Case Report

Nontraumatic central fracture dislocation of the hip in a patient with chronic kidney disease and post gastrectomy

Ken Shimizu1, Hisanori Kameda1, Haruo Kawamura2, Takeshi Makihara1 and Yukiyo Shimizu3

1 Department of Orthopedic Surgery, Namegata District General Hospital, Japan
2 Department of Orthopedic Surgery, Ryugasaki Saiseikai Hospital, Japan
3 Department of Orthopedic Surgery, Ibaraki Prefectural University of Health Sciences, Japan

Abstract

Objective: Patients with secondary hyperparathyroidism caused by chronic kidney disease (CKD) develop secondary osteoporosis, which increases fracture risk. We report a case of insufficiency fractures complicated by secondary osteoporosis caused by chronic renal failure and gastrectomy.

Patient: A 78-year-old man with a medical history of nephrotic syndrome and gastric cancer experienced an occult intertrochanteric fracture of his left femur after falling.

Results: Ten days after the first fracture, the patient was treated with hemodialysis for acute uremic symptoms. Eight weeks after this fracture, he sustained a right insufficiency acetabular fracture and was treated with total hip arthroplasty (THA).

Conclusion: For patients with CKD, effective fracture prevention is difficult. THA with reconstruction of the acetabulum was an effective therapy in a patient with nontraumatic central fracture dislocation of the hip.

Key words: chronic kidney disease, secondary hyperparathyroidism, insufficiency fracture, central fracture dislocation of the hip

Introduction

It is well known that patients with secondary hyperparathyroidism caused by chronic kidney disease (CKD) develop secondary osteoporosis, which increases fracture risk. The most common site of pelvic insufficiency fracture is the pubic bone. The pubic fracture is generally stable and can be treated conservatively. We report here a case of acetabular insufficiency fracture treated with total hip arthroplasty (THA).

Patient

A 78-year-old man visited our hospital because he was unable to walk due to pain around the left hip joint after falling in November 2010. He had a medical history of nephrotic syndrome (membranous nephropathy) in 1995 and gastrectomy (gastric cancer) in 2005. At the initial hospital presentation, he was very thin; his height was 152.5 cm, weight was 42.7 kg, and body mass index was 18.4. He complained of severe tenderness and pain on motion about the left hip joint. The clinical findings suggested the possibility of a hip fracture. Plain radiographs revealed no fracture in the left hip joint or the pelvis, although severe osteoporosis with a Singh index grade of 2 was observed in the femoral neck (Figure 1). We performed magnetic resonance imaging (MRI) to find any abnormality of the hip joint. T1- and T2-weighted images showed a line of low signal intensity running obliquely in the metaphysis of the left femur, which represented an occult intertrochanteric fracture (Figure 2). Blood tests and a urinalysis revealed anemia, undernutrition, and renal dysfunction (Table 1). Written informed consent was obtained from the family of the patient for publication of this case report and accompanying images.

He was hospitalized for conservative treatment of an occult intertrochanteric fracture of the left femur. On the 10th day of hospitalization, he developed loss of appetite, nausea, and vomiting. A second set of blood tests and blood gas tests suggested acute uremic symptoms due to deterioration of renal function and metabolic acidosis (Tables 2 and 3). He was immediately treated with hemodialysis.

Partial weight bearing on his left leg with a walker was initiated 4 weeks after the occult intertrochanteric fracture...
of the left femur. Eight weeks after the fracture, he suddenly felt severe pain in the contralateral hip when he stood at his bedside. Because of severe right hip pain, he was unable to stand or walk. A plain radiograph showed an acetabular fracture with penetration of the femoral head into the pelvis (Figure 3). We performed MRI of the hip joint again and showed a right acetabular fracture and signal changes suggesting hematoma of the right hip joint cavity (Figure 4). Computed tomography showed central dislocation due to penetration of the femoral head through the inner table of the pelvis without fractures of the anterior and posterior pelvic columns. On the basis of CT findings, the patient was diagnosed with central fracture dislocation of the right hip (Figure 5). Blood and urinary tests were repeated to identify the cause of the insufficiency fracture. The blood biochemistry revealed a marked elevation of intact parathyroid hormone (681 pg/mL), a decrease of 1,25-dihydroxyvitamin D3 (4.9 pg/mL), an elevation of osteocalcin (radioimmunoassay) (25 ng/mL), a decrease of Ca2+ (7.0 mg/dL), and a normal level of inorganic phosphorus (4.7 mg/dL). The creatinine-corrected urinary N-terminal telopeptide of type I collagen level was very high at 403.7 nmol bone collagen equivalents/mmol creatinine. The osteo sono-assessment index (OSI) of the right calcaneum was determined using an ultrasound bone assessment device (AOS-100NW, Hitachi-Aloka Medical, Ltd., Tokyo, Japan). The OSI was 1.827 (× 106), which was 63% of the young adult mean.

Because he was elderly and had many medical complications, we selected THA rather than open reduction and internal fixation of the pelvis. Surgery was delayed approximately 6 weeks after the acetabular fracture to allow stabilization of the soft tissues at the fracture site. We used a posterior approach to the hip joint. We removed the femoral head and ground it in a bone mill. The morselized

| Table 1 | Initial examination of blood and urine |
|---------|--------------------------------------|
| WBC (/μL) | 5200 |
| RBC (100 million/μL) | 2.76 |
| Hb (g/dL) | 8.3 |
| Ht (%) | 8.3 |
| Plt (10000/μL) | 13.4 |
| TP (g/dL) | 5.6 |
| ALB (g/dL) | 2.4 |
| Albumin/globulin | 0.8 |
| UN (mg/dL) | 40 |
| CRE (mg/dL) | 6.9 |
| K⁺ (mEq/L) | 4.8 |
| Ca²⁺ (mEq/L) | 6.5 |
| Corrected Ca²⁺ (mEq/L) | 8.1 |
| ALP (IU/L) | 505 |
| LDH (IU/L) | 135 |
| Urine protein | 2+ |

Figure 1 Plain radiograph from the initial examination. No fracture was apparent in the left hip joint. The Singh index for the femoral neck was grade 2.

Figure 2 Magnetic resonance imaging (coronal slice of the hip joint; left, T1-weighted images; right, T2-weighted image). A fracture line was observed running obliquely in the metaphysis of the left femur.
bone was mixed with artificial bone and packed tightly into the freshened acetabulum. Then, an acetabular ring (Lima Corporate, Udine, Italy) was placed in the acetabulum for reconstruction, and a ZCA Snap-In Cup (Zimmer, Warsaw, Indiana, USA) was cemented into place. For the femur, a VerSys Cemented Stem (Zimmer, USA) was cemented in place (Figure 6). Weight bearing on the right leg was started 2 weeks after the surgery. He was discharged 10 weeks after surgery on foot using a Japanese style walker. He reported no pain in the right hip joint as of 18 months postoperatively. Although he needed a wheelchair to travel long distances, he was able to walk with a cane for a short distance indoors.

### Discussion

The pathobiology of abnormal bone metabolism in patients with CKD is shown in Figure 7. The patient in this report had already developed secondary hyperparathyroidism caused by chronic renal failure at the time of the initial examination. He also had postgastrectomy undernutrition and malabsorption of vitamin D. The 4 weeks of bed rest after the left occult hip fracture might have increased bone resorption, resulting in severe bone fragility, which might have caused the right nontraumatic central fracture dislocation of the hip.

Pentecost et al. classified stress fractures into fatigue fractures, which occur when abnormal stress is applied to bone with normal elastic resistance, and insufficiency fractures, which are produced by rhythmic and repeated application of subthreshold external force to bone with poor elastic resistance. There are various underlying diseases that can cause insufficiency fracture, including geriatric osteoporosis, rheumatoid arthritis, oral steroid therapy, hemodialysis,
There have been many case reports of fractures of the pelvis due to bone fragility. According to Goto et al., the next most common site of insufficiency fracture associated with rheumatoid arthritis, after the spine, is the pelvis. However, the majority of the pelvic insufficiency fractures in their study were pubic bone fractures, and they did not include any acetabular insufficiency fractures. Other studies have reported cases of minor pelvic fractures diagnosed by radiographs or MRI alone that were successfully managed with conservative treatment. However, there have been only a few case reports of central fracture and dislocation of the hip requiring surgical treatment.

Berman et al. reported the use of conservative treatment for central fracture and dislocation of the hip in patients with chronic renal failure. They observed that the clinical course was excellent when partial weight bearing was initiated after traction and no weight bearing for 8 weeks but thought that THA would be necessary later due to leg shortening. In addition, Hirao et al. performed symptomatic treatment in adults with Down syndrome with severe bone fragility who developed central fracture and dislocation of the hip with the expectation that the hip would undergo ankylosis in the dislocated position. This course was chosen because either long-term traction and bed rest or surgery was considered unsuitable in light of the patients' level of

Figure 5 Computed tomography of the hip joint after injury of the right hip (left, multiplanar reconstruction [MPR] coronal slice; right, three-dimensional [3D] reconstruction from behind). The MPR image shows femoral head deformity. The 3D reconstruction shows that the femoral head penetrated through to the inner region of the pelvis.

Figure 6 Plain radiograph of the hip joint after surgery.

Figure 7 Abnormal bone metabolism in patients with chronic kidney disease. 1,25(OH)$_2$D$_3$, 1,25-dihydroxyvitamin D$_3$; IP, inorganic phosphorus.
comprehension and tolerance of the treatment options. The authors found that the pain in the hip joint was decreased 7 months after the fracture but found that the range of motion was limited and that the patients could not move without a wheelchair.

The major surgical treatments for central hip fractures with dislocation are open reduction and THA, and in all of the reports that we found, THA was performed because of the difficulty of anatomical internal fixation of the acetabulum protruding into the pelvis and the severe operative stress involved. Fukunishi et al.\textsuperscript{13} and Fujinaka et al.\textsuperscript{14} reported excellent outcomes after THA performed after 2 months without weight bearing in a patient with rheumatoid arthritis and a patient with chronic liver injury, respectively.

In summary, we experienced a case of pelvic insufficiency fracture in a patient with secondary osteoporosis due to chronic renal failure and undernutrition. Effective fracture prevention was difficult in the patient with the above-mentioned complications. THA with reconstruction of the acetabulum was an effective option in the patient with nontraumatic central fracture dislocation of the hip.

Conclusion

We report here a case of nontraumatic central fracture and dislocation of the hip in a patient with CKD. Patients with undernutrition due to chronic renal failure may develop severe insufficiency fractures such as this one. THA with acetabular reconstruction using a support ring and morcelized bone graft was effective for treating central fracture dislocation of the hip in a patient with these complications.

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