

# Hip arthroplasty for failed treatment of proximal femoral fractures

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**Abstract** Failed treatment of an intertrochanteric fracture typically leads to profound functional disability and pain. Salvage treatment with hip arthroplasty may be considered. The aim of this study was to evaluate the results and complications of hip arthroplasty performed as a salvage procedure after the failed treatment of an intertrochanteric hip fracture. Twenty-one patients were treated in our hospital with hip arthroplasty for failed treatment of intertrochanteric hip fracture. There were sixteen women and five men with a mean age of 75.8 years (range 61–85 years). Fourteen patients had failure of a previous nail fixation procedure, five had failure of a plate fixation, one of hip screws fixation and one of Ender nail fixation. In 19 out of 21 patients we performed a total hip arthroplasty—14 cases used modular implants with long-stems and five cases used a standard straight stem. In 2 of 21 cases we used a bipolar hemiarthroplasty. A statistically significant improvement was found comparing pre and postoperative conditions ( $p < 0.05$ ). Our experience confirms that total hip arthroplasty is a satisfactory salvage procedure after failed treatment of an intertrochanteric fracture in elderly patients with few serious orthopaedic complications and acceptable clinical outcomes.

## Introduction

Intertrochanteric fracture is one of the most frequent fractures in orthopaedic surgery with a high cost for the public health service. Almost nine out of ten proximal

femur fractures occur in patients older than 65 years of age and about three out of four occur in women [1, 2].

The most appropriate treatment for these fractures remains controversial. In fact, both reduction and internal fixation and replacement arthroplasty have been advocated as the primary treatment for these fractures [3].

However, most intertrochanteric hip fractures can be treated successfully with nail or plate fixation. Nevertheless, in a small percentage of patients, the fracture fails to heal because of the initial fracture pattern, comminution, suboptimal fracture fixation, or poor bone quality [4, 5]. Lu-Yao et al. [6] reported, in a meta-analysis on outcomes after displaced fractures, that 20–36% of patients initially treated with reduction and internal fixation required revision within two years, usually because of nonunion or avascular necrosis.

Failed treatment of hip fracture usually leads to functional disability and pain [7]. The two main treatment options for patients with a failed intertrochanteric hip fracture are revision internal fixation and a salvage treatment with hip arthroplasty [8].

There are a number of specific technical hurdles to successful hip arthroplasty in this setting, including the presence of failed internal fixation devices, bone deformity, bone loss, and poor bone quality.

To the best of our knowledge there are only a few, relatively small reports on this form of treatment [9–12]. The purpose of this study was to evaluate the results, technical problems, and complications associated with hip arthroplasty performed as a salvage procedure after failed treatment of intertrochanteric hip fractures in our institute.

## Materials and methods

Between 2004 and 2007, 21 patients (16 women and 5 men) with a mean age of 75.8 years (range 61–85 years)

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were treated in our hospital with hip arthroplasty for failed treatment of intertrochanteric hip fracture. Fourteen patients had failure of a previous nail fixation procedure, five had failure of plate fixation, one of hip screws fixation and one of Ender nail fixation. In the nail fixation group we had five cut-out of the neck screw (Fig. 1), one migration of the neck screw (Fig. 2), four fractures around the implant and four nonunions. Among patients treated with a plate fixation, failure occurred for cut-out of the lag screw in three cases and for nonunion in two cases. Patients treated with hip screw fixation failed for an avascular necrosis of the femoral head, and patients treated with Ender nails failed for nonunion. In all cases failure of the primary implant occurred within one year.

In 2 out of 21 cases we used a bipolar hemiarthroplasty. In 19 of 21 patients we performed a total hip arthroplasty. In 14 out of 19 cases we used modular implants with long-stems; all but one case were cementless. In 5 out of 19 cases we used a standard straight stem; all but one case were cementless.

All procedures were performed by the same senior author with the patient in lateral decubitus using the lateral direct approach [13]. The choice of the implant (hemiarthroplasty or a total hip arthroplasty) was made by the treating surgeon. Total hip arthroplasty was performed routinely if the acetabular cartilage was found to be markedly damaged at the time of surgery, and it was also done at the surgeon's discretion in some cases in which the acetabular articular cartilage was of good quality.

The mean duration of the operation was three hours (range 1.5–4 hours). One patient had a postoperative infection and needed revision for hardware removal,

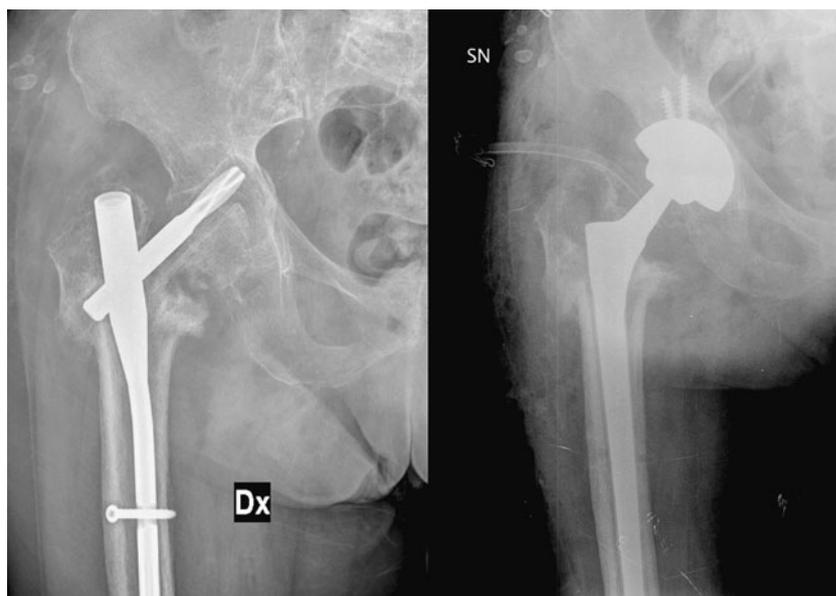
irrigation and debridement. All patients preoperatively received the same prophylactic antibiotics and the same postoperative anticoagulation therapy with low molecular weight heparin (LMWH). All patients were followed up after the arthroplasty at regular intervals of one, three, six and twelve months. Clinical status at the time of the last follow-up was evaluated by assessing pain, ambulatory status, use of walking aids, and domestic situation. WOMAC and Harris Hip scores (HHS) were also evaluated in all cases pre and postoperatively. Postoperative radiographs were evaluated for component position, cemented and uncemented component fixation and component loosening. Heterotopic bone was graded using the classification system of Brooker [14].

## Results

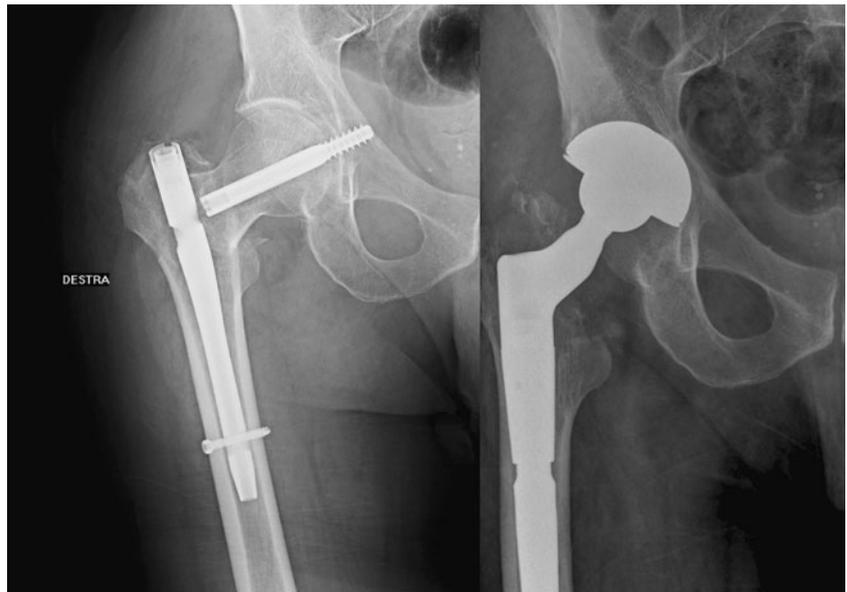
At the most recent follow-up all but one patient were re-evaluated (minimum six months of follow-up). One patient died of cardiovascular disease within the first year with the implant intact.

*Functional outcomes* Before the revision hip arthroplasty procedure all patients had moderate or severe pain in the hip and were unable to walk or had minimal walking ability with crutches. The mean WOMAC score was 87 (range 70–95, standard deviation [SD] 7.5) preoperatively and 43.7 (range 41–47) postoperatively at one month. The WOMAC score at six months postoperatively was 40.8 (range 38–45, SD 1.9). The mean HHS was 37 (range 32–45, SD 2.4) preoperatively and 81 (range 65–85, SD 6.1) postoperatively. In 4/21 (23.8%) cases, the postoperative HHS was

**Fig. 1** Pre and postoperative anteroposterior X-ray of a patient with cut-out of the neck screw



**Fig. 2** Pre and postoperative anteroposterior X-ray of a patient with migration of the neck screw



between 90 and 100, in 10/21 (47.6%) between 80 and 89, and in 6/21 (28.6%) between 70 and 79. In one case the HHS was poor. A statistically significant improvement in both scores was found comparing pre and postoperative conditions ( $p < 0.05$ ). All but one patient were able to walk supported by one arm (or less).

**Radiographic results** Radiographs were available for all patients at least six months postoperatively. In no cases were component malpositioning or dislocations and aseptic loosening detected. Heterotopic bone (Brooker type-2) was found in one case at six months.

**Complications** One patient had a femoral fracture during preparation of the femoral canal which was successfully treated by cerclage wiring.

## Discussion

Failed treatment of an intertrochanteric fracture typically leads to severe functional disability and pain, especially in elderly patients [4, 15–17]. Salvage options consist of either revision internal fixation or proximal femoral replacement with or without acetabular resurfacing. At the intertrochanteric or subtrochanteric level, a prosthesis with diaphyseal support is one of the solutions to this problem. The candidates for proximal femoral replacement are patients with non viable proximal femoral segments, no acute infection, no pre-existing arthritic condition of the hip joint, destruction of the proximal femoral articular surface and advanced age. In our series the choice of the revision implant was made on the basis of the advanced age of the

patients and to the marked damage of the acetabular cartilage present in all but one patient. Moreover, the choice of proximal femoral replacement (hemiarthroplasty or a total hip arthroplasty) in all cases was made to achieve earlier mobilisation and earlier weightbearing.

To the best of our knowledge very few studies have been published about this topic and show different results. Stoffelen et al. [9] reported on seven patients who had an arthroplasty for the treatment of an intertrochanteric non-union; five had good or excellent results. Mehlhoff et al. [18] reported on thirteen patients who had an arthroplasty after failed intertrochanteric fixation. Only five patients had good or excellent results, three patients had a dislocation and two patients had a revision because of instability. Tbash et al. [12] compared results of 53 total hip arthroplasties performed after failed treatment of a proximal femoral fracture with those of 53 routine total hip arthroplasties. An increased prevalence of complications and increased surgical difficulties were noted in the group of patients who had a previous hip fracture.

In our group of patients, 11 out of 21 failures were subsequent to osteoporosis with poor bone quality, 7 out of 21 failures were related to cut-out of the implant due to a suboptimal fixation and in 3 out of 21 failures the cause was not easily detectable.

When arthroplasty is performed after the failed treatment of an intertrochanteric hip fracture, a number of technical challenges must be overcome. Failed internal fixation devices, frequently with broken screws, must be removed from the femur. Special instruments for the removal of broken screws can simplify this process. Bone loss distal to the usual neck-resection level for hip arthroplasty is common, and calcar-replacement implants are frequently needed to make up for bone deficiency and to restore limb

length; however, such implants were not used in this series. Long-stem implants were used in 14/21 cases in our patients to bypass cortical defects left at the site of failed fixation devices. Proximal bone loss, bone deformity, and compromised proximal bone quality limit implant fixation options and can contribute to intraoperative femoral fractures during canal preparation. In our series we had one femoral fracture during preparation of the femoral canal which was successfully treated by cerclage wiring. Decisions about acetabular resurfacing were based on the surgeon's assessment of the quality of the remaining cartilage and on the surgeon's preferences.

In our series of patients we had good and excellent results in 70% of cases, in agreement with previous results published by Stoffelen et al. and Mehlhoff et al. However, we detected two of 21 intra and postoperative complications, an incidence of 9.5%, which is significantly higher than the rate of complications in our primary THA experience, in agreement with the findings of Tabsh et al. [12]. However, despite the technical challenges associated with the performance of hip arthroplasty in these patients, there was a surprisingly low rate of serious orthopaedic complications and the prostheses were durable.

The strength of this study includes the number of patients treated with total hip replacement for failure of intertrochanteric fracture, and the fact that the operations were in recent years, thus allowing us to assess the results of this operation in an era in which hip arthroplasty methods and implants have evolved sufficiently to treat these challenging problems effectively. Furthermore, all procedures were performed by the same senior surgeon with the same surgical approach. The weakness of this study includes the diversity of implant fixation method in the primary treatment of the fracture and the diversity of the prosthetic implant used for revision and the subjectivity of the choices between the arthroplasty and hemiarthroplasty.

On the basis of this study, total hip arthroplasty seems to be a satisfactory salvage procedure after failed treatment of an intertrochanteric fracture in elderly patients. However, this procedure performed as a revision of an intertrochanteric fracture is technically more difficult than routine primary total hip arthroplasty with a longer operative time and an increased incidence of postoperative complications. Despite the technical challenges, in our series there were surprisingly few serious orthopaedic complications and the clinical outcomes were acceptable.

In conclusion, we suggest that in some selected cases (elderly patients, initial fracture pattern, poor bone quality) hip arthroplasty may be a reliable treatment for intertrochanteric fractures [19].

**Conflict of interest statement** The authors declare that they have no conflict of interest related to the publication of this manuscript.

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