 to 12 cm in the anterolateral minimally invasive group compared to 15-22 cm in the posterior approach.

Operation time

The duration of the procedure was (32±9) minutes in anterolateral group, and (35±10) minutes in conventional group. It took less time (average, 3 minutes) to complete the procedure by posterior approach as compared to the anterolateral approach.

Harris score

The average Harris hip score for the anterolateral approach was 87.12 ±10.10 (range, 35-100 points) and the average pain score was 43.26±6.41. For the posterior approach, the average Harris hip score was 85.23±10.05 (range, 25-100 points), and the average pain score was 45.13±5.06.

Length of hospital stay

The average length of hospital stay was (9.4±2.2) days (range, 7-11 days) for patients with the anterolateral approach, and (12.2±3.1) days (range, 9-15 days) for patients with the posterior approach.

Length of bed stay

The average length of bed stay was (3.4±1.1) days (range, 2-5 days) for patients with the anterolateral approach, and

(6.2±2.8) days (range, 3-10 days) for patients with the posterior approach.

Dislocation

No patients with the anterolateral approach experienced dislocation. Two patients (5%) in the posterior group had dislocations which were then managed with open reduction.

Discussion

Hip hemiarthroplasty through minimally invasive procedures potentially reduces operative trauma, which is expected to improve recovery and rehabilitation. We performed hip hemiarthroplasty using anterolateral Watson-Jones approach. For a hip replacement procedure to be truly “minimally invasive”, it is not necessary to perform the surgery via the smallest possible skin incision, but it is essential that the procedure be performed with minimal soft tissue trauma. Tissue structures that are not divided cannot cause the pain, while over-stretched soft tissues can cause pain and delay healing. Consequently, the optimal soft tissue sparing incision for hemi hip replacement balances the desire to minimize the size of the entry portal with the need to provide the required intraoperative view and atraumatic access to the femoral neck and the hip joint.

Minimally invasive surgery through the anterolateral approach potentially leads to a reduction in operative trauma, reduced blood loss, lesser soft tissue damage, reduced postoperative pain, and earlier mobilization accomplished by preserving muscle insertions of gluteus medius and minimus. Theoretically, these improvements may result in shorter hospitalization and rehabilitation periods, as well as better cosmetic results through smaller skin incision and atraumatic wound closure [16-23].

The complications may be intraoperative, immediately postoperative, or long-term by component malposition. Component malposition may lead to decreased implant longevity and other debilitating complications such as recurrent dislocations, acetabular protrusion. Any short-term benefits of a new surgical approach should not be at the cost of long-term outcomes. The previous studies have suggested that there is an increased chance of malposition using the minimal incision anterolateral approach. However, many reports suggest that minimal incision surgery is a reproducible technique that does not compromise component positioning or increase postoperative complications [19-23]. The malalignment of prosthesis in anterolateral approach may be due to less favorable field of vision [24]. If the patient is in standard lateral decubitus with the body perpendicular to the operating table and the table parallel to the ground, anteversion of prosthesis could be well established with reference to the knee joint. This study does not evaluate the long term complication due to implant malposition due to its short duration of follow up (6 months). Each case of femoral neck fracture can be done by the minimally invasive anterolateral approach that we have used. However, it is highly demanding on the experience and skill of the surgeon. Nevertheless, when correctly performed, the minimally invasive approach provides the patient with a functional result similar if not worse compared to that obtained 6 weeks after conventional surgery.

Some studies have shown a higher dislocation rate with the posterior approach as compared with the anterolateral approach [17, 18, 20]. The current findings support these observations with two dislocations recorded in patients in the posterior group as opposed to none in the anterolateral group. Theoretically, minimally invasive hip hemiarthroplasty seems

beneficial. It causes less surgical, less soft tissue insult but not at the expense of decreased observation, which potentially increases complications related to the soft tissue envelope and component positioning. Our study showed that there are no substantial safety concerns using the minimal incision anterolateral approach. The mini-incision approach has produced less operative time, decreased length of hospital stay and bed stay, and improved early postoperative functions. The goal of additional studies remains to objectively determine rehabilitation benefits with gait analysis, and a longer follow-up.

There are several reports that investigated the learning curve of minimally invasive hip arthroplasty in details [22-25]. D'Arrigo and others [22] considered it to be the first 20 cases for a single surgeon. Seng and his colleagues [23] found that after 6 months, more than 50% of the patients received the hemiarthroplasty comfortably by the anterolateral technique. Mears *et al.* [24] reported an initial learning curve of 10 cases with regards to complications. Archibeck *et al.* [25] reported increased proficiency as indicated by decreased operative time and fluoroscopy use in the first 10 cases.

Despite the steeper learning curve required to master the Anterolateral approach, the early functional outcome of our study in patients treated using this approach showed the advantages of decreased trauma, operation time, length of hospital stay and bed stay, rehabilitation time, and dislocation rate over the southern moore's approach. Success of hip hemiarthroplasty using a minimally invasive approach depends on excellent operative technique and experience of the surgeon with standard hip approaches rather than on the use of special instruments.

Thus, once the learning period is passed, the stability and minimal muscular damage should permit the acceleration of postoperative rehabilitation, which can subsequently reduce the perioperative risk in the treatment of femoral neck fractures in the elderly with hip hemiarthroplasty.

Limitations of the study

The study does not evaluate the long-term complications of the procedures with >6 months of duration, such as implant failure, periprosthetic fractures, protrusion acetabuli, periprosthetic joint infections for which a separate study is needed.

The study does not consider the variation due to the comorbidities of the patient in question, which, may significantly affect the duration of hospital stay and duration of bed stay, both pre and post operatively.

Conflict of Interest

Not available

Financial Support

Not available

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