

Operative treatment of hip fracture in haemodialysed patients

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ABSTRACT

Purpose. To study operative treatment and postoperative clinical outcomes of hip fracture in haemodialysed patients.

Methods. In 12 patients (8 men and 4 women) undergoing haemodialysis, 14 hip fractures were treated. Of these, 8 hips were treated with bipolar hip arthroplasty, one hip with total hip arthroplasty, 4 hips with a compression hip screw, and one hip with a gamma nail. The mean duration of dialysis treatment until fracture was 7 years. During a mean postoperative follow-up period of 17 months (range, 1-44 months), the patients' renal condition, type of fracture, and level of activities of daily living before and after surgery were assessed.

Results. Of the 7 patients who died during a mean follow-up period of 17 months, 2 died from myocardial infarction, 2 from sepsis, and one each from gastric

cancer, pulmonary oedema, and liver failure. Five of the 8 patients with diabetic nephropathy died, whereas 6 of the 8 patients who underwent bipolar hip arthroplasty or total hip arthroplasty died. Most of the patients had declined level of activities of daily living postoperatively.

Conclusion. For haemodialysed patients with fractures, it is essential to select the most suitable operating method and to conduct vigilant management before and after the operation.

Key words: amyloidosis; hip fractures; renal dialysis

INTRODUCTION

Thanks to the advances in haemodialysis treatment, the life expectancy of patients with chronic renal failure in Japan has been improving. However, the number of dialysed patients has also increased, and the older

the patient, the higher the complication rate of bone and joint disease resulting from long-term haemodialysis.

We evaluated the postoperative clinical outcomes and the problems associated with operative treatment in haemodialysed patients with hip fractures, who were treated at Tokyo Medical University and underwent orthopaedic surgeries between September 1992 and November 2002.

MATERIALS AND METHODS

Our study reviewed 12 haemodialysed patients (8 men, 4 women) with a mean age of 68 years (range, 50–82 years) at the time of operation. These patients underwent surgery for hip fracture. We operated on a total of 14 hips: 9 from the men and 5 from the women. Seven patients (8 hips) underwent bipolar hip arthroplasty (BHA), and one patient (one hip) underwent total hip arthroplasty (THA). The remaining 4 patients (5 hips) underwent osteosynthesis, of whom 3 patients (4 hips) used a compression hip screw (CHS) and one patient (one hip) used a gamma nail. The postoperative follow-up period ranged from one to 44 months (mean, 17 months).

The patients' causes for requiring dialysis, duration of dialysis treatment until fracture, fracture type, and changes in activities of daily living (ADL) before and after operation were clinically reviewed.

Radiologically, we examined the patients who had BHA and THA for any recognisable loosening and bone changes in the areas surrounding the implants, whereas we examined patients who had osteosynthesis for any bone union. In addition, for the patients who had died, we evaluated their condition before death and the causes of death.

RESULTS

Diseases that caused patients to require dialysis

Eight patients had chronic renal failure caused by diabetes mellitus, which also complicated the postoperative convalescence. One patient had chronic glomerulonephritis and another had polycystic kidney. The causes for the remaining 2 patients were unknown.

Fracture type

In 9 of the 12 patients (10 hips) who had femoral neck fracture, one had a Garden type II condition

and underwent surgery using a CHS. Eight had Garden type III or IV conditions: one of them, who had acetabular changes, underwent cementless THA; the other 7 patients (8 hips) underwent BHA. The remaining 3 patients (4 hips) had trochanteric fractures and underwent osteosynthesis using a gamma nail (one hip) and a CHS (3 hips) (Table 1).

Duration of dialysis treatment before fracture

The longest duration of dialysis treatment before fracture among patients with femoral neck fracture was 20 years (mean, 7 years). However, among patients with trochanteric fracture, the mean duration of dialysis treatment before fracture was only 4 months (range, 1–10 months) (Table 1).

Patients undergoing BHA or THA (patients 1–8)

BHA was performed in 7 patients (8 hips), and THA in one patient (one hip). Patient 1 had about 13 years of dialysis treatment before suffering a slight external injury. Deformity on the acetabular side and amyloid deposition were observed. The amount of bleeding during THA was 1150 g, which was a relatively large quantity.

Patients 2 and 3 fell and sustained the fracture during hospitalisation in the department of internal medicine. The duration of dialysis treatment before injury was short, and the amount of bleeding during surgery was 240 g and 233 g, respectively.

Patient 4 underwent cementless BHA. Although he was relatively young, he had the longest period of dialysis treatment of 20 years.

Patient 5 was a clear case of traumatic fracture. The intra-operative bleeding was 191 g, and dialysis was commenced immediately after the operation.

Patient 6 had initially suffered a slight external injury on the right hip and was conservatively treated at another hospital, but pseudoarthrosis developed and she was barely able to walk on crutches. Later, the patient suffered a left femoral neck fracture and was conservatively treated, but pseudoarthrosis was again diagnosed and she ended up in a wheelchair. The patient could not bear the worsening pain and was hospitalised at our department. We performed BHA on her right hip. Subsequently the patient required another operation on the left hip because of a sharp pain. The period of dialysis treatment was relatively long: 13 and 14 years before the respective operations. Amyloid deposition was observed at the fracture site, and the intra-operative bleeding was relatively large,

Table 1
Patients undergoing BHA* or THA† (patients 1–8) or osteosynthesis using a CHS‡ or a gamma nail (patients 9–12)

Patient No.	Age (years)/sex	Operative method	Type of fracture	Cause of fracture	Duration of dialysis treatment	Intra-operative bleeding (g)	Outcome
1	63/M	THA	Garden type III or IV fracture	Pathological fracture (amyloidosis)	13 years and 1 month	1150	Dead
2	67/F	BHA	Garden type III or IV fracture	Fall in the hospital	After operation	240	Alive
3	81/M	BHA	Garden type III or IV fracture	Fall in the hospital	1 year and 1 month	233	Dead
4	50/M	BHA	Garden type III or IV fracture	Fall	20 years	450	Alive
5	74/M	BHA	Garden type III or IV fracture	Fall from a bicycle	After operation	191	Dead
6 (right hip)	62/F	BHA	Garden type III or IV fracture	Pathological fracture (amyloidosis)	13 years	690	Dead
6 (left hip)	63/F	BHA	Garden type III or IV fracture	Pathological fracture (amyloidosis)	14 years	710	Dead
7	63/M	BHA	Garden type III or IV fracture	Fall	10 years	580	Dead
8	59/M	BHA	Garden type III or IV fracture	Fall	9 months	470	Dead
9	72/M	Gamma nail	Trochanteric fracture	Fall outdoors	10 months	60	Alive
10	77/M	CHS	Trochanteric fracture	Fall in the hospital	1 month	100	Alive
11	64/F	CHS	Garden type II fracture	Fall indoors	2 years and 1 month	160	Dead
12 (both hips)	82/M	CHS (both hips)	Trochanteric fracture	Fall indoors	1 month	130	Alive

* BHA bipolar hip arthroplasty

† THA total hip arthroplasty

‡ CHS compression hip screw

amounting to 690 g and 710 g for the first and second operations, respectively (Table 1).

Patients undergoing osteosynthesis (patients 9–12)

The duration of dialysis treatment before injury for the 4 patients who underwent osteosynthesis was relatively short (mean, 9 months; range, 1–25 months). A gamma nail was used for one patient and a CHS was used for the other 3 (4 hips). The amount of intra-operative bleeding ranged from 60 g to 160 g, which was not particularly large in any of the osteosynthesis cases (Table 1).

Postoperative complications

Of the 8 patients who underwent THA or BHA, one patient had wound haematoma postoperatively and was treated with curettage. Another patient had suture failure and required resuturing. Two patients had postoperative infections. One of

Table 2
Causes of death

Patient No.	Period after surgery to death	Cause of death
1	1 year and 2 months	Sepsis
3	1 month	Myocardial infarction
5	7 months	Gastric cancer
6	9 months	Liver failure
7	3 years and 8 months	Sepsis
8	9 months	Myocardial infarction
11	1 year	Pulmonary oedema

them had antibiotic cement inserted after extraction, and reimplantation was performed using THA 6 months after extraction. The other had a hip infection early after surgery and died from myocardial infarction before extraction could be performed.

Table 3
Comparison of preoperative and postoperative ADL level of patients undergoing BHA* or THA† (patients 1–8) or osteosynthesis using a CHS‡ or a gamma nail (patients 9–12)

Patient No.	Walking ability before fracture	Latest walking ability	Postoperative follow-up duration
1	With the aid of a stick	On crutches	1 year and 2 months
2	With support	With support	1 year and 9 months
3	Standing with support	In a wheelchair	1 month
4	With the aid of a stick	With the aid of a stick	1 year
5	Normal	On crutches	7 months
6 (right)	Normal	On crutches (indoors)	1 year and 3 months
6 (left)	On crutches	In a wheelchair (outdoors)	9 months
7	In a wheelchair (outdoors)	In a wheelchair (outdoors)	3 years and 8 months
8	Normal	With the aid of a stick	9 months
9	Normal	With the aid of a stick	2 years and 2 months
10	Normal	With the aid of a stick	1 year and 9 months
11	With the aid of a stick	With the aid of a stick	1 year
12	With the aid of a stick	In a wheelchair	2 years

* BHA bipolar hip arthroplasty

† THA total hip arthroplasty

‡ CHS compression hip screw

One of the patients who underwent osteosynthesis had pseudoarthrosis of the right hip after a CHS was used simultaneously on both hips.

Causes of death

Seven patients died after surgery: 2 died from myocardial infarction, 2 from sepsis, and one each from gastric cancer, liver failure, and pulmonary oedema. One of the patients who had myocardial infarction died a month after surgery; the other 6 died after being released from hospital. The underlying disease in 5 of the 7 fatalities was diabetes (Table 2).

Comparison of preoperative and postoperative ADL levels of patients

Of the 8 patients who underwent THA or BHA, 5 showed a decline in walking ability at the follow-up evaluation; in particular, 3 of them became wheelchair-bound. One of the 3 developed an infection soon after the operation. Another patient, who had surgery on both hips, was a long-time wheelchair user after conservative medical treatment at another hospital. The remaining patient had arteriosclerosis obliterans and had already been confined to the wheelchair outdoors before the injury.

Of the 4 patients who underwent osteosynthesis, only patient 12 ended up in a wheelchair; the remaining 3 were able to walk with the aid of a stick (Table 3).

Evaluation of postoperative radiographs

Six of the 8 patients who underwent THA or BHA died and none was followed up long enough. However, no loosening or clear zone was observed, apart from one case that required revision surgery as a result of infection. Of the 4 patients who underwent osteosynthesis, one had pseudoarthrosis of the right hip and ended up in a wheelchair after the simultaneous insertion of a CHS in both hips. The remaining 3 showed bone union.

DISCUSSION

We aimed to assess the clinical outcomes of surgically treated hip fractures in dialysed patients. The number of dialysed patients in Japan has exceeded 20 million in 2000 and is still increasing. Advances in dialysis treatment have increased the long-term survival of patients with chronic renal failure. Secondary hyperparathyroidism or deposition of aluminium and iron in bone tissue can cause renal osteodystrophy and result in decreased bone mass and bone fractures.

The most common fracture site in dialysed patients is the ribs, followed by the spine and the femoral neck.¹⁻⁴ Nishida et al.⁵ conducted a study in Niigata, Japan in 1989 and reported that femoral neck fracture was nearly 20 times more frequent in dialysed patients aged over 65 years than in non-dialysed patients of the same age-group.

In our series, 3 patients (4 hips) had trochanteric fracture and underwent osteosynthesis. One of them developed pseudoarthrosis of the right hip after the insertion of a CHS in both hips. The patient could not be re-operated on because of senility and ended up in a wheelchair. Nine patients (10 hips) had femoral neck fracture and 7 of them (8 hips) underwent BHA. Normally, we would perform osteosynthesis for patients with Garden type I and II conditions and even for Garden type III and IV conditions if the patients were younger than 70 years. However, it takes time for dialysed patients to have bone union, and it is likely for them to develop pseudoarthrosis. After considering the patients' general medical condition, we performed BHA in the hope of treating the patients once and for all without further revision.⁶

Amyloid deposition

In the present series, 3 femoral neck fractures were pathological fractures and were caused by amyloid deposition, which was observed during surgery. Lai et al.⁷ suggested performing BHA as a precautionary treatment when a large bone cyst is present in the femoral neck of a dialysed patient, in order to reduce the risk of fracture. Loosening of the nail and non-union of the bone were likely if such patients underwent osteosynthesis. Umeda et al.⁸ suggested that amyloid deposition was one of the causes of the loosening. In their series, loosening was observed in 8 of 14 hips during a mean follow-up period of 5.9 years. No wear particles of polyethylene or phagocytosis were observed in the granulation tissues around the prosthesis in 6 of the 8 revision hips, but amyloid deposition was observed in all cases. Amyloid deposition can be prevented with dialysis treatment using high-performance film such as a high-flux film dialyser to remove β_2 microglobulin.⁹ Six of our 8 patients undergoing BHA or THA died and thus no long-term follow-up could be made, but so far no loosening has been observed in the patients who are still alive. Because loosening has been reported in long-term cases of BHA and THA, we are examining the effect of bisphosphonates to improve renal osteodystrophy and to prevent bone resorption caused by amyloid deposition.

Clinical outcome of patients

One patient had an infection one month after the surgery and died from myocardial infarction at an early postoperative stage. Six patients died after discharge and the causes of death were not directly related to the surgery. The underlying disease in 5 of the 7 deaths was diabetes mellitus; thus the prognosis for dialysed patients with diabetic nephropathy was poor. According to the Japanese Society for Dialysis Therapy, the number of dialysed patients with diabetic nephropathy has been increasing annually since 1998. The one-, 5-, and 10-year survival rates of dialysed patients have been improving, so are the survival rates of patients with diabetic nephropathy. However, the cumulative survival rate for diabetic nephropathy and nephrosclerosis was low, and the outcome was poor.¹⁰

Sepsis was the cause of death in 2 of the patients, along with 2 postoperative infections, which makes infection prevention and treatment an important issue. Haemorrhagic diathesis, infection, and vulnerability of the bone are major prognostic factors. It is therefore important to examine these prognostic factors when selecting the most suitable operating method and conducting preoperative and postoperative management for dialysed patients.

CONCLUSION

Seven out of the 12 patients died. The underlying disease in 5 of the 7 deaths was diabetes nephropathy; thus, the life expectancy in such patients was poor. Five of the 8 patients who underwent BHA or THA showed a decline in the ADL level, 3 of whom became wheelchair-bound. Three of the 4 patients who underwent osteosynthesis showed a decline in the ADL level; one of them became wheelchair-bound. In order to minimise the decline of the postoperative ADL level, it is necessary to select the most suitable operating method and to conduct careful preoperative and postoperative management for these patients. Extra attention should be paid to monitor changes in patients' general medical condition and to prevent infection.

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