



Total hip arthroplasty with minimal invasive surgery in elderly patients with neck of femur fractures: our institutional experience

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KEYWORDS

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Hip fracture
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Total hip arthroplasty
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ABSTRACT

The purpose of this study was to investigate whether minimal invasive surgery (MIS) in elderly patients with neck of femur fractures would reduce the peri-operative complications and improve the post-operative ambulation and length of hospital stay in his cohort of patients. Forty elderly patients were treated with either total hip arthroplasty (THA) or bipolar prosthesis using MIS transgluteal approach. A matched reference group treated with a conventional surgical approach formed the control group. All procedures were performed by the same surgeon. Selection of acetabular component included Novae® uncemented press fit dual mobility concept socket or Bipolar Hemi-Arthroplasty (BHA). The femoral implant was Corail® uncemented stem or Fjord® cemented stem when primary instability was encountered. The follow-up was done for all patients and its minimum length was more than thirty-six months.

The average length of the skin incision was 7 (6–8) SD 0.7 cm. Eighteen THA, twenty-two BHA, thirty-seven uncemented femoral stems and three cemented stems were implemented. The length of the procedure was the same as those of the reference group. The operative and post-operative blood loss and analgesic use were significantly decreased in the MIS group. Radiographic implants positioning was similar amongst the two groups. No skin complication, no primary infection, no death within ninety days and no dislocations were observed. MIS approach for implanting THA after a femoral neck fracture in the elderly appears to be a reliable procedure.

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Introduction

The choice of treatment of displaced femoral neck fractures in the elderly continues to be hemiarthroplasty or total hip arthroplasty (THA) [1]. However, this group of patients usually suffers from a number of comorbidities that could influence their clinical outcome. The early and late mortality by six months after surgery has been reported to be as high as 17.5% [2].

In order to improve the management of this frail population focus has been given to optimize quickly their preoperative physiological state and to proceed with surgery within 48 hours. In addition any improvement of the surgical procedure itself would minimize the surgical stress reaction and the development of post-operative complications and would facilitate postoperative mobilization and return to pre-fracture functional status [1]. Such a strategy of applying minimal invasive surgery (MIS) has been proven beneficial in patients with hip osteoarthritis undergoing THA [3–5]. Could MIS [6] also be beneficial in elderly

patients with intra-capsular neck of femur fractures requiring replacement?

The purpose of this study therefore was to investigate whether MIS in elderly patients with neck of femur fractures would reduce the peri-operative complications and improve the post-operative ambulation in this cohort of patients.

Patients and methods

Between February 2004 to January 2005 forty consecutive patients admitted to our institution with proximal femoral fractures were eligible to participate and formed the study group. Inclusion criteria were patients over seventy years old with a displaced femoral neck fracture graded Garden III and Garden IV types [7] on the pelvis AP radiograph. Exclusion criteria were pathological fractures and patients below the age of 70 years old.

For comparison purposes 40 randomly selected patients that had been previously managed (between 2003 and 2004) with conventional approach matched for age and sex formed the control group of the study.

For the both groups, the surgical procedure was performed by the same trauma surgeon. The algorithm of treatment and the implants used were similar in both groups of patients.

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THA was selected based on patient's life expectancy [1] or a pre-existing osteoarthritis of the hip joint. Otherwise a Bipolar Hemi-Arthroplasty (BHA) was planned [1]. The planning of the position and the size of implants was carried out according to layers-method on the preoperative AP pelvis X-ray on the uninjured side. In the prospective series, the MIS approach was always performed.

MIS approach

The procedure was done with general anaesthesia or with local regional anaesthesia in the lateral decubitus positioning with an operating table in a strict horizontal position.

The skin incision was less than eight cm and suitable for Body Mass Index (BMI) of the patient. It focused on the greater trochanter (halfway anteroposterior and two-thirds proximal and one third distal). The surgical approach was performed with a modified transgluteal Hardinge type approach [8], without real muscle dissection. Following incision of the subcutaneous fat, fascia lata was opened vertically and, while gradually bending the hip, a tendon-periosteal flap digastric muscle section was performed at the point that goes with one third anteriorly and two thirds posteriorly of the greater trochanter, proximally along the axis of the gluteus medius muscle fibres and distally along the axis of the vastus lateralis muscle fibres. The anterior surface of the hip capsule was exposed anteriorly with two elevators placed on the anterior brim of the acetabulum and posteriorly with two retractors placed on the rear edge of the fascia lata. Then, the foot was placed in external rotation, the joint capsule on its anterior aspect was "T" shape incised and thus the femoral neck fracture was exposed. The femoral neck was cut with a saw according to the planning and the femoral head was extracted with a corkscrew. Subsequently, the acetabulum was exposed anteriorly with two elevators placed on the anterior acetabular brim and posteriorly with a curved retractor pushing back the greater trochanter. The fovea, the acetabulum centre, and the transverse ligament direction of the acetabulum were identified.

Acetabular socket implementation for THA

The prosthetic cup orientation was planned according to Lewinnek recommendations [9] with an inclination of $45^\circ \pm 10^\circ$ and an anteversion of $15^\circ \pm 10^\circ$ for its implantation in the safe zone. The acetabulum was milled according to these criteria and with the help of the previously noted acetabular landmarks until a subchondral bone "bleeding" was achieved. The direction and the bone-holding of a trial socket with the same diameter as the last milling were checked. The relative cup anteversion to the bony acetabulum was not increased to avoid overflow of the extra-osseous prosthetic metal cup. The final acetabular implant was impacted Novae® dual mobility press fit cup without cement, with two divergent plots in the pubis and in the ischium and with one malleable tab set by one cortical screw in the ilium.

Femoral implant implementation

The femur was brought closer to the surface of the incision by two elevators located on each side of the femoral neck. The opening of the femoral medullary cavity was carried out by a punch. The femoral stem anteversion was planned at 15° . The femoral broaching was achieved by increasing the size of the broach until a three-dimensional trapping of the trial broach rod was achieved. The femur length and the lateralization were adjusted while the trial broach rod was trapped in good position in the femoral canal, by the choice of the length of the collar. The final femoral implant was impacted; either Corail® stem without cement or Fjord® cemented stem when there was a primary instability of the broach during femoral broaching.

The aspect of the calcar after impaction of the femoral stem was systematically checked [1]. If a crack initiation was noted in the proximal femur, a 1.25mm stainless steel cerclage wire was used to maintain stability and containment of the canal.

Hip prosthesis reduction

When performing THA, a polyethylene insert matching the inner diameter of the acetabular cup was crimped onto a 22.2 mm diameter metal head (impacted on the femoral stem Morse taper). When performing BHA, a dual mobility metal shielded ball whose diameter was the same size or one mm less than the diameter of the extracted femoral head, was crimped onto a 22.2 mm diameter metal head (impacted on the femoral stem Morse taper). Once the reduction was achieved, the joint stability and the limb length were checked.

Suction drain and closing

A suction drain was systematically performed with one sub-fascial aspiration Redon drain®. Closure was performed with absorbable Vicryl® suture for each layer with re-attachment of the hip capsule and of the transgluteal flap. After closure of the fascia lata and the fat layer, the skin was sutured with staples.

Analysis method

The preoperative patients' evaluation included epidemiological data, BMI, comorbidities, ASA score [10], Parker score [11], residence type and need for walking aids.

Size of the incision, length of operating time, operative and peri-operative blood losses [12] and blood units transfused were recorded.

The protocol included systematic postoperative AP pelvic X-rays in a supine position conducted at the end of procedure to analyse inclination [13] and anteversion of the acetabular cup [14], haematological and biochemical monitoring (measurement of haemoglobin in the first and fifth day), thromboprophylaxis with a low molecular weight coagulant iso dose starting twelve hours after the end of the procedure, suction drain removal on the third day, standardized pain relief and mobilization protocol with full weight bearing on day one.

Early postoperative complications, progress of mobilization, length of hospital stay and destination of stay/care after hospital discharge were recorded.

Following discharge from the hospital patients were followed up in the outpatient clinics postoperatively for clinical and radiological assessment at day 8, 30, 60, 90, 180 and after 12 months. The monitoring was performed by the same surgeon.

The statistical calculation was performed in Statview® with Student's test. The significance level was $p < 0.05$.

All patients in the MIS group were reviewed with a minimum follow-up of thirty-six months and a maximum of forty-two months. The follow-up of the control group was the same.

Results

In total 40 patients (eight men and thirty-two women) were recruited with an average age of 84 (70–98) SD 7 years. The data of age and sex ratio of the patients is reported in Table 1. The historical control also consisted of 40 patients (seven men and thirty three women) with an average age of 83 (71–99) SD 8 years. There was no difference between the two groups in terms of age and sex distribution, $p < 0.03$.

The data of the length of the incision of the MIS group is reported in Table 2. No enlargement of the incision for technical difficulty or intraoperative complication has been made. The

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