The Ulster Medical Journal, Volume 69, No. 2, pp. 118-122, November 2000.

Periprosthetic femoral fractures in Northern Ireland

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Accepted 12 June 2000

SUMMARY

Twenty-five patients with periprosthetic femoral fractures were admitted to the Ulster Hospital between August 1998 and May 2000. Average age was 77 years (range, 42-96 years) with a female to male ratio of 2:1.

Twenty-four of the fractures occurred following primary joint arthroplasty on average 7.6 years from insertion of the primary prosthesis. One patient sustained an intraoperative fracture during revision surgery. In the majority (80%), the periprosthetic femoral fracture was associated with a traumatic event.

On average, two days elapsed from the time of injury until admission to our unit. Time from admission to surgery was on average 4 days. All patients were treated by open fracture fixation. Duration of stay in the fracture unit was on average 20 days.

Prior to their fracture 92% of patients were living at home and 84% were mobile either unaided or with the use of a stick. At most recent review, 72% are back living at home and 60% are mobile either unaided or with the use of a stick.

We emphasise that there is the likelihood of an increase in periprosthetic femoral fractures due to the increasing number of primary arthroplasties being performed on a more active, ageing population. Preventative measures and cost implications are also discussed.

INTRODUCTION

Fractures of the femoral shaft after total hip replacement are increasingly common, and present a complex management problem.[1] Incidence varies from 1% after primary hip arthroplasty to 4% after revision surgery.[2]

Periprosthetic femoral fractures may occur intraoperatively or in the postoperative period and many predisposing factors have been identified.[3] Patients are often elderly and frail thus adding to the difficulties faced by the orthopaedic surgeon when dealing with this complex injury.

Management may be conservative including such measures as skeletal traction and cast bracing. However in the majority of cases surgical intervention is required to achieve stable fracture fixation and to avoid the complications of prolonged bed rest.

Due to the complex nature of these fractures, they therefore place a greater demand on medical, nursing and rehabilitation resources and with the ever increasing number of primary hip arthroplasties coupled with the ageing population, prevention of these fractures should be the key aim of the orthopaedic surgeon.

We present an audit of the management of periprosthetic femoral fractures in our unit and discuss the impact that the ageing population will have on the provision of services for this group of patients.

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PATIENTS AND METHODS

We reviewed the charts and radiographs of 25 patients with periprosthetic femoral fractures treated in our unit between August 1998 and May 2000. Age, gender, side, type of primary prosthesis and date of insertion, primary diagnosis, event leading to fracture, date of injury, referring hospital, time delay to admission to fracture unit, presence of pain prior to fracture, mobility and living circumstances were recorded for each patient. Preoperatively, the femoral fractures were classified according to Johanssen *et al*,[4] into three types (Type I–fractures proximal to the tip of the prosthesis, Type II–fractures through the tip, and, Type III–fractures distal to the prosthesis). The presence of radiolucent lines surrounding the femoral and acetabular components was noted. These were classified into zones according to Gruen [5] for the femoral component and Charnley-DeLee [6] for the acetabular component. ASA grading, intraoperative blood transfusion requirements and operating time were also recorded.

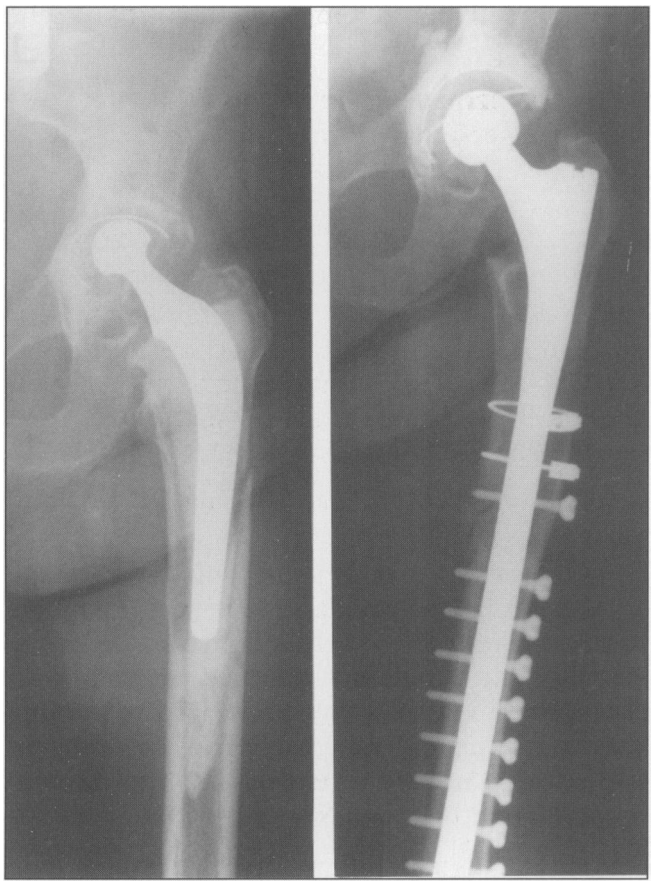

Fig 1. Radiograph of left femur demonstrating – type I periprosthetic femoral fracture around a loose stem with extensive osteolysis on the medial aspect of the distal stem (left); fracture stabilisation using a Kent hip prosthesis replacing the femoral and acetabular components (right).

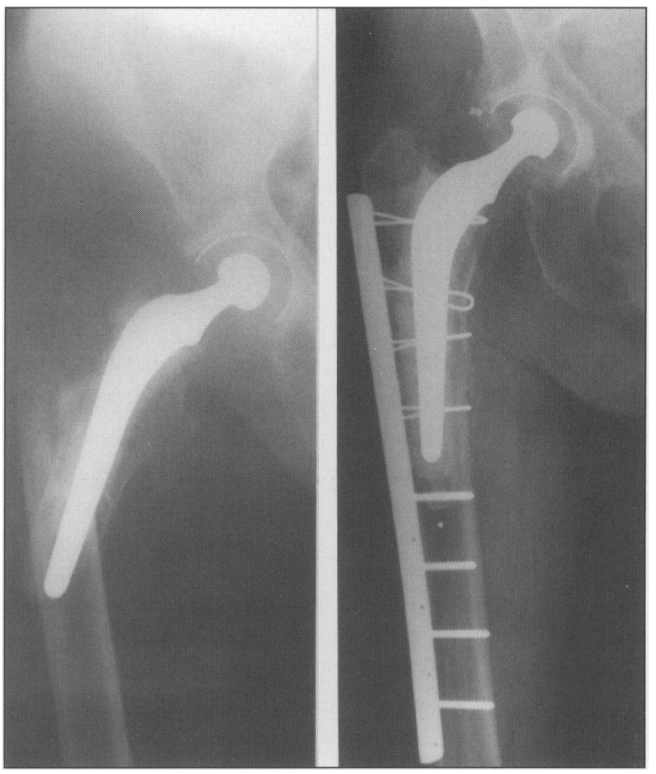

Fig 2. Radiograph of right femur demonstrating – type II periprosthetic femoral fracture at the tip of the stem (left); fracture fixation using a plate supplemented with cerclage wires (right).

All operations were performed by the senior author (JGB). Fractures associated with a loose prosthesis, confirmed peroperatively, were treated using a distal-locking long-stemmed Kent prosthesis (Biomet Merck Ltd, Bridgend, UK) with or without acetabular replacement using an elite plus flanged LPW cup (Figure 1). Fractures associated with a fixed prosthesis were managed using a cable ready plate (Zimmer, Inc., Indiana, USA) and cerclage wiring (Figure 2). Intravenous antibiotics (cephamandole 1 g) were given at induction and at 8 and 16 hours postoperatively. Enoxaparin (40 mg daily) was used for antithrombotic prophylaxis. All patients spent the first 24 hours in the high dependency unit and patients were immobilised until their wound was dry.

Complications (early and late), duration of stay and placement on discharge from the fracture unit was noted for each patient. Home circumstances, mobility and the presence of hip or other joint pain at latest review was also recorded.

RESULTS

Of the 25 cases reviewed (8 males, 17 females), there were twenty-four postoperative periprosthetic femoral fractures and one intraoperative periprosthetic femoral fracture. Average age was 77 years (range, 42-96 years). The right side was affected on 13 occasions and the left on twelve.

The types of primary prostheses were as follows: Charnley [17], Custom [2], Austin-Moore [2], Howse [2], Exeter [1] and one uncemented Porous-Coated-Anatomic prosthesis. Time from insertion of the primary prosthesis to fracture was 7.6 years on average (range, 3 months to 20 years).

Of the 24 postoperative fractures, 20 fractures were associated with a fall. The remaining four fractures were atraumatic in nature (two occurred whilst walking, one resulted from a twisting injury and one occurred whilst turning in bed). Five of these patients were referred via our own casualty department, with the remainder being referred from ten different hospitals distributed throughout the province (Table I). Average time from fracture to admission to our unit was two days (range, 0-eight days). Fourteen patients were ASA grade II, 10 were grade III and 1 grade IV. Four Type I, 19 Type II and 2 Type III fractures were identified.

Time from admission to theatre ranged from 0 to 13 days (average, 4 days). In most cases, patients were delayed because of medical complications, most commonly cardiac or respiratory in origin.

Table I

Distribution of referring hospitals

Referring Hospital	*Number of patients*
Ulster Hospital Dundonald	5
Lagan Valley Hospital	3
Antrim Area Hospital	3
Craigavon Area Hospital	3
Daisy Hill Hospital	3
Coleraine Hospital	2
Erne Hospital	1
Altnagelvin Hospital	1
Musgrave Park Hospital	1
Royal Victoria Hospital	1
Whiteabbey Hospital	1

Fourteen patients required a long-stemmed Kent prosthesis (eight of these patients also required revision of their acetabular component due to the presence of loosening). Ten patients required cable-ready plating and in one case fracture fixation was achieved by means of two cerclage wires. Average operating time was 115 minutes (range, 56-168 minutes) and the volume of blood transfused intraoperatively was on average 450 mls (range, 0-1250 mls).

In the early postoperative period, three patients developed urinary tract infections and one patient had a superficial wound infection. All cases were successfully treated with antibiotic therapy.

Prior to sustaining their fracture, twenty-three patients were living in their own home, one patient was living in a residential home and one was resident in a nursing home (Table II). Twelve patients were mobile without aids, nine patients required a stick whilst walking, three patients required the use of a zimmer and one patient was wheelchair bound (Table III). All patients with a loose prosthesis had hip pain prior to their fracture.

Table II

Home circumstances pre-fracture and at latest review

Home circumstances prior to fracture	*Home circumstances at latest review*
23 Own home	18 Own home
1 Nursing home	4 Nursing home
1 Residential home	2 Rehabilitation units
	1 Residential home

Duration of stay was on average 20 days (range, 8-49 days). On discharge, eighteen of the patients were transferred back to the initial referring hospital, three patients returned to their own home, two patients were discharged to nursing homes, one patient was discharged to a relative and one patient returned to residential accommodation.

Currently, 18 patients are living in their own home, 4 patients are in a nursing home, two patients are still in rehabilitation units (both patients are < 4 weeks following surgery) and one patient is in residential accommodation. At present, five patients are mobile without the use of aids, 10 patients require the use of a stick, eight

Table III

Mobility pre-fracture and at latest review

12 without aids	5 without aids
6 one stick	10 one stick
3 two sticks	8 zimmer
3 zimmer	1 two helpers
1 wheelchair bound	1 wheelchair bound

patients require the use if a zimmer frame, one patient requires two carers to transfer and one patient has remained wheelchair bound.

Late complications include one dislocation at six weeks (managed by closed reduction), two cases of fracture non-union following cable ready plating requiring further surgery, and two patients with persistent ipsilateral hip pain.

DISCUSSION

Periprosthetic fractures of the femur after hip replacement are a serious complication that can prove difficult to treat. Although previously considered uncommon, the incidence of this complication has increased in recent years.[3,7] This increase is due in part to the greater number of primary and revision hip arthroplasties being performed on an increasingly active ageing population.[7]

Periprosthetic fractures of the femur can occur intraoperatively and postoperatively. The incidence of both intraoperative and postoperative femoral fractures associated with primary joint replacement has been reported to be less than 1%.[4,8] Revision surgery is however associated with a greater risk of both intraoperative and postoperative fracture (6.3-17.6%).[3,7] In order to prevent periprosthetic femoral fractures it is important to know which factors increase the risk of this complication. Many factors are well recognised in the pathogenesis of periprosthetic femoral fractures,[3] some of which are preventable whilst others are not. Trauma, osteoporosis (primary and secondary), osteopenia, revision arthroplasty, loose prostheses, cortical perforation and the use of uncemented implants are but a few of the factors that have been identified.[3,7]

The primary goals in treating periprosthetic femoral fractures are to achieve union of the fracture and to create a stable arthroplasty in order to obtain early mobility. Although, many patients with periprosthetic femoral fractures are frail and elderly, operative intervention is often the best, if not the only option. The use of traction and casting, although less invasive, does not remove the risks of pressure sores, deep venous thromboses and other complications associated with prolonged immobility.

Surgical options include open reduction and internal fixation using plates and screws, revision of the femoral component to a long-stemmed prosthesis (Kent hip prosthesis) and revision arthroplasty (both components replaced). These procedures may be supplemented by additional fixation, most commonly using cerclage wires.

Hospitalisation costs are significant for periprosthetic femoral fractures for several reasons. Firstly, patients are often in hospital for long periods (average of 20 days in our study). This does not include the time spent in the referring hospital, both before and after surgery. Secondly, the prostheses are expensive due to their complexity (£2000 per Kent hip prosthesis, £1000 per cable ready system). Thirdly, patients usually require high dependency care or even intensive care at an average cost of £1012 per day, and finally, patients often require a significant input from the rehabilitation team (average cost £134 per day). As a result, the cost per patient is often in excess of ten thousand pounds. However, non-operative treatments, such as traction, may be just as, if not more expensive due to the fact that patients can require a period of in-patient treatment of up to four months. Furthermore, even if fracture healing is achieved, the patient may still require operative intervention for a loose prosthesis. Aside from the financial cost, operative treatment often allows the patient to become mobile earlier and to return to their pre-fracture quality of life. In our series, at latest review, 18 of the 23 patient's resident at home before their fracture were back to living in their own home environment. Also, patients with pain arising from a loose prosthesis are often relieved of their symptoms.

We acknowledge that the follow up period of this study is short (average, 2 months). However, since we are dealing in general with an elderly population with a reduced life expectancy, short-term outcome measures are more important. Regaining independence and relief of pain in the early postoperative setting contribute to enhancing the patient's quality of life.

In conclusion, periprosthetic femoral fractures are becoming increasingly common. With over 2000 primary arthroplasties being performed in Northern Ireland each year, coupled with an ageing, more active population, we predict that the incidence of periprosthetic femoral fractures will increase steadily.

Prevention, through improving surgical technique, early detection of loose prostheses and early revision arthroplasty with routine outcome review, should be the primary approach to this problem.

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