

CASE REPORT

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Simultaneous bilateral femoral neck fractures in a dialysis-dependent patient: case report and literature review

Yunyun Zhu¹, Jingtao Hu², Wenlun Han¹, Jianwei Lu³ and Yuqing Zeng^{3*}

Abstract

Background: Simultaneous bilateral femoral neck fractures are extremely rare without obvious injury. Herein, we report the case of a patient on dialysis presenting with bilateral femoral neck fractures, which is a condition with high complication and mortality rates according to a review of the pertinent literature.

Case presentation: We report the case a 47-year-old female with a history of 8 years of haemodialysis due to polycystic kidney disease who presented with bilateral hip pain during walking. The clinical history and results of physical and radiographic examinations of this patient are shown. Single-stage bilateral hemiarthroplasty was performed after a multidisciplinary team consultation. Three days after the operation, she could ambulate with a walker. The woman gradually regained her previous ability to walk over 6 months after surgery.

Conclusions: A multidisciplinary team consultation for perioperative management is necessary and effective in patients on dialysis. Early diagnosis with prompt surgical treatment could lead to favourable recovery.

Keywords: Femoral neck fractures, Bilateral, Dialysis, Osteoporosis, Case report

Background

Renal osteodystrophy (RO) secondary to chronic kidney disease (CKD) is an established cause of pathological femur neck fractures [1]. The incidence of hip fracture in patients undergoing haemodialysis (HD) is significantly higher than that in the general population. The incidence of hip fracture in dialysis patients is 4.4 times higher than that of the general population [2], and its incidence is 29.3 / 1000 people / year [3]. However, simultaneous bilateral femoral neck fractures (SBFNs) in patients on dialysis are extremely uncommon [4]. We report a rare case of SBFNs in a middle-aged patient on dialysis and review SBFNs in patients with CKD.

Case presentation

The patient was a 47-year-old female with no history of trauma who developed bilateral hip pain 1 day prior to admission. She had a history of haemodialysis due to polycystic kidney disease. Upon physical examination, she demonstrated inability to move the hip joints and bilateral inguinal tenderness. Laboratory studies showed anaemia (haemogram 8.5 g/dL), a low normal albumin value (3.1 g/dL), a high parathyroid hormone level (907 pg/ml), hypocalcaemia (5.1 mg/dL), hyperphosphatemia (2.3 mmol/L), and elevated alkaline phosphatase activity (1228 U/dL). Hip X-ray (Fig. 1a) and CT (Fig. 1b, Fig. 1c) examinations showed bilateral femoral displaced fractures. Bone mineral density testing revealed osteoporosis (T = 3.0). She also had a history of hyperparathyroidism secondary to CKD and parathyroidectomy.

We promptly performed a multidisciplinary team consultation to make preoperative preparations and performed the surgery 4 days after admission. Considering

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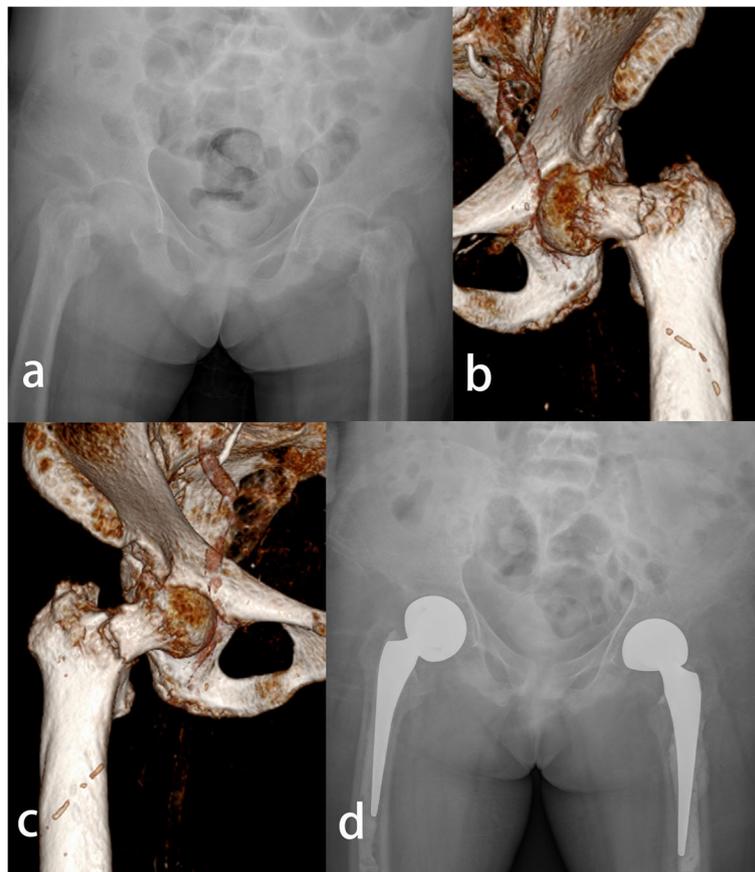


Fig. 1 **a:** Hip X-ray showing bilateral femoral displaced fractures with low bone density. **b:** CT scan showing the femoral displaced fracture on the left side. **c:** CT scan showing the femoral displaced fracture on the right side. **d:** Bilateral femoral displaced fractures treated with bilateral hip hemiarthroplasty

her mobility and life expectancy, we performed concurrent bilateral hip hemiarthroplasty with cement prostheses (Fig. 1d). The operative findings included severe osteoporosis and displaced femoral neck fractures. Anti-osteoporosis medication was administered after surgery. Meanwhile, the patient continued maintenance haemodialysis. Three days after the operation, she could ambulate with a walker. The follow-up appointments at 3 and 6 months revealed that the woman had gradually regained her previous ability to walk.

Discussion and conclusions

SBFNs in patients on dialysis are relatively rare. To the best of our knowledge, only 10 cases have been reported previously, making our case the 11th (Table 1) [1, 5–14]. SBFNs are usually secondary to seizure disorders [15], trauma [16], electric shock injuries [17], hypovitaminosis D [18], osteoporosis [19], and metabolic diseases. Stress fractures of the bilateral femoral neck occasionally occur in young patients [20]. It has been reported that the incidence of hip fractures in the general population has decreased significantly [21]. In the contrary, the incidence

of hip fractures among haemodialysis patients is increasing [22, 23]. However, in Japan, compared to the general population, in Japanese dialysis patients, the incidence of hip fractures decreased among women but did not change among men between 2008 and 2013 [24]. Although the incidence of hip fractures appears to have decreased slightly, it remains a challenging problem in dialysis patients for both orthopaedic surgeons and nephrologists [25].

Among end-stage renal disease (ESRD) patients, HD is associated with a 61% higher risk of hip fracture than peritoneal dialysis (PD) [26]. Nevertheless, PD, HD, and kidney transplantation (KT) patients and HD and KT patients had the highest and lowest risk of hip fractures, respectively [27]. One study found that an advanced age, low body weight, low serum albumin level, and high alkaline phosphatase (ALP) and parathyroid hormone levels were associated with a low bone mass in HD patients [28]. The patient in our case had a parathyroid hormone level of more than 5000 pg/ml until undergoing parathyroidectomy. Thus, we suggest that maintaining an adequate body weight and serum albumin level,

Table 1 Summary of all studies in the English literature reporting bilateral pathological neck femur fractures in chronic renal disease

No	Reference	Year	No. of cases	SEX	Age	Primary renal	Treatment	Dialysis (Y/N)
1	Zingraf et al. [5]	1974	1		45	Unknown	Arthroplasty	Y
2	Gerster et al. [6]	1983	1 out of 2 cases reported had CRF	Case 1: F Case 2: F	Case 1: 69 Case 2: 78	Case 1: CP Case 2: Unknown	Case 1: bilateral THR Case 2: Conservative for right hip and Osteosynthesis for left intertrochanteric hip	Case 1: N Case 2: N
3	Ogun et al. [7]	2001	2	Case 1: M Case 2: M	Case 1:45 Case 2:35	Case 1: amyloidosis Case 2: nephrolithiasis	Osteosynthesis with multiple cannulated screws in both cases	Case 1: N Case 2: N
4	Hung et al. [8]	2001	1	F	39	Unknown	Bilateral hemiarthroplasty	N
5	Karapinar et al. [1]	2003	1	M	23	Obstructive uropathy	Bilateral cemented THA	Y
6	Devkota et al. [9]	2013	1	F	47	DN and HN	Non-operative management	Y
7	Garcia et al. [10]	2014	1	F	43	Reflux nephropathy	Osteosynthesis	Y
8	Satyanarayana et al. [11]	2015	1	M	23	Reflux nephropathy	Bilateral, uncemented, modular bipolar hemiarthroplasty	Y
9	Mazzola et al. [12]	2015	1	F	76	Unknown	right cemented hemiarthroplasty and left fixation with dynamic hip screw	Y
10	Freitas et al. [13]	2016	1	F	49	Unknown	Bilateral total hip arthroplasty	Y
11	John et al. [14]	2018	3	case1:M case2: F case3:M	case1:44 case2:15 case3:64	PKD CDK CP	Osteosynthesis Osteosynthesis Conservative (infected)	case1:Y case2:Y case3:Y
12	current study	2020	1	F	47	PKD	bilateral hip hemiarthroplasty with cement prosthesis concurrently	Y

Abbreviations: F female, M male, chronic pyelonephritis CP congenital dysplastic kidneys CDK, DN diabetic nephropathy, HN hypertensive nephropathy, PKD polycystic kidney disease

regular monitoring of the femoral neck bone mineral density, and undertaking an exercise programme are important to improve bone health in patients on HD.

Guidelines recommend that surgery for hip fracture should be performed within 48 h after the event. Delayed surgery for more than 48 h in elderly patients with hip fractures increased the risk of postoperative complications. However, in dialysis patients, a delayed operation did not contribute significantly to the mortality rate compared to that in the non-dialysis cohort [29]. The current study found that delaying surgery for a period of time did not negatively impact the incidence of postoperative complications [30].

Hip fractures are a common problem in the ageing population and are associated with significant mortality and morbidity rates. The mortality rate within 1 year after hip fracture is as high as 36% despite aggressive management, including surgery and rehabilitation [31]. Unfortunately, the incidence, mortality, and medical costs of fractures in patients with kidney disease are much higher than those of ordinary fractures [32, 33]. Patients with CKD often have a longer hospital stay after a fracture, and the chance of going to a skilled nursing facility after discharge is higher than that of patients without CKD. According to reports, more than 80% of

fracture patients with CKD need skilled nursing facility after discharge from the hospital, which is much higher than other complications of CKD [34].

Femoral neck fractures are often treated with either internal fixation or artificial hip replacement. In the general population, treatment is performed according to age, bone quality, and fracture classification. In our case, we performed hemiarthroplasty according to the poor bone quality and life expectancy of less than 10 years. In the patient dependent on dialysis, the outcomes of arthroplasty are well described in the recent literature. Compared to non-dialysis-dependent patients, dialysis patients undergoing arthroplasty have suboptimal results with significantly higher incidence rates of deep venous thrombosis, surgical site infection, need for blood transfusions, wound complications, intensive care unit care, and attentive postoperative rehabilitation, as well as a 10–20 times greater risk of inpatient mortality [35, 36]. Some authors have suggested that arthroplasty should be approached with caution and preferably be delayed until after KT [37, 38]. In our case, blood transfusions were performed, and a seizure occurred 2 weeks after surgery. There are two possible factors may contribute to the high mortality in dialysis patients with hip fracture. The first is the higher prevalence of comorbidities

and the second is the higher occurrences of postoperative complications. A personalized surgical treatment based on specific clinical situations should be planned and carried out using a necessary risk assessment before surgery [39]. It should be noted that biological and mechanical failure can occur in the patients with RO and osteoporosis after hip fracture surgery [40]. Thus, a team approach involving expert nephrologists, geriatricians and orthopaedic surgeons is highly significant to reduce early complications and mortality. Dialysis patients with hip fracture require multidisciplinary assessment and intervention for the prevention of subsequent osteoporotic fractures. It can be difficult for dialysis patients to participate in rehabilitation while undergoing dialysis. Therefore, clinicians should highly pay attention to their standard rehabilitation.

In conclusion, hip fractures in HD patients pose serious challenges for surgeons. Clinicians should pay more attention to comprehensive treatment methods, which can reduce the morbidity and mortality rates of hip fractures in HD patients. A multidisciplinary team consultation for perioperative management is necessary and effective. Early diagnosis with prompt surgical treatment could lead to favourable recovery.

Abbreviations

RO: Renal osteodystrophy; HD: Haemodialysis; CKD: Chronic kidney diseases; SBFNF: Simultaneous bilateral neck femoral fractures; PD: Peritoneal dialysis; KT: Kidney transplantation

Acknowledgements

Not applicable.

Authors' contributions

JWL, WLH, JTH and YQZ participated in the diagnosis and treatment of the patient, provided follow-up, acquired clinical data, drafted and reviewed the manuscript. YYZ and YQZ conducted investigations, reviewed literature, and assisted in polishing the manuscript for final publication. All of the authors read and approved the final manuscript.

Funding

No funding was received for this study.

Availability of data and materials

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

Not applicable.

Consent for publication

The written consent to publish images or other personal or clinical details of participants was obtained from the patient.

Competing interests

The authors declare that they have no competing interests.

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Received: 7 March 2020 Accepted: 13 April 2020

Published online: 15 April 2020

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