

INTERTROCHANTERIC FRACTURES : INTERNAL FIXATION OR PROSTHETIC REPLACEMENT ?

P. L. O. BROOS, I. FOURNEAU

Different studies on the treatment of 756 intertrochanteric fractures type IC-ID of Evans and Jensen and type A2 according to Müller allow us to conclude that :

– There is no difference as to mortality rate after 1 year in patients treated with internal fixation (DHS) or patients treated with an endoprosthesis (EP) (23 versus 24%) ($p > 0.05$).

– The final functional evaluation after one year shows that the results of DHS fixation and EP surgery are quite comparable (65% good results) and are better than in patients treated with blade plates or Ender nails ($p < 0.01$).

– The transfusion requirement is higher after EP treatment than after DHS treatment ($p < 0.05$).

– The DHS as well as the EP treatment rarely lead to major complications requiring reoperation (3% versus 1%) ($p > 0.05$).

– The highest complication rate after DHS-treatment (severe collapse) (80%) is observed in patients with Evans and Jensen ID or Müller A2-2/3 fractures enjoying a normal functional status pre-injury. These fractures may be the only indication for primary EP replacement.

Keywords : endoprosthesis ; hip fracture ; DHS ; geriatrics ; complications.

Mots-clés : endoprothèse ; fracture de hanche ; DHS ; vieillard ; complications.

1. It requires a major operation resulting in significant blood loss.
2. Mechanical difficulties are encountered when a large segment of the proximal femur has to be replaced.
3. There is a high risk of infection which can necessitate removal of the prosthesis with disastrous sequelae (10, 12).

Internal fixation using a compression hip screw might still be an appropriate treatment even for severely comminuted fractures, especially in patients with advanced osteoporosis, but with some restrictions.

When treating elderly patients, restoration of function is the most important goal. In our opinion, immediate unrestricted full weight bearing should be postponed for a few weeks after internal fixation, as suggested by Gruss and Traut (7), whereas unrestricted full weight bearing can be initiated within two or three days following operation when a cemented endoprosthesis is used.

For this reason, a number of these fractures have been treated with an endoprosthesis in the University Hospital Gasthuisberg of the Katholieke Universiteit Leuven.

Two retrospective and one prospective study allow us to draw some clear conclusions from this experience.

INTRODUCTION

The use of endoprostheses has never been popular in the treatment of trochanteric fractures for several reasons :

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CLINICAL STUDIES

Between 1978 and 1995, two retrospective and one prospective study have been conducted concerning the use of an endoprosthesis as a primary treatment for recent unstable intertrochanteric fractures (6, 8, 9, 11) in hips without osteoarthritis. Owing to their subtrochanteric component, "reversed fractures" were not included. All patients were older than 70 years of age.

Prosthetic replacement was carried out with the patient in the supine position, and the affected hip was explored using an anterolateral approach. The femoral neck was completely removed. Cerclage wiring of the greater trochanter was not routinely performed as it can be a time-consuming and sometimes difficult procedure. Indeed, snapping of the encircling wires and pseudarthrosis of the greater trochanter have no influence on walking capacity or pain in elderly patients (4).

Early unrestricted weight bearing was required of all our patients. In all studies, the functional status of the patient was evaluated using our "scale of independence" (4). This scale is based on the ambulatory capacity of the patient at the time of the accident and his/her capacity to perform activities of daily living. Patients with a relatively good functional status, evaluated on this scale, were considered as "independent" patients. In order to be considered as independent, the patient had to meet at least the following criteria: ability to walk outdoors more than 50 meters without walking aids, except one cane or crutch, and ability to get dressed and to get up from an armchair without assistance. Furthermore, since the functional recovery of elderly patients is greatly dependent on their mental and neurological status, possible alterations of these functions were also recorded. Inability to communicate sufficiently with the hospital staff or a neurological disease influencing the functional capacity (e.g. Parkinsonism, stroke) was considered pathological. The functional capacity at discharge from the hospital was only recorded for the patients who were independent preoperatively.

Student's t-test and the chi-square test (with correction for continuity in 2 x 2 contingency tables) were selected for, respectively, parametric and non-

parametric statistical analysis. The 5% probability level was considered to be significant.

Study I

Between 1978 and 1984, 102 patients were treated with a long stem - long neck endoprosthesis. A bipolar prosthesis was used in 78 cases, a total prosthesis in 24. We retrospectively compared this cohort with 55 patients treated with internal fixation (Ender nails or angled blade plate).

There was no statistically significant difference between patients treated with an endoprosthesis and patients treated with osteosynthesis as to average age, sex ratio and number of associated ailments (table I). The duration of the operation was almost equal for Ender nailing, blade plate fixation or total hip arthroplasty. Insertion of a bipolar prosthesis required a shorter operating time. Bipolar prosthetic replacement resulted in less blood loss than internal fixation with Ender nails or with blade plate (table II). There was no significant difference as to the mortality rate at one year (table III). Treatment with the endoprosthesis had a very low incidence of postoperative mechanical complications in comparison with Ender nailing and blade plate fixation (table IV). Fifty-seven percent of the surviving patients who enjoyed a good functional condition at the time of injury maintained this status one year after surgery. More than 90% were painfree or only felt moderate pain when walking.

We concluded that prosthetic replacement was not a more serious intervention than osteosynthesis. The mortality rate after prosthetic replacement was not significantly different from the mortality rate after osteosynthesis; the incidence of mechanical complications was significantly lower.

Table I. - Study I:
Unstable intertrochanteric fractures (n = 157)

	Endoprosthesis (n = 102)	Osteosynthesis (n = 55)
Average age	83	81
Sex ratio (m:f)	1:2.7	1:2.9
Average number of associated ailments	5.3	4.9

Table II. – Study I :
Unstable intertrochanteric fractures (n = 157)

Procedure	n	Average operating time (min)	Average blood loss (ml)
Ender nails	14	66	339
Angled plate	41	69	510
Bipolar prosthesis	78	42	276
Long Spherostem THP	24	64	726

Table III. – Study I :
Unstable intertrochanteric fractures (n = 157)

Mortality rate	Osteosynthesis (Ender nails or angled plate) (n = 55)	Endoprosthesis (n = 102)
Within 24 h	1 (2%)	2 (2%)
Within 1 month	6 (11%)	16 (16%)
Within 1 year	13 (24%)	34 (33%)

Table IV. – Study I :
Unstable intertrochanteric fractures (n = 157)

Procedure	n	Postoperative mechanical complications	
Ender nails	14	Distal slipping	4
		Supracondylar fracture	2
		Penetration into acetabulum	2
Angled plate	41	Device loosening	2
		Device breakage	3
		Dislocation	1
Endoprosthesis	102		

Study II

In 1991, we reviewed 287 Evans and Jensen IC-ID or Müller A2 fractures treated between 1984 and 1988. One hundred forty-two patients were treated with a dynamic hip screw (DHS), the other 145 with a Vandeputte prosthesis (VDP) (1, 2), an improved version of the former Merle d'Aubigné-Leinbach prosthesis. The main advantage of this prosthesis compared with the long neck endoprosthesis is that the proximal extremity is made in such a way that more support is given to the femoral shaft after resection of part of the trochanteric region (fig. 1).

Both groups were completely comparable as to age, sex ratio and functional status pre-injury. Once

again, it was clear that primary prosthetic surgery should not be considered an extreme treatment. Implanting a bipolar endoprosthesis did not take more time and did not cause more blood loss than performing internal fixation with a dynamic hip screw (42 minutes vs. 48 minutes; 278 ml vs. 342 ml ; $p > 0.05$). Moreover, the mortality rate was not higher (32% vs. 32% after one year).

It appears that 73% of the surviving prosthesis patients and 63% of the surviving dynamic hip screw patients did not complain of pain ($p > 0.05$).

The dynamic hip screw as well as the endoprosthesis treatment rarely led to major complications requiring reoperation (respectively 3 and 1%) ($p > 0.05$). Reoperation after the dynamic hip screw was necessary in 3 cases because of complete, extremely painful fracture collapse.

The final functional evaluation after one year was only made for the 92 "independents" (65%) in the dynamic hip screw group and the 95 "independents" (65.5%) in the prosthesis group. This showed that the results from dynamic hip screw fixation and from prosthetic surgery were equivalent : 64% of the dynamic hip screw patients and 65% of the prosthesis patients were still "independent" (table V).

Table V. – Study II :
Evaluation in independent patients after one year (n = 179)

	DHS (n = 88)	VDP (n = 91)	
still independent	56 (64%)	59 (65%)	NS*
pain complaints	24 (27%)	15 (17%)	NS
reintervention	3 (3%)	1 (1%)	NS

* NS : not significant

This study has proved again that prosthetic surgery should not be considered as a more invasive treatment, as the final results of unstable fractures with severe comminution (6, 8, 9, 11) show no differences between the patients treated with a dynamic hip screw or a prosthesis. It might be concluded that, as prosthesis surgery has no advantages, it should therefore not be encouraged, especially when it comes to surgeons unfamiliar with the method. This conclusion may however be a little premature. On scrutiny, it appears that equally

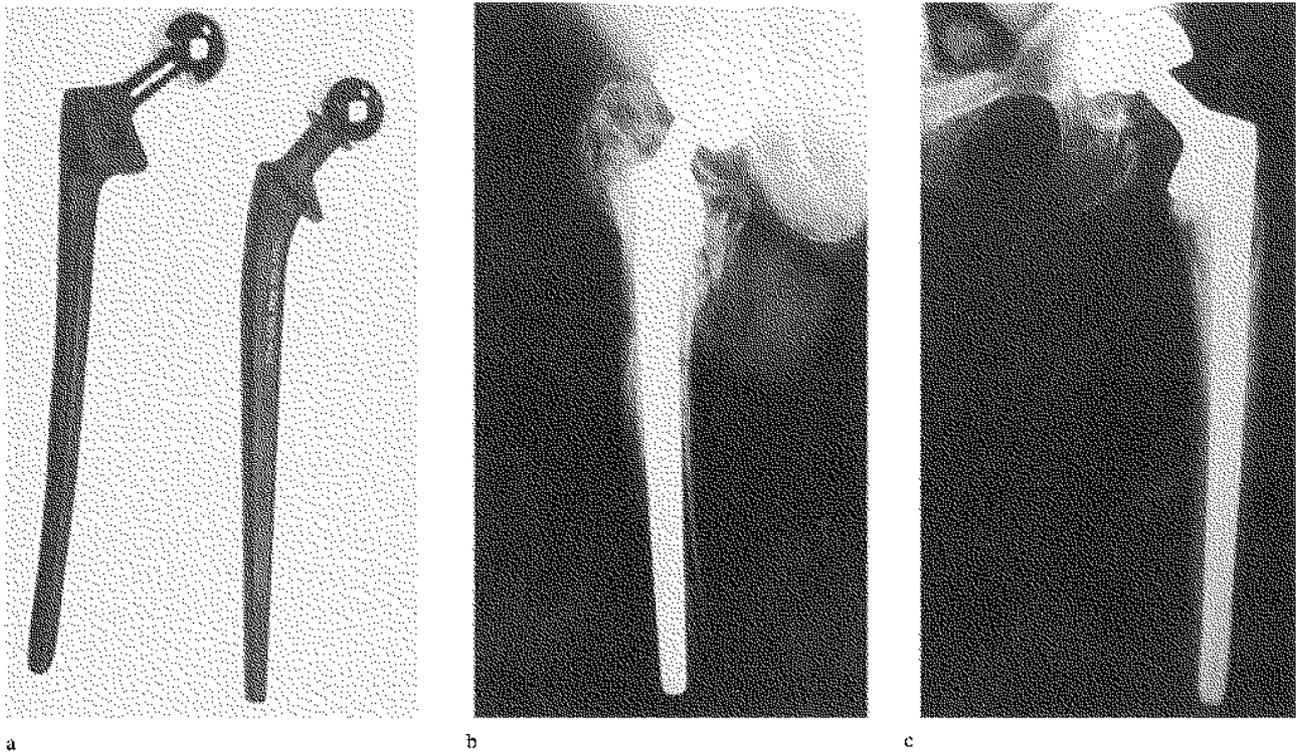


Fig. 1a. – Right : Vandeputte prosthesis, left : long spheristem – long neck prosthesis. **Fig. 1b.** – Intertrochanteric fracture treated with a long spheristem – long neck prosthesis. **Fig. 1c.** – Intertrochanteric fracture treated with a Vandeputte prosthesis.

good results were not achieved in every type of unstable fracture. The less satisfactory results were mostly found in Evans and Jensen ID or Müller A2-2/3 fractures. All 3 reoperations took place in Evans and Jensen ID or Müller A2-2/3 fractures. Serious collapse with medialization occurred in 39 of the 88 survivors. This occurred in 20 of the 26 Evans and Jensen ID or Müller A2-2/3 fractures (77%) and only in 18 of the 62 Evans and Jensen IC or Müller A2-1 fractures (11%) ($p < 0.001$). There was also a clear correlation between collapse and pain : 32 of the 39 patients (82%) with a significant collapse had pain complaints compared with only 9 of the 49 patients without collapse (18%) ($p < 0.001$).

Finally, only 19% of the patients with an Evans and Jensen ID or Müller A2-2/3 fracture (5 out of 26) were painfree compared with 81% of the patients with an Evans and Jensen ID or Müller A2-1 fracture (50 out of 62) ($p < 0.001$).

We concluded that the dynamic hip screw gave good results in the treatment of unstable intertrochanteric fractures. Nevertheless, the dynamic hip screw has a risk of serious collapse in nearly 80% of cases, especially in very complex multifragment fractures. There is a good correlation between collapse and pain. On the other hand, prosthetic surgery, especially with a bipolar prosthesis, no longer needs to be considered as a major operation since the danger of mechanical complication is minimal. Because of this, it may be advisable to apply this treatment initially, especially when confronted with complex multifragment fractures.

Nevertheless, we must be very careful not to draw premature conclusions. Finally, we concluded that this problem can only be solved by undertaking a strict randomized prospective study, which was started in May 1989 in all Evans and Jensen IC and ID or Müller A2 fractures in hips without osteoarthritis.

Study III

Between May 1989 and May 1992, 90 patients aged 70 years or more with a fresh unstable intertrochanteric fracture (IC, ID, A2) in a nonarthritic hip were included in this study. On admission, patients were randomly assigned to one of the two treatment regimens. When the study was closed, 43 (48%) patients had been allocated to a cemented Vandeputte (VDP) endoprosthesis and 47 (52%) to an AO/ASIF dynamic hip screw (DHS).

Both treatment groups were comparable as to fracture type, age and functional status pre-injury (table VI).

In this study, the transfusion requirement was significantly higher after VDP endoprosthesis treatment than after DHS treatment. Only 57% of the osteosynthesis group needed a transfusion of at least 400 ml against 79% of the endoprosthesis group ($p < 0.05$).

Table VI. – Study III :
Comparison of the Dynamic Hip Screw (DHS) (n = 47)
versus the Vandeputte endoprosthesis (VDP)
treatment group (n = 43)

	DHS	VDP	
Fracture type			
Evans and Jensen IC	34 (72%)	27 (63%)	
Evans and Jensen ID	13 (28%)	16 (37%)	NS
Age (yrs) (mean)	87,7		
< 85 yrs	23 (49%)	25 (58%)	
> 85 yrs	24 (51%)	18 (42%)	NS
Prefracture functional status			
Dependent	18 (38%)	12 (28%)	
Independent	29 (62%)	31 (72%)	NS
Neuropsychiatric pathology			
Yes	19 (40%)	17 (40%)	
No	28 (60%)	26 (60%)	NS

There was no significant difference in mortality rate between the DHS-group and the VDP-group (21 versus 23%).

One patient treated with the VDP prosthesis showed recurrent dislocation requiring reoperation. The VDP endoprosthesis was replaced by a Wagner endoprosthesis after which there was an uneventful recovery.

In 9 out of 47 patients (20%) treated with a dynamic hip screw, severe fracture redisplacement and collapse was seen, associated twice with cutting out of the screw requiring reoperation. Therefore, the reintervention rate was 2% in the VDP group and 4% for the DHS group. This difference is not statistically significant. The difference in final functional result in the surviving independent patients after one year was also not significant: 60% of the VDP patients (15 out of 26) remained "independent" compared with 50% of the DHS patients (13 out of 26).

Nevertheless, there was once again a correlation between mechanical complications and fracture type, as well as between mechanical complications and functional status of the patient pre-injury in the 43 surviving patients treated with a DHS.

We therefore observed severe displacement and collapse in 3 out of 34 Evans and Jensen IC or Müller A2-1 fractures (9%) and in 6 out of 13 patients with an Evans and Jensen ID or Müller A2-2/3 fracture (46%). Displacement and collapse occurred in only 2 out of 18 of the "dependent" patients (11%) and in 7 out of 29 "independent" patients (24%). It appeared that the highest complication rate was observed in patients with a good functional status pre-injury with an Evans and Jensen ID or Müller A2-2/3 fracture.

We may conclude that endoprosthetic surgery is only indicated in Evans and Jensen ID or Müller A2-2/3 fractures in independent patients and that early weight bearing is not without risk after dynamic hip screw treatment in unstable intertrochanteric fractures. Therefore, for severely comminuted fractures treated with a dynamic hip screw, especially in patients with advanced osteoporosis, we proceeded in our department to controlled weight bearing.

CONCLUSIONS

Based on these three studies, we conclude that there is no significant difference as to mortality rate after 1 year in patients treated with internal fixation (blade plate, Ender nails, DHS) or with an endoprosthesis ($p > 0.05$). The functional results however are clearly better in patients treated with an

endoprosthesis than in patients treated with blade plates or Ender nails ($p > 0.01$).

The final functional evaluation (after one year) for all Evans and Jensen IC-ID or Müller A2 fractures shows that the results of DHS fixation and prosthetic surgery are quite comparable. DHS fixation as well as prosthetic replacement rarely lead to major complications requiring reoperation and the incidence of major complications is not significantly different in the two groups ($p > 0.05$). The transfusion requirement is however significantly higher after endoprosthetic treatment than after DHS treatment ($p < 0.05$).

After DHS treatment, there is a correlation between mechanical complications and fracture type and between mechanical complications and functional status of the patient pre-injury. The highest complication rate is observed in patients with Evans and Jensen ID or Müller A2-2/3 fractures enjoying a normal pre-injury functional status.

In very complex multifragment fractures (Evans and Jensen ID or Müller A2-2/3) the DHS treatment has a risk of serious collapse and pain in nearly 80% of cases.

Only an Evans and Jensen ID or Müller A2-2/3 fracture in patients enjoying normal functional status pre-injury may be an indication for primary prosthetic replacement.

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SAMENVATTING

P. L. O. BROOS, I. FOURNEAU. Behandeling van intertrochantere fracturen: inwendige fixatie of endoprothese?

Jarenlang ervaring met verschillende behandelingsmethoden voor 746 onstabiele intertrochantere fracturen (type IC-ID volgens Evans en Jensen of type A2 volgens Müller) lieten ons toe volgende besluiten te trekken:

- Inwendige fixatie en prothesechirurgie gaan gepaard met dezelfde mortaliteit na één jaar ($p > 0.05$).
- DHS behandeling en prothesechirurgie gaan slechts zelden gepaard met ernstige verwikkelingen die tot heringreep nopen (3% vs. 1%, $p > 0.05$). Beide technieken leiden tot 65% gunstige functionele resultaten na één jaar. Deze resultaten zijn veel beter dan na behandeling met hoekplaten of met Enderse pennen ($p < 0.01$).
- De transfusienood is groter bij prothesechirurgie dan bij DHS behandeling ($p < 0.05$).
- 80% van de mechanische complicaties (forse collaps) na DHS-behandeling worden gezien bij patiënten met fracturen van het type Evans ID of Müller A2-2/3 die

voor de val nog goed konden stappen. Zulke gevallen zijn de enige indicaties om primair een endoprothese te plaatsen.

RÉSUMÉ

P. L. O. BROOS, I. FOURNEAU. Fractures pertrochantériennes : traitement par ostéosynthèse ou prothèse ?

Notre expérience du traitement de 746 fractures pertrochantériennes instables (Type IC-ID de Evans et Jensen ou A2 de Müller) nous a permis de conclure que :
– Il n'y a pas de différence statistique en ce qui concerne la mortalité après un an entre le groupe de malades traités par ostéosynthèse et le groupe traité par endoprothèse (23% contre 24% ; $p > 0.05$).

– Ni le traitement par DHS, ni le traitement par prothèse ne sont associées à un taux élevé de complications graves nécessitant une réintervention (3% contre 1% ; $p > 0.05$). Les deux techniques nous montrent des résultats bons et excellents dans 65% des cas un an après l'opération. Ces résultats sont supérieurs à ceux obtenus après fixation par lame-plaque ou par clous de Ender ($p < 0.01$).

– Le traitement par endoprothèse nécessite plus de transfusion sanguine que le traitement par DHS ($p < 0.05$).

– Parmi les complications mécaniques après DHS, 80% ont été observés chez des malades valides présentant les fractures les plus complexes (type Evans et Jensen ID ou Müller A2-2/3). C'est uniquement dans ces cas qu'une endoprothèse pourrait être indiquée comme traitement primaire.