

## The role of primary total hip replacement for the treatment of the displaced femoral neck fractures

P. Nikiforidis, G.Ch. Babis, N. Papaioannou, D.S. Korres and T. Pantazopoulos

Orthopaedic Department, University of Athens Medical School, KAT Accident Hospital, Nikis 2, Kifissia, 145-61 Athens, Greece

**Summary:** The management of displaced intracapsular fractures of the hip is still controversial because of the high incidence of complications after internal fixation or hemiarthroplasty. To avoid some of these complications we have used primary total hip replacement for independently mobile patients over 65 years of age.

Of 49 patients who were interviewed an average of 4.6 years after total hip replacement, 81.6% had excellent or good results as assessed by the Harris Hip Score. At that time two hips had been revised and another converted to Girdlestone due to deep infection. The survival of the prostheses was at 5 years 91.3%.

It is concluded that total hip replacement is an established method of management for a selected group of patients with this injury, but further prospective studies are needed in order to define the groups of patients that benefit the most.

**Key words:** Total hip arthroplasty — Femoral neck fractures

The treatment of acute femoral neck fractures remains a major challenge in modern Orthopaedics. A displaced femoral neck fracture is difficult to treat

and the indications for internal fixation, total hip arthroplasty or hemiarthroplasty have not been well clarified. The injury is commonest in the elderly and has significant morbidity and mortality, which continue for at least 6 months after injury [1, 17].

The management of subcapital fractures of the femur in younger, more active patients with stage III or IV fractures [8] remains controversial. For patients of 70 years of age or less the surgical options include reduction with internal fixation, hemiarthroplasty and primary total hip replacement. The result of treatment by reduction and internal fixation is influenced by many factors, including the age of the patient, displacement of the head of the femur, delay in reduction, the quality of reduction, the type of fixation device and its final position. These results are marred by a high incidence of non union and avascular necrosis. Barnes et al. [1] reported 20 to 25% non union for this age group and Skinner and Pawles [16] reported non union in 26%. Avascular necrosis either segmental or of the entire head, resulting in late collapse, occurs in up to 33% of cases.

Hemiarthroplasty is often unsatisfactory in younger patients because of a high incidence of acetabular erosion and pain. In patients under 70 years of age, 26% were found to have such complications at an average follow-up of 3 years [6]. Stem loosening may occur

from 6 to 12% of cases [6, 14]. Kofoed and Kofod [12] reported that 55% of active patients living in their own home after a hemiarthroplasty had subsequently undergone revision to total hip replacement as a result of these complications.

More recently, primary total hip replacement has been advocated for severely displaced fractures. Encouraging early results have been reported [4,5,15] but the follow up in all these studies was short and the age of the patients was not considered. Taine and Armour [18] reported their results in patients of average age of 78 years. After an average of 42 months seven patients (12%) had undergone revision. In contrast, Delamarter and Moreland [7], reported excellent results after a longer period of follow-up, but their patients had an average age of 72 years and most of them had pre-existing hip disease.

This prospective study was performed to determine the safety, the complications and the results of primary total hip replacement for the displaced femoral neck fractures.

### Material and methods

From 1988 to 1993 a total of 51 patients aged 76 years or less had a primary total hip replacement (T.H.R.) for an acute displaced femoral neck fracture, at the University Department KAT Accident Hospital in Athens. Only patients who

had been living an independently mobile life, were included in this study.

Contraindications to T.H.R. included infection and neurovascular disease, while patients with pathological fractures were also excluded.

There were 33 women and 18 men with an average age at operation of 71.2 years (range 65 to 76 years).

Thirty of the femoral neck fractures in our series (58.8%) were subcapital, 14 (27.5%) were mid-cervical and 7 (13.7%) were basilar. 18 (35.3%) of the fractures were classified as Garden's stage III and 33 (64.7%) as stage IV [8]. Furthermore over one half of the fractures were considered comminuted.

Twenty-two patients in the series (43.1%) were noted to have mild osteoporosis and 12 (23.5%) had severe osteoporosis, as was evidenced by the fractures that occurred spontaneously or as a result of minor trauma.

Arthritic signs of the acetabulum and of the femoral head were categorised according to radiographic and operative findings. Ten patients (19.6%) had severe degenerative changes, fifteen (29.4%) had moderate and the rest 26 (51%) had no or only slight degenerative arthritis.

All patients received prophylactic antibiotic coverage beginning one hour before the operation and continuing for 48 hours postoperatively. Prophylactic anticoagulation with low molecular heparin was begun in all patients on admission and was continued for 8 to 21 days postoperatively until the discharge of the patient.

All patients were operated on within 10 days of the accident (mean 7.2 days). Spinal anaesthesia was used in 80% of them and general anaesthesia in the remainder. The operations were mainly performed through a posterior approach (80.8%) or a lateral transtrochanteric one. A variety of implants were used -all cemented-: SP-II (32), Charnley (11), Mueller (8). The mean operative time was 120 minutes, with an average blood replacement of 3.5 units. The average length of hospital stay was 15 days (8 to 21 days).

All the patients were evaluated annually, as a rule with clinical and radiological examination. The clinical

assessment was expressed with the Harris Hip Scoring system [11].

Radiographically the acetabular component was considered as definitely loose when there was either migration, in a vertical or horizontal direction, of more than 2 mm and as probably loose in the presence of a progressive radiolucent line of more than 2 mm in the upper 2/4 of the socket, without migration or change of its position [3]. The femoral component was classified as definitely loose when there was a discernible shift in its position or subsidence more than 2 mm [9] and probably loose in the presence of a continuous progressive radiolucent zone at the cement bone interface without migration [2].

The survival was estimated by the Kaplan-Meier survivorship analysis with end point revision or a radiographically definitely loose implant.

## Results

At the time of the final review, two patients had died from unrelated causes (3.92%), leaving 49 patients for assessment. Two of them (4%) had already been revised, one for loosening and the other for recurrent dislocation due to malorientation of the cup and another one patient had had a Girdlestone procedure for deep infection.

One patient sustained a femoral shaft fracture at the tip of the prosthesis 32 months post-operatively, one had massive ectopic bone formation (Brooker type IV) and two dislocated in the first week after the operation but there was no recurrence after reduction and three weeks of traction. The immediate post-operative radiographs of all hips were reviewed to assess component orientation. All but two of the acetabular components were open between 35 and 55°. The femoral components were in satisfactory alignment in all but 2 cases which showed varus orientation of the stem.

Clinically the Harris hip score was excellent in 10 cases (20.4%), good in 30 (61.2%), fair in 5 (10.2%) and poor in 4 cases (8.2%).

Radiographically there was definite loosening in 1 case (both of the compo-

nents) and probable loosening in another two cases. The components in the other 43 cases were considered as well fixed (Fig. 2).

The complications are listed in Table 1.

## Survival analysis

The survival analysis, having as an end point re-revision, conversion to Girdlestone or definite radiographic loosening, showed at 5 years a cumulative success rate of 91.3% with confidence intervals (9.6% (Fig. 2). At this time there were over 23 surviving total hip replacements, suggesting that the percentages are valid [13].

## Discussion

Displaced intracapsular hip fractures continue to be difficult to manage. The criteria for treatment by internal fixation, hemiarthroplasty or total hip replacement have not been well defined. Successful union of the fracture by internal fixation without avascular necrosis achieves the best result. Certainly the functional results are superior to these after the insertion of an endoprosthesis.

This study aimed to show the results of our current policy of treating displaced femoral neck fractures by primary total hip replacement.

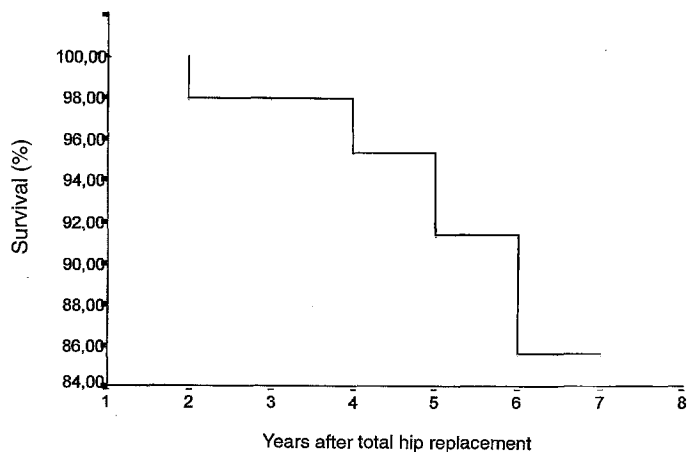
While this operation has been well documented in its elective role, its place in fracture management is ill defined. The consideration of replacement for fracture reflects dissatisfaction with the

Table 1. Complications of THR's other than loosening

	No
Fracture of the femur	1
Haematoma	1
Deep infection	1
Dislocation	3
Deep venous thrombosis	1
Urinary tract infection	3
<b>TOTAL</b>	<b>10</b>



**Fig. 1a-c**  
 a Radiograph of a 72-year-old woman who sustained a Garden stage III femoral neck fracture. b Post-operative radiograph after treatment with total hip replacement. c Radiograph of the same patient 6 yrs post-op showing well fixed components



**Fig. 2**  
 Cumulative survival function chart (after Kaplan - Meier) of the THRs performed for the treatment of displaced femoral neck fractures

existing alternatives of internal fixation or hemiarthroplasty.

The patients treated were representative of the condition in respect of sex distribution and age, but our criteria selected those in better general condition than the average patient with a displaced subcapital fracture. We excluded patients under 65 years of age since we felt that they should be given a chance to retain their femoral head. Patients who were already institutionalised with limited mobility and therefore at less risk of

loosening and acetabular erosions usually had a hemiarthroplasty.

Our mortality rate at one and six months is low compared to other reports [1,6]. In our study a rate of 3.9% was documented over the same time interval, confirming the findings of Soreide and Lillestol [17]. Our follow-up shows that after this time the mortality rate returns towards that of the normal elderly population. The revision rate was 4% at an average follow-up of 55.2 months. Delamarter and Moreland [7]

reported a zero revision rate at an average follow-up of 44 months. Coates and Armour [5] reported a revision rate of 3% for femoral loosening, all cases concerning the Muller curved-stem prosthesis, Taine and Armour [18] reported a 12% revision rate at an average follow-up of 42 months in patients with average age of 78 years. Greenough and Jones [10] reported a 19% revision rate at an average of 20.4 months and believed that the marked contrast between their results and those previously reported may be explained by the significant differences in the reported populations but not by the technical aspects of the operation.

The main early complication in our series was dislocation (5.9%); it was more common than in elective hip replacement for arthritis. The explanation probably lies in the very wide range of flexion obtained soon after operation which is not seen after elective replacement for arthritis. The lax nature of the tissues in comparison with those of an arthritic hip is frequently remarked upon at operation.

Age is known to be related to the loosening of total hip replacements, an

effect generally ascribed to the greater physical activity of the younger patients. Increasing age may also affect loosening in another way. It is known that the incidence of osteoporosis in patients with femoral neck fractures increases with age and it has recently been demonstrated that the rate of bone loss in osteoporosis is related to the initial bone density and occurs more rapidly in the sixth decade than the seventh or eighth. The assessment of the result in an individual elderly patient is also difficult, as any rating system is inevitably influenced by other conditions. The Harris hip rating system [11] was used because of its precise definitions and its emphasis on pain but it fails to make allowance for disabilities other than those of the hip and therefore the results do not only reflect the state of the hip.

A total hip replacement for fracture differs from the usual operation for arthritis, in the absence of abnormal soft tissue. Results in our series indicate that total hip arthroplasty has a definite place in properly selected patients with acute femoral neck fractures. However, the selection of these patients remains a challenge to the judgement of the surgeon. Our study was prospective but selective and has shown that a controlled prospective trial is warranted. This could determine the proper place of

total replacement in the management of the "unsolved fracture".

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#### La place de l'arthroplastie totale de hanche d'emblée dans le traitement de fractures déplacées du col du fémur

**Résumé :** Le traitement des fractures de la hanche intracapsulaires déplacées est toujours controversé à cause de la haute incidence de complications après fixation interne ou hémiarthroplastie. Afin d'éviter certaines de ces complications, nous avons réalisé le remplacement primaire total de la hanche pour les patients mobiles et autonomes de plus de 65 ans.

Sur 49 patients interrogés 4,6 ans en moyenne après une prothèse totale de hanche, 81,6% avaient d'excellents ou de bons résultats selon le score Harris pour la hanche. A cette époque 2 hanches avaient été revues et une autre avait été convertie en Girdlestone à cause d'une infection. La survie à 5 ans des prothésés était de 91,3%.

En conclusion, la prothèse totale de hanche est un moyen bien établi de traiter un groupe sélectionné de patients ayant cette atteinte, mais il faut d'autres études prospectives afin de définir les groupes de patients qui en bénéficieront le plus.

**Mots-clés :** Arthroplastie totale de hanche — Fracture du col du fémur