The cost and implications of reoperation after surgery for fracture of the hip

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Revision operations after fracture of the hip are costly, in both monetary and personal terms. We have assessed whether these costs applied equally to all complications after the primary procedure. We studied 3154 consecutive patients with fracture of the hip and analysed the complications and financial implications related to reoperation within one year of injury. The results showed that revision surgery is not always associated with a significant increase in morbidity, financial cost or mortality, but is directly related to the underlying complication.

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There has been a steady increase in the incidence of fracture of the neck of the femur during recent years.¹ With increasing numbers of operations carried out for these fractures, complications will inevitably rise in a field in which their rate is already high.²⁻⁴ Previous studies have suggested that early revision surgery after failure of a procedure for a fractured hip is associated with a poor prognosis,⁵ with an increase in mortality,⁶ a decrease in the number of patients able to return to their original residence and a threefold rise in the financial cost of treatment.⁷

We have examined whether these findings are true for all complications of the management of fracture of the hip, or whether some complications have a less serious outcome than others.

Patients and Methods

We studied 3154 consecutive patients who presented to Birmingham Accident Hospital with a fracture of the proximal femur between May 1988 and July 1989 (572) and to Peterborough District Hospital between May 1988 and

February 1997 (2582). Patients who had their fracture treated by conservative measures (98), intramedullary nail fixation (33) and primary total hip replacement (31) were excluded from the study. Five other patients were also excluded because of incomplete data. Those with an extra-capsular fracture of the proximal femur were treated with a sliding hip screw (SHS), and with an intracapsular hip fracture by either multiple cannulated screws or a hemiarthroplasty.

All patients were reviewed clinically two months after the operation; subsequent follow-up was dependent on individual progress. They were contacted by telephone one year after the operation to identify specific problems. Those who had required reoperation within a year were also reviewed. The rates of mortality, the length of hospital stay and the place of discharge from hospital after uncomplicated fractures were compared with the same data for those who required revision within a year of the injury.

The total cost for each patient was calculated by separating the treatment into its component parts and determining the total cost of each of these.⁸ The calculation involves summing the 'accommodation' costs dependent on the type of hospital ward which the patient occupied and adding to this the supplementary expense of departments, including the operating theatre, radiology, pharmacy, physiotherapy, outpatient treatment, etc. The total sum included those for any readmissions and reoperations related to the initial fracture within a year of injury. The figures quoted are based on 1997-98 costs in pounds sterling to the National Health Service. Statistical comparison was made between those patients who did not have a revision (uncomplicated cases) and those who developed specific complications, using chi-squared tests for binary outcomes and Student's *t*-test for continuous outcomes.

Results

A total of 2987 patients was included in the study; 1614 (54%) had their operation carried out by the hip fracture research surgeon (MJP), 1165 (39%) were operated on by an orthopaedic registrar, 149 (5%) by other consultants and 59 (2%) by senior house officers. The mean age of the patients was 79 years, and 79% were women.

An SHS was the initial form of treatment in 1300

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Table I. Results for the 1300 patients who had SHS fixation for extracapsular fractures as their initial treatment, by number and *percentage*. Complications encountered are compared with patients with no complications

Complications	Number	Duration in hospital (days)	Destination on discharge		Mortality within 1 year	Cost (£)
			Original	Downgrade		
None	1246	35	966 (78)	103 (8)	391 (31)	5962
Sepsis	8	6*	5 (63)	1 (13)	5 (63)	14 282*
Implant removal	15	57†	10 (67)	2 (13)	3 (20)	9750*
Arthroplasty	13	84*	8 (62)	2 (15)	5 (40)	12 521*
Refixation	18	72*	10 (56)	3 (17)	10 (56)	13 368*

* $p < 0.005$ † $p = 0.025$ to 0.005 **Table II.** Results for the 908 patients who had hemiarthroplasty for intracapsular fractures as their initial treatment, by number and *percentage*. Complications encountered are compared with patients with no complications

Complications	Number	Duration in hospital (days)	Destination on discharge		Mortality within 1 year	Cost (£)
			Original	Downgrade		
None	864	30	693 (80)	78 (9)	93 (11)	5259
Dislocation	15	74†	7 (47)*	2 (13)	6 (40)*	11 730*
Sepsis	11	71	8 (73)	1 (9)	2 (18)	12 772*
Loosening	7	53	7 (100)	0 (0)	0 (0)	10 241*
Fracture	11	78†	5 (45)*	3 (27)	3 (27)	13 786*

* $p < 0.005$ † $p = 0.025$ to 0.005 **Table III.** Results for the 780 patients who had internal fixation of intracapsular fractures as their initial treatment, by number and *percentage*. Complications encountered are compared with patients with no complications

Complications	Number	Duration in hospital (days)	Destination on discharge		Mortality within 1 year	Cost (£)
			Original	Downgrade		
None	634	18	555 (88)	29 (5)	50 (8)	3746
Sepsis	3	80*	2 (66)	1 (33)	0 (0)	11 510*
Removal	39	27	37 (95)	2 (5)	0 (0)	5464
Arthroplasty	95	45*	79 (83)	9 (10)	7 (7)	8087*
Failure of fixation	9	71*	7 (78)	2 (22)	0 (0)	12 080*

* $p < 0.005$

patients. Their mean age was 80 years, and 77% were women; 54 (4.2%) of these patients required reoperation within a year. The reasons for reoperation were various (Table I). Of the eight patients who developed sepsis, five had surgical drainage and three an excision arthroplasty. Fifteen patients required removal of their SHS implant; in nine the device had cut out of the femoral head, in one a nonunion developed, in one the SHS plate separated from the shaft of the femur and in four the fracture had healed successfully but the SHS was removed due to persistent pain around it. Arthroplasty was the revision procedure in 13 patients; one had developed arthritis of the hip, in four the SHS had cut out of the femoral head, three developed nonunion, two had a refracture above the lag screw, two had rotation of the proximal fragment into an unacceptable position and in one patient the implant had broken. Refixation with an SHS was required in 18 patients, sometimes with additional wiring; one developed nonunion, in ten the implants cut out of the femoral head, in three the plate had separated from the femur, in two there was a fracture below

the initial implant and in two the device had broken.

Hemiarthroplasty was the initial procedure for 908 patients, most of whom (83%) were women. Their mean age was 77 years; 44 (4.8%) required a revision operation within a year of fracture (Table II). Eleven developed sepsis, seven required surgical debridement and four underwent excision arthroplasty. Dislocation of the prosthesis occurred in 15 patients who were managed by closed reduction. Seven developed symptoms attributable to prosthetic loosening and were revised to a total hip replacement. Of the 11 patients who had a fracture around or below the prosthesis, seven were treated by plating and wiring of the fracture, three had revision to a long-stem prosthesis and one underwent an excision arthroplasty.

Multiple parallel screws were used to secure the fractures in 780 patients whose mean age was 75 years and 76% of whom were women. Of these patients, 146 (18.6%) required revision within a year of fracture (Table III). Three had developed sepsis, one required removal of the screws and two underwent excision arthroplasty. The 95 patients

who developed avascular necrosis or a nonunion were revised to a hemiarthroplasty. A total of 39 patients had their cannulated screws removed either because they were prominent or because the patients were young. Nine patients had revision of their internal fixation; in seven this was for a fracture below the original screws which was treated by an SHS, one developed a nonunion and in one the initial fixation failed and the hip was converted to an excision arthroplasty.

These results are summarised in Tables I to III. Cases which had no complications refer to patients who did not have revision surgery within one year of injury. Destination refers to the final outcome after the hospital stay for either the primary operation (uncomplicated case) or the revision. A downgrade in destination implies that the level of independence had decreased and that they were unable to return to their original place of residence. For example, a patient admitted from their home after their fracture may have to return to a nursing or a residential home following surgery, or a patient may be admitted from a residential home but, requiring more care, may have to return to a nursing home. Statistical analysis was between uncomplicated cases and each complication for all outcomes.

Discussion

In frail and elderly patients with a fracture of the hip there is a high risk of complications irrespective of the surgical procedure. If these patients do suffer a complication related to their fracture, it is assumed that the subsequent reoperation will increase the mortality, degree of social dependence, length of hospital stay and cost. Our results, in general, support the view that revision surgery for fracture of the hip has a poor prognosis, as has been shown in previous publications.⁵ Some complications carry a worse prognosis than others; it is the type of complication and not necessarily the revision operation which dictates the outcome. For example, reduction of a dislocated hemiarthroplasty can be a minor procedure; it is the complication of the dislocation and not the surgery which carries the poor prognosis.

In our series all procedures requiring revision led to a significant increase in the total cost of treatment ($p < 0.005$) except for simple removal of cannulated screws for internal fixation of intracapsular fractures. The mean length of hospital stay includes all the time spent between injury and discharge. These times, even for uncomplicated cases, are long but comparable with other reports.^{9,10} The length of hospital stay was increased ($p < 0.025$) in patients requiring revision except for removal of multiple screws or for loosening of a hemiarthroplasty requiring conversion to a total joint replacement.

Some complications have a more favourable outcome.

Simple removal of an SHS or multiple parallel screws may be carried out as a day-case and screws can be removed under local anaesthetic. Such procedures have no effect on the destination of the patient on discharge from hospital and may have a slightly lower rate of mortality when compared with those not having a revision of the same initial means of fixation of the fracture.

Loosening of a hemiarthroplasty appears to have a good prognosis. There is an extra cost when these patients undergo a total hip replacement, but there is no significant increase in their mortality or degree of social dependence. These patients have already proved their fitness by surviving the initial operation and when they are selected and prepared for total hip replacement.

Previous studies of complications after hip fractures have been too small to subdivide into specific complications and have therefore not distinguished between them. Our results show that for patients requiring a revision operation, except for the removal of screws for intracapsular fractures, there is a two- to threefold increase in cost when compared with an uncomplicated case.

There is a notable increase in mortality and in failure to return to their previous home in patients who sustain a dislocation of an hemiarthroplasty, a fracture around an arthroplasty or failure of SHS fixation. Prevention is easier and cheaper than cure.

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