



Mid term results of Furlong LOL uncemented hip hemiarthroplasty for fractures of the femoral neck

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We report the mid-term results of hemiarthroplasty with the Furlong hydroxyapatite coated bipolar prosthesis for displaced (Garden type III and IV) intracapsular hip fracture in 480 patients operated between 1989 and 2000. Three hundred sixty eight (77%) patients were lost to follow-up due to death, dementia or movement away from the area. In the patients followed up there was an 8% reoperation rate for infection, aseptic loosening, periprosthetic fracture and acetabular erosion.

One hundred and twelve patients with a mean follow-up of 4 years (3-14) were studied. Eighty eight percent had no or slight pain, 77% could mobilise outdoors and 89% needed either no aid or a single walking stick to mobilise. Radiographic assessment revealed a stable implant with visible osseointegration in 91%.

We conclude that hemiarthroplasty with the hydroxyapatite coated bipolar Furlong® LOL prosthesis for displaced intracapsular fracture of the neck of the femur gives good mid term results in elderly patients for return to mobility, use of mobility aids and freedom from pain. It avoids the need for cement and provides satisfactory incorporation into the host bone. The use of a modular head makes revision to total hip replacement easier.

Keywords : hip fracture ; uncemented ; hemiarthroplasty ; mid term results.

INTRODUCTION

Management of displaced intracapsular hip fracture remains controversial. Options include reduc-

tion and fixation of the fracture, hemiarthroplasty or total hip arthroplasty.

Reduction and internal fixation of the fracture has a shorter hospital stay and lower mortality rates, but failure and reoperation rates are high with an incidence of up to 30% (6, 15, 30, 32, 34, 37). Total hip arthroplasty has shown better pain relief and clinical outcome, but in the elderly frail population who often suffer from fracture of the neck of the femur, mortality rates are high (37, 38). Hemiarthroplasty gives good pain relief and predictable results with lower reoperation rates, but morbidity is higher compared to those treated by reduction and internal fixation (15, 32, 34). Cementation of the prosthesis achieves good initial fix in an osteoporotic bone, however it has the risk of bone marrow and fat embolisation with resulting intra-operative hypotension and increased incidence of

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deep vein thrombosis (35). Uncemented hydroxyapatite coated prostheses have been shown to provide reliable and durable fixation in total hip arthroplasty (1, 8, 28, 33, 40). A unipolar or a bipolar head may be used during hemiarthroplasty. Bipolar heads may reduce the incidence of protrusio, however numerous studies have maintained that there is no significant difference with the use of unipolar or bipolar prosthesis (5, 18, 27, 36). Modularity of the head allows later conversion to total hip arthroplasty without revision of the stem. Factors such as age, level of activity, associated co-morbid conditions of the patient also influence the outcome of treating such injuries (16, 24, 39). We report our results for the Furlong LOL hip hemiarthroplasty over a 10 year period, for the treatment of displaced, intracapsular fractures of the femoral neck.

PATIENTS AND METHODS

Between the years 1989 and 2001, 480 patients underwent hemiarthroplasty for Garden type III and IV intracapsular fracture of the femoral neck at our institution. There was no rigid policy on femoral head retention versus replacement and each patient was considered individually regarding age, activity level, infection risk, general health and mental state. In general, displaced intracapsular fractures (Garden type III & IV) in physiologically older patients were treated by hemiarthroplasty in order to minimise the reoperation rate, and physiologically younger patients were treated either by fixation of the fracture or by total hip replacement.

All procedures were performed using the modular Furlong LOL (Joint Replacement Instrumentation, London, UK) hip hemiarthroplasty prosthesis with a bipolar head (fig 1). This is a stainless steel, completely hydroxyapatite coated implant with a modular, stainless steel, bipolar head. The standard implant available is with a neck angle of 127° and intramedullary stem diameter in the increments of 1 mm from 9 to 14 mm, the bipolar head is factory fitted, the inner head is designed to be situated above the centre of gravity of the outer head thus creating a 'self centring' effect to prevent the outer head assuming a varus position. Most of the articulation is provided internally by the secure 22.25 mm inner head ; a complete range of physiological head size is available for use.

The anterolateral approach to the hip was used and it was ensured at the time of surgery that a stable primary



Fig. 1. — Furlong LOL Hemiarthroplasty prosthesis with a bipolar head.

fixation was achieved, allowing early postoperative weight bearing mobilisation.

Using hospital and general practitioner records it was found that 368 (77%) of this population had either died or moved away from the area, were institutionalised due to dementia or were untraceable. The hospital records showed that 57% (209) had died at the time of this study and no definitive records regarding the current situation of the remaining patients were available as they had moved. This left 112 (23%) patients with a mean follow up of 4 years (range, 3-14 years).

Mean age at time of fracture was 77.5 years (range 56 – 93 years) and mean age of the surviving patients at follow up was 78.0 years (range 61 – 98 years). The similarity of these figures is explained by the fact that younger patients survived longer, and mostly those who were younger at the time of fracture were available for review. There were 5 male and 107 female patients available for assessment.

All patients were called to a dedicated follow-up clinic where demographic details, pain, pre and postoperative mobility and use of mobility aids scores were noted.

Medical notes were used to ascertain pre-injury mobility scores. We used the Standardised Audit of Hip

Fracture in Europe scoring system (31). Plain radiographs of the affected hip were taken for comparison with original films for assessment of stem fixation and stability, using the scoring system developed by Engh *et al* (10).

RESULTS

Revisions and Exclusions

Of 480 patients treated by hemiarthroplasty for displaced (Garden type III and IV) fracture of the femoral neck between 1989 and 2001, 112 patients were available for follow-up.

Of those followed up, one patient had sustained a periprosthetic fracture following a subsequent fall and was treated by cable plate fixation and retention of the prosthesis.

Four patients had undergone re-operation for pain associated with either protrusio acetabuli or increased acetabular uptake on isotope bone scanning. Three out of four patients retained the femoral stem with substitution of the bipolar head by a 28-mm head and implantation of an acetabular cup.

There were two revisions for aseptic loosening, one two-stage revision for infected loosening and one revision to a cemented implant following a periprosthetic fracture which was unrecognised at operation and led to loss of primary stability (table I). At follow-up all these patients were mobilising pain free. The femoral stem revision rate was thus 4.5% and the reoperation rate (for any

reason) was 8.0%. This group of patients were excluded while specifically assessing for pain, mobility and use of mobility aids in the LOL hemiarthroplasty group. A total of 103 patients were included for the above analysis.

Hip and thigh pain

The mean pain score at follow-up was 5, with 91 patients (88.4%) having no pain or occasional pain, 5 (4.8%) patients having intermittent pain (a score of 5 or 6) and 7 (6.8%) having pain at rest (a score of 1). The rest pain was due to trochanteric bursitis in two patients, low back pain with radiation in three, and in two patients the pain was referred from the knee.

Mobility and mobility aid scores

The mean mobility pre-injury was 1.4 with 84% of patients walking outdoors. The mean mobility score at follow-up was 1.9 with 76.6% of patients walking outdoors. This represents a mean decrease in mobility score of less than 1 point (0.5) compared to the pre-fracture status. This is a statistically significant difference with $p < 0.05$ (95% CI 0.3-0.6).

The mean "use of walking aids" score pre-fracture was 1.4 with 89% of patients walking with no aid or just a stick. The mean score for the use of mobility aids was 2.3 after fracture, with 74.7% of patients walking either unaided or with the aid of one stick, a mean increase in the use of mobility

Table I. — Revisions of Furlong LOL hemiarthroplasty

Case no	Age at fracture	Time to revision	Reason for revision	Mode of revision
26	72 Years	9 months	Aseptic loosening	Furlong stem & cup
92	67 Years	15 months	Pain, increased acetabular uptake on isotope scan	Stem retained, 28 mm head & cup
118	67 Years	57 months	Aseptic loosening	Furlong stem & cup
167	73 Years	9 months	Aseptic loosening	Charnley stem & cup
231	85 Years	28 months	Protrusio acetabuli	Stem retained, 28 mm head & cup
275	74 Years	36 months	Protrusio acetabuli	Stem retained, 28 mm head & cup
334	75 Years	18 months	Protrusio acetabuli	Charnley stem and cup
345	89 Years	4 months	Septic loosening following dislocation & wound infection	2-stage Furlong stem & cup

aids score of 0.9 compared with pre fracture usage, $p < 0.05$ (95% CI 0.7-1.1).

Radiological stability and fixation score

Using the method described by Engh *et al* (10), stability and fixation of uncemented implants are graded radiologically from < -10 (Unstable with no bone ingrowth) to $> +10$ (Stable with bone ingrowth). Following radiological evaluation, the mean stability/fixation score in our series was 15.2, with 91% of implants having a score $> +10$. Six patients showed radiolucent lines with isolated patchy bone loss in Gruen zones 1, 6 and 7; however sequential radiographs did not show any migration of the prosthesis. Five patients showed no evidence of bone ingrowth and no radiolucent lines were visible, of which one patient showed signs of instability and migration of the prosthesis.

DISCUSSION

The Furlong LOL hip implant is a completely hydroxyapatite ceramic coated implant and is based on the femoral component of the Furlong total hip arthroplasty prosthesis. The hemiarthroplasty stem differs from the total hip component, in that it is manufactured from stainless steel and has a neck angle of 127° , designed to minimise dislocation and theoretically reduce loading on the acetabular cartilage. The stem is modular, with a choice of uni or bipolar head (fig 1).

Use of the hydroxyapatite-coated stem eliminates the need for cement and its attendant risks to the cardio respiratory system in the elderly and often frail population (21, 35); indeed we encountered no intraoperative deaths associated with implantation of the stem. Use of a fully hydroxyapatite coated femoral stem has proved successful in the Furlong total hip arthroplasty (8, 23, 24, 25, 33, 40). Initial stability of the stem is by interference fit, the funnel shaped mid portion of the stem wedging into the broached medulla acts as a ground glass stopper into the top of a bottle and often a three point fixation depending on the shape and width of the canal is achieved. Secondary stability is attained at 6-12 weeks by osseointegration (12), as evidenced by

the characteristic 'spot welds' (10). High stability and fixation scores were achieved. This situation provides a more stable fixation within the medulla than a purely press fit implant (non HAC coated surface), such as the Austin-Moore (26) or Thompson (41) prosthesis, which have shown poor overall results in some studies (9, 17) and tend to produce thigh pain and reduced mobility, thought to be due to instability within the medulla (4, 7, 14, 39).

Common to all uncemented hip prostheses, there is a risk of intraoperative femoral fracture during implantation, mainly due to the efforts to achieve a tight fit within the femoral medullary canal for initial stability (3). This risk may be smaller in cemented devices where a space is left for the cement to act as a grout (11). In our study group, one patient had an intraoperative fracture and required revision at a later stage.

Studies involving fractures of the neck of the femur are notoriously difficult due to the mortality associated with this injury in the characteristic age group (20). High loss of numbers due to death in the early and midterm postoperative period is compounded by loss to follow-up due to migration from the local area or admission to care institutions because of poor health or dementia. This is certainly true in our study, as we cover elderly populated areas, who are in transiently, particularly during the summer months in this seaside resort.

A recent systematic review noted the difficulties in comparing the results from cemented versus press fit hip hemiarthroplasty implants (19). Overall it was felt that stable intramedullary fixation with cement produced better functional results and less thigh pain than press fit devices (22). No comparison was made with coated, uncemented devices; however functional results and revision rates from the hemiarthroplasty using Furlong LOL implants would appear to be comparable to the cemented devices and better than several press fit devices over a similar follow-up period, probably due to its geometry as well as to its HA coating (13, 19, 29).

The results of our study indicate that hip hemiarthroplasty using the Furlong LOL implant is associated with a good functional recovery in terms of mobility and reliance on walking aids, patients

tending to move down a maximum of one level on the scale for each of these parameters. Thigh and groin pain would appear to be less of a problem than with some purely press-fit implants, without the need for cement to effect stable fixation. Levels of mobility and reliance on walking aids before injury may indicate that the survival group that we have studied are the fittest and most active patients ; this is of relevance as they are likely to place greater demands on the implant and expect a pain free limb, but may also be less likely to experience operative complications in severely osteoporotic bone. We also observed a similarity in the mean age at operation and mean age at follow-up, probably due to better survival rates in younger patients, who were therefore available for follow-up.

All implants were used with a bipolar head. Opinion on whether a bipolar head reduces erosion of the acetabulum and increases range of movement is divided (5, 18) ; however modularity allows for simpler revision to total hip replacement in a well fixed stem (2). The majority of our revisions for acetabular problems allowed retention of the stem and substitution with a stainless steel 28 mm diameter head, and insertion of an acetabular cup as was done in 3 out of 4 patients with acetabular problems.

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