



## Satisfactory results of Stanmore total hip arthroplasty after failed osteosynthesis of the femoral neck

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**Treatment of fractures of the femoral neck by closed reduction and internal fixation results in a high incidence of complications, and often requires secondary total hip arthroplasty. We retrospectively studied 31 patients who underwent a Stanmore (Howmedica®) total hip arthroplasty performed five months (median) after osteosynthesis. The most common indications were : failure of fixation (n = 14), osteonecrosis (n = 9) and secondary osteoarthritis (n = 6). Eight patients had a maximum follow-up of 12 months ; the median follow-up was 30 months in the remaining group of 23 patients.**

**Although one patient had radiographical signs of femoral loosening, none of the patients studied needed revision of the total hip arthroplasty. Using the Merle d'Aubigné scoring system, we found excellent results in 94% of the cases.**

**Despite the short-term follow-up and the small number of patients, we conclude that the Stanmore THA was a satisfactory salvage procedure after failure of internal fixation for femoral neck fracture.**

### INTRODUCTION

The primary treatment of fractures of the femoral neck is mostly closed reduction and internal fixation. In the literature, complication rates after internal fixation range from 2 to 42% (1, 3, 10-12). The most common complication is failure of fixation, such as migration of the cervical screw. Avascular necrosis of the femoral head occurs in 7 to 12% of cases after internal fixation (3, 4, 10-12, 18). Although total hip arthroplasty (THA) is often advocated as a salvage procedure after failed osteosynthesis of hip fractures, literature support is

lacking. In our centre the Stanmore THA (Stryker Howmedica Osteonics®, Allendale, New Jersey, USA) is the first choice for cemented total hip replacement. We have used this prosthesis since the seventies for primary non-traumatic indications and for secondary indications such as after failure of internal fixation of femoral neck fractures. The aim of this study was to evaluate the Stanmore total hip arthroplasty as a salvage procedure for failed internal fixation of femoral neck fractures.

### PATIENTS AND METHODS

From 1985 until 2000, 31 patients underwent a Stanmore THA for failure of internal fixation of a femoral neck fracture ; they were all included in the study. We used in all cases the Stanmore CoCrMo alloy prosthesis with a 28-millimeter head and an ultra-high-molecular-weight polyethylene cup. Two patients had a 25-cm long femoral stem because of an intraoperative fracture in the trochanteric region ; a standard femoral stem was implanted in the other patients.

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**Fig. 1.** — Failure of DHS fixation of a femoral neck fracture 3 months after operation and secondary Stanmore total hip arthroplasty.

In January 2002 we retrospectively reviewed all patients. There were six male (19%) and 25 female patients (81%); the average age at insertion of the Stanmore prosthesis was 74 years (range: 59 to 92 years). There were 26 medial neck, three lateral neck and two intertrochanteric fractures. The majority (25 patients) had a Dynamic Hip Screw (DHS, Synthes) for the initial internal fixation; four patients had their fractures fixed with screws, and in the remaining two with intertrochanteric fractures, Ender Rods were used in one instance and a Gamma Nail in the other.

The median interval between the initial osteosynthesis and secondary THA was 5 months (range: 1 to 127 months). Indication for the secondary THA was in half (14/31) of the patients a progressive displacement

of the femoral head (fig 1). Avascular necrosis of the femoral head developed in nine patients and secondary osteoarthritis in six. Additionally one patient presented a non-union and in another one, one screw broke shortly after the osteosynthesis.

Eight patients died within one year after secondary THA and had a follow-up less than 12 months. The remaining group of 23 patients had a median follow-up of 30 months (range: 13 to 109 months).

We used the Merle d'Aubigné scoring system for clinical evaluation (13). A new standard radiographic examination was performed if the last radiograph had been made more than one year previously. We used the classification of Gruen and Salvati (8, 15) to assess radiolucent lines.

## RESULTS

Sixteen patients died after a median follow-up of 12 months (range : 1-84 months). Two patients were lost to follow-up, one because of emigration and one was not able to participate because of a mental disorder. Peroperatively two patients had a fracture of the greater trochanter during insertion of the femoral component. Both fractures were treated with cerclage wires (fig 2).

Two patients (6%) had short-term complications. One was reoperated to remove extramedullary cement ; the other patient presented a sciatic nerve paresis, which fully recovered after four weeks. Twenty-nine patients (94%) had excellent clinical results at their latest follow-up using the Merle d'Aubigné scoring system. Two patients had moderate pain in the hip and needed a cane when walking (table I).

Radiolucent lines (RLL) were detected on standard radiographs in 15 patients : eight patients had RLLs in zone 1 and zone 7 of the femoral component and five had RLLs in zone 1 of the acetabular component. All but one of these lines had a maximum thickness of 1 millimeter. One patient had signs of radiological loosening of the femoral component, with RLLs ranging from 1 millimeter to over 2 millimeters in zone 1, 6 and 7 (table II). However, there were no clinical complaints and therefore no revision was indicated. Wear, migration or resorption of the calcar were seen in no instance at the latest follow-up.

## DISCUSSION

This study shows that the results of Stanmore Total Hip Arthroplasty after failed internal fixation of femoral neck fracture are satisfactory, even in comparison with the results found by Gerritsma-Bleeker *et al* for Stanmore THA for primary non-traumatic indications (6). One weak point in this study is the short-term follow-up. However, McKinley and Robinson showed that most complications occur during the first year of follow-up (11). In their study they compared THA performed immediately after the hip fracture to THA performed after failed osteosynthesis. They found an



**Fig. 2.** — Cerclage wire osteosynthesis of the greater trochanter.

increased morbidity in the group treated with prior osteosynthesis. In our hospital all hip fractures were initially treated with osteosynthesis, except in elderly patients with short life expectancy. In these

Table I. — Results according to the Merle d'Aubigné scoring system

Points	Pain	Walking	Flexion	Patients (%)
0	severe, continuous	none	ankylosis	0
1	severe, sleep disorder	2 crutches	mild ankylosis	0
2	severe at walking	2 canes	less than 40°	0
3	mild, moderate at walking	1 hour with 1 cane	40 to 60°	0
4	not at rest	> 1 hour with 1 cane	60 to 80°	1 (3)
5	sometimes	without cane, limp	80 to 90°	1 (3)
6	none	normal	> 90°	29 (94)

Table II. — Radiological findings

	Cement – Radiolucent (n = 16)	Radiopaque (n = 15)
Acetabular component		
Migration	0	0
No migration	16	15
Radiolucent lines (millimeter)		
Yes		
Zone I (1)		5
No		10
Wear		
Yes	0	0
No	16	15
Cement fracture		
Yes	0	0
No	16	15
Femoral component		
Migration	0	0
No migration	16	15
Radiolucent lines (millimeter)		
Yes		
Zone I (1)	8	
Zone VII (1)	7	
Zone I (2), VI (1), VII (2)	1	
No		15
Bone resorption calcar		
Yes	0	0
No	16	15
Cement fracture		
Yes	0	0
No	16	15

latter cases we prefer hemiarthroplasty (17). Although the results of hemiarthroplasty are not completely satisfactory with regard to pain and hip function, the functional demands are relatively minor in such indications. Using the protocol described above we prevent unnecessary overtreatment with a THA.

There are a few reports about THA following failed osteosynthesis of femoral neck fractures in the literature, and none of the studies has used one single type of prosthesis. Franzen *et al* have noted nine complications in 84 hips treated with THA, with permanent dislocations being the most common (4). Dislocation of the secondary THA occurred in two patients (5%) in the study of Hagglund *et al* (9). They suggest that splinting the knee in extension was effective in the prevention of hip dislocation. Tabsh *et al* had a similar dislocation rate (3/13), mostly after intertrochanteric fractures (18). In contrast to these studies, we did not have any dislocation in our series.

Furthermore, Mehlhoff *et al* concluded that the results of secondary THA after intertrochanteric fractures are worse than following THA for primary non-traumatic indications (12). Although we only had two patients with intertrochanteric fractures in our series, their results after THA are similar to those after cervical fractures. The fracture location was not found to be a prognostic factor in our study.

After removal of the internal fixation, THA was performed in a standard fashion. During cement pressurising, the cortical defects were covered by the surgeon's fingers or filled with autologous bone graft to prevent cement extrusion through the screw holes. In our series, cement extrusion was seen in one case. Removal of extramedullary cement was indicated because of persisting pain. Although this has been reported in the literature, it is usually not reported as a complication (11, 13). The surgeon should pay attention to bypass the screw holes of the osteosynthesis with a long femoral stem.

In our series a transient sciatic nerve paresis was noted, which completely recovered in one month. There is an increased possibility of a heat injury due to the wider femoral canal and the presence of screw holes which requires more bone cement (14).

The overall median follow-up in our series was 24 months, but 8 patients died within one year after the secondary THA. The short follow-up is related to the poor general condition of a number of patients at the time they fractured their femoral neck. Increased mortality, up to two years after the hip fracture, is also noted in the literature (15). None of the patients in our series died of a condition related to the hip arthroplasty.

The value of radiological evaluation of THA with standard radiographs is limited. One single radiolucent line does not have clinical relevance (7). Gerritsma-Bleeker *et al* found wear of the cup and migration after a 22 years follow-up. We did not note any wear, migration or bone resorption of the calcar, which is also related to our short follow-up. Franzen *et al* found a revision rate of 4.3% (2/47) after salvage treatment with a THA (4). In our series, we had one case of aseptic loosening of the THA (1/31) but no revision operation was scheduled as the patient did not have any significant complaints.

In retrospective studies on THR, we prefer the Merle d'Aubigné scoring system to other scoring systems (5). At their latest follow-up visit, 94% of the patients studied had good clinical results. This clinical outcome is in line with the literature. Franzen *et al* surprisingly found that the overall results after secondary THA were better than after primary non-traumatic THA (4), suggesting that secondary arthroplasty could be performed more safely than an elective procedure. The present study does not provide any arguments to support such a statement.

In patients with femoral neck fractures the standard treatment is mostly osteosynthesis. However, patients older than 80 years and patients with pathological fractures should be treated with a bipolar hemiarthroplasty because of their immediate functional demands in combination with their probably short life expectancy (2). Primary THA for fractures of the femoral neck is only indicated in patients with severe coxarthrosis prior to trauma.

Despite the short-term follow-up, we conclude that after failure of the osteosynthesis Stanmore THA is a satisfactory salvage procedure.

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