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Proximal femoral nail antirotation versus hemiarthroplasty in the treatment of senile intertrochanteric fractures: Case report

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ABSTRACT

BACKGROUND: Primary hemiarthroplasty was recommended by some surgeons as the preferred choice in treating unstable senile intertrochanteric fractures with osteoporosis. However, many studies reported that proximal femoral nail antirotation (PFNA) currently was as an optimal implant for the treatment of different type of intertrochanteric fractures. Which method is better for treating senile intertrochanteric fractures remains controversial due to the insufficient clinical evidences.

METHODS: We reviewed all consecutive senile intertrochanteric fractures treated with PFNA or cemented hemiarthroplasty at our institution between July 2010 and March 2015. The primary outcome measures were postoperative complications, reoperation rate and hip function. The secondary outcome measures were intraoperative blood loss, transfusion rate, surgical time, postoperative hemoglobin, hospital stay and 1- year mortality.

RESULTS: Seventy-one patients in PFNA group and 52 patients in hemiarthroplasty group were included for analysis. There were no significant differences between the two groups regarding to the orthopaedic complications, reoperation rate, surgical time and Harris Hip Score at 1 year follow-up. Significant differences were found between PFNA and hemiarthroplasty group in comparison of intraoperative blood loss ($P < 0.001$), transfusion rate, medical complications ($P = 0.037$) and hospital stay ($P = 0.001$). Patients treated with hemiarthroplasty had a trend of higher postoperative 1- year mortality compared to those underwent PFNA but this was statistically not significant ($P = 0.134$).

CONCLUSIONS: These findings indicate that PFNA has obvious advantages over hemiarthroplasty in the treatment of senile intertrochanteric fractures. Hemiarthroplasty in treating these fractures is associated with greater surgical trauma and higher incidence of postoperative medical complications.

1. Introduction

Intertrochanteric fracture is a common injury in the elderly. The primary treatment for intertrochanteric fracture is internal fixation. However, senile intertrochanteric fractures treated with internal fixations are often associated with complications due to poor bone quality, such as metal failure, nonunion and femoral head perforation. Hip arthroplasty is always used as a salvage procedure for internal fixation failure [1,2]. Some studies reported that hip arthroplasty could shorten the weight bearing time, reduce the incidence of implant-related complications and improve the hip function when compared with internal fixations by Gamma nails, dynamic hip screws, and proximal femoral nails (PFN) [3,4]. In order to prevent the reoperation due to internal fixation failure, some surgeons recommended hemiarthroplasty as the preferred choice for treating the unstable senile intertrochanteric fractures with osteoporosis [5,6,]. Nevertheless recent studies indicated that proximal femoral nail antirotation (PFNA) currently was an optimal implant for the treatment of different type of intertrochanteric fractures [7–10]. PFNA is an intramedullary fixation system which allows early weight bearing postoperatively. The device permits impaction of the metaphyseal fracture through the sliding helically shaped collum-blade, which can accelerate the fracture union and reduce the incidence of femoral head penetration. Meta-analysis showed that PFNA had the benefits of less blood loss, minimal rate of fixation failure and shorter hospital stay compared with patients treated with Gamma nails, and dynamic hip screws [11,12].

So far, however, there was no prospective randomized study comparing PFNA with hemiarthroplasty for senile intertrochanteric fractures in the literature. Which method is better for treating these fractures in elderly patients remains controversial due to the insufficient clinical evidences. The purpose of this retrospective study

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was to compare the results of PFNA with hemiarthroplasty for senile intertrochanteric fractures.

2. Materials and methods

This study was approved by our institutional medical ethics committee and has been reported in line with the SCRE criteria [13]. The patients or their families were informed that data from the case would be submitted for publication, and obtained their consent. We reviewed all consecutive senile intertrochanteric fractures treated with PFNA or cemented hemiarthroplasty at our institution between July 2010 and March 2015. Patients aged ≥ 70 years and treated within 3 weeks after injury were included in the study. Pathologic fractures, multiple fractures treated with operation and those who lost follow-up were excluded. The chief doctors selected the treatment methods by their preference. If patients did not accepted the doctors' preferred choice, then the other treatment was selected. Before operation the patients and their families have been informed the choice of treatment, and all signed a consent form. The patients' baseline characteristics, operational data, the volume of concentrated red blood cells transfused, postoperative complications and rehabilitation program were obtained from the patients' medical records. Two authors independently collected the data. Discrepancy was resolved by discussion. The fracture type was classified according to the Arbeitsgemeinschaft für Osteosynthesefragen/Orthopaedic Trauma Association (AO/OTA) classification. Bone osteoporosis was graded according to the Singh index [14].

2.1. Surgical methods

All operations were completed by two experienced orthopedic surgeons. Patients were given either general or spinal anaesthesia. All patients were administered prophylactic antibiotics 30–60 min before operation. The patients treated with PFNA were placed in the supine position on fracture traction table. The injured lower limb was put in straight and mild abduction with foot fixed in the boot on the traction device. After performed continuous mechanical traction, the limb was put at 10–15° adduction and rotation neutral position, then the state of reduction was checked by G-arm fluoroscopy, and was maintained by the traction device. Most cases of fractures achieved satisfactory reduction by this manipulations. If closed reduction was failed, a limited additional incision on the trochanter level was conducted without extensive exposure of fracture blocks, through which fracture reduction was completed with surgical instruments. PFNA was planted under G-arm fluoroscopy. After closed reduction, an about 5 cm longitudinal incision was made approaching to the femoral greater trochanter. A guide pin was drilled from the lateral aspect of the greater trochanter to the femoral medullary canal, and then inserted the nail through the guide pin. The collum-blade was located in the lower half of the femoral neck in the anteroposterior view and centrally in the lateral view and its tip reached nearly 5–10 mm to the subchondral bone of femoral head. A static locking screw was inserted under an aiming device.

Hemiarthroplasty was performed by using posterolateral approach with patients positioned in the lateral position. The femoral head and neck was taken out after the femoral neck osteotomy was done by oscillating saw. The femoral medullary canal was reamed to the appropriate size. A cemented stem and a bipolar head were used. The femoral stem was cemented into the femoral canal using the modern third-generation cementing technique. In case where the calcar was deficient, a longer femoral stem was selected. The hip center of prosthesis was placed at the height of the trochanter tip. Anteversion of prosthesis was guaranteed at 15–20° according to lateral condyle of femur and lesser trochanter. The greater and lesser trochanter were reset and stabilized by using the tension band wiring technique. The external rotators were sutured to their anatomical locations.

2.2. Rehabilitation program

Patients were routinely given antibiotic prophylaxis for 48 h postoperatively. Low molecular heparin was given for two weeks as a mean of thromboprophylaxis. Patients were encouraged to do active and passive functional exercise from postoperative day 1. Patients with stable fractures treated with PFNA started partial weight bearing with a walker from 1 week after surgery; whereas those with unstable fractures started partial weight bearing 2–3 weeks postoperatively. Patients underwent hemiarthroplasty were encouraged to ambulate with support of a walker from postoperative day 2.

2.3. Follow-up and outcome measures

Patients were followed up at 1.5, 3, 6, 12 months for clinical and radiological evaluation after operation. Anteroposterior and lateral radiographs were performed to detect the fracture healing and implant-related complications. If the patients didn't come to hospital, the functional results were evaluated by telephone. The primary outcome measures were postoperative complications, reoperation rate and hip function. The postoperative complications were divided into orthopaedic complications and medical complications (occurred in hospital). The Harris Hip Score was used for functional evaluation [15]. The Harris Hip Score was divided into four grades: 90–100 were considered excellent; 80–89 were considered good; 70–79 were considered medium; and ≤69 was considered poor. The secondary outcome measures were intraoperative blood loss, transfusion rate, surgical time, postoperative hemoglobin, hospital stay and 1- year mortality. The surgical time of PFNA group was defined as from close reduction to complete the wound closure. The lowest value of hemoglobin in 5 days after operation was selected for comparison.

2.4. Statistical analysis

Statistical analysis was performed in Statistical Package for Social Sciences (SPSS) 20. Mean ± standard deviation or median value was reported for continuous variables. The Kolmogorov-Smirnov test was used to check the normality of distribution of continuous variables. If the continuous data were in accordance with Gaussian distribution, independent-sample *t*-test was used, and if the continuous data were not in accordance with Gaussian distribution, Mann-Whitney *U* test was used. Pearson chi-square test was used for the count data. A two-tailed *P*-value < 0.05 was considered to indicate statistically significance.

3. Results

Seventy-one patients in PFNA group and 52 patients in hemiarthroplasty group were included for analysis (Fig. 1). There was no significant difference in the comparison of baseline characteristics between PFNA and hemiarthroplasty group (Table 1).

There were significant differences between the two groups with regard to intraoperative blood loss, transfusion rate, postoperative HGB, time to partial weight bearing, and hospital stay (Table 2).

No statistically difference was observed between the two groups regarding to the Harris Hip Score at 1 year follow-up (81.3 ± 8.2 for the PFNA group and 79.1 ± 10.2 for the hemiarthroplasty group, *P* = 0.240, Table 3).

The incidence of orthopaedic complications was similar between the two groups (8.4% vs. 7.7%, *P* > 0.999, Table 3). In the