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Hip Arthoplasty for Femoral Neck Fracture in Patient with End Stage Renal Disease

Abstract

Introduction: The risk of femoral neck fracture increases in the End Stage Renal Disease (ESRD) patients who underge hemodialysis. The aim of this study was to describe our experience with the treatment of femoral neck fracture in this particular group of patients.

Method: In a retrospective study, between January 2010 to December 2015, there were 16 displaced femoral neck fracture in 12 haemodialytic ESRD patient. All patients underwent total hip arthroplasty via direct anterior approach (three cementless and 9 cemented). No closed suction drain was used. Follow up regime was at 3,6 and 12 month and annually thereafter.

Result: All patients were satisfied with the results of total hip arthroplasty. At the time of the final follow-up of 22 months (2-47) months, all the hips in the 12 haemodialytic patients functioned well without any loosening, and with a Harris hip score (HHS) of 90(82–100). Of those patients who received cementless components: one patient showed loosening of femoral component on the right and then left hip one year after surgery. He underwent revision of femoral component to a cemented one. The other complications include one greater trochanteric fracture, one intraoperative distal femoral fracture, one postoperative hematoma formation and one superficial surgical site infection.

Conclusion: In this small series, relatively high complication rate is observable in cases of ESRD with femoral neck fracture treated by hip Arthroplasty. The use of cemented femoral sterns is preferred and extra caution is advised to avoid fracture in such osteoporotic bones.

Keywords: ESRD ؛Femoral Neck Fractures ؛Total Hip arthroplasty, Bone Cements, Postoperative Complications

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Introduction

The risk of femoral neck fracture increased in the ESRD patients who underwent hemodialysis [1]; it is a common cause of mortality and reduce function In ESRD patients and general population [2, 3]. The relative risk of hip fracture for patients with ESRD on dialysis has been estimated as 4.4 times the general population [4]. In patients on hemodialysis, the incidence of femoral neck fracture is rated to be 7 per 1,000 patient per year in males and 17 per 1,000 in females [1, 5, 6]. Previous studies have reported that hip fractures in this group of patients may occur after minimal trauma [5, 7] and may occur bilaterally [8]. One study looked at mortality in ESRD patients with hip fracture and concluded that operative treatment had lower mortality than non-operative treatment [9]. Osteosynthesis is an acceptable option for nondisplaced femoral neck fractures. Internal fixation of femoral neck fractures in ESRD patients is associated with a high risk of failure, nonunion and avascular necrosis (AVN) [7, 9-12].

There have been several studies reporting the poor outcome of hemiarthroplasty or cementless total hip arthroplasty in patients with chronic renal failure [12, 13]. The aim of this study was to describe our experience with hip Arthroplasty for the treatment of femoral neck fracture in the patients population these particular patients.

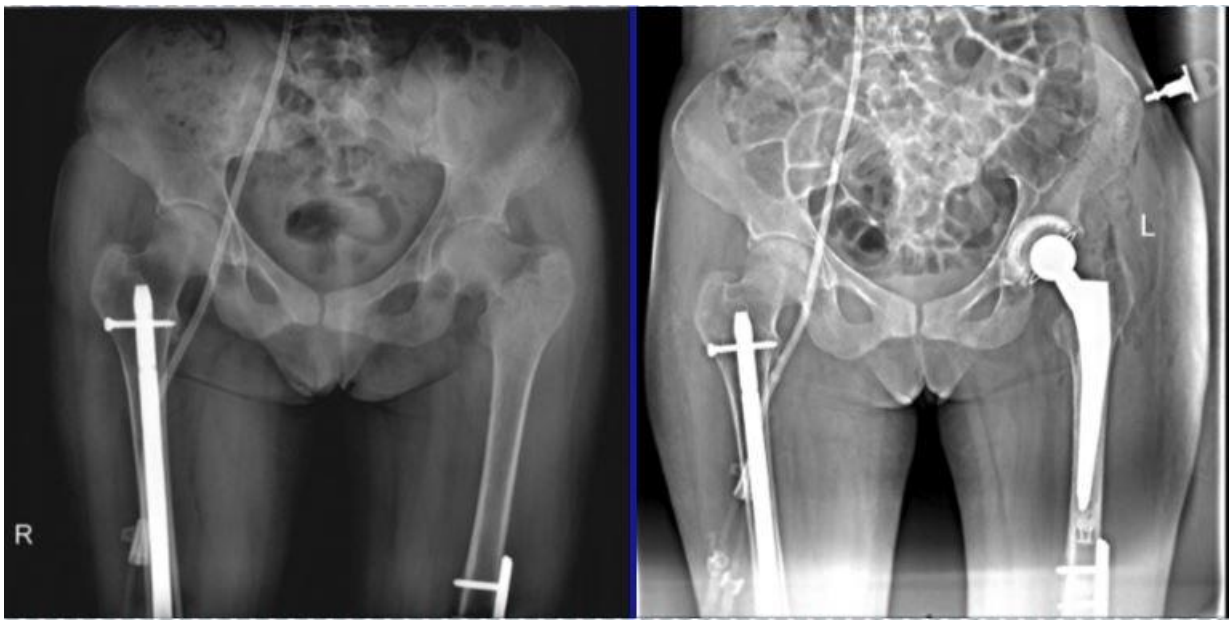

Figure 1: A 29 years old women with ESRD presented with Left Femoral Neck Fracture who underwent Cemented THA

Methods

Demographics

We retrospectively reviewed our prospective by collected database at our institution between January 2010 and December 2015. We found 16 femoral neck fracture in 13 patients with displaced femoral neck fracture who had been on hemodialysis for chronic renal failure. 5 of the fractures were not associated with trauma.

The causes of renal failure were: Diabetes mellitus [1], systemic lupus erythematosus [14] chronic glomerulonephritis [4], pyelonephritis [7]. Three patients had one failed renal transplant attempt before the study. None of the patients had a functioning renal transplant at the time of fracture or during follow-up. Three patients were chronically ill with multiple medical problems, the average age at surgery was 49 (41–78) years and the average follow-up time was 22 (2–24) months. There were 9 men and 4 women, the mean duration of hemodialysis prior to the fracture was 11 (2–26) years.

All patients underwent surgery at our institution using an anterior approach; -all by a single orthopedic surgeon. Three patients received cementless stems and cups and nine patients received cemented stem and cup components (Figure 1). From 12 patients, seven patients received CORAIL cemented stem, two patients received Fitmore cementless stem (Zimmer, USA), two patients received Müller cemented straight stem (Zimmer Biomet, Westminster, California, USA) and one patient was Wagner cementless stem. After reaming the acetabulum, the corresponding size polyethylene cup was cemented with the finger-packing technique. The femoral canal was prepared with rasps, canal blocker was inserted, and the femoral component was introduced with a cement pusher. The median size of the used cups was 50 mm (44–56). femoral component sizes were 7.5 and 10.

Each patient underwent hemodialysis on the day before surgery, without heparinization. All the patients were managed pre- and postoperatively by nephrology team to ensure the best medical condition before and after surgery. Intravenous Patients on hemodialysis did not receive subcutaneous LMWH prophylactically. Prophylactic antibiotics (second generation of cephalosporin) were given postoperatively to all the patients for 3 doses. No suction drain was used after surgery. The patients were allowed to bear full weight as tolerated.

The patients were evaluated preoperatively and postoperatively at 3–6 months, 12 months, and annually thereafter. Pain and function were recorded at each follow-up visit using the Harris hip score. The average follow-up was 22 (2-24) months.

Radiographic evaluation

After operation, anteroposterior radiographs of both hips were routinely taken annually or whenever clinical symptoms indicated. Radiographs were digitized and migration was measured using an image analysis program. The known diameter of the head was used to determine the magnification on radiographs. The position of the femoral component was assessed by comparing the positions of reference points on the prosthesis and on the tip of the greater trochanter. Subsidence was recorded as being present when the femoral component migrated more than 3 mm or varus/valgus displacement of more than 5 degrees was noted [15].

The radiographs were rated according to the Gruen zone system for the femoral component and according to De Lee and Charnley for the acetabular component [6]. Loosening was defined as follows: potential loosening: radiolucency (linear/focal) < 2 mm; probable loosening: linear radiolucency > 2 mm; focal radiolucency > 5 mm; definitive loosening: linear radiolucency > 2 mm all around ([6, 15].

All radiographs were evaluated by all the authors. The end points for prosthetic survival was included, the revision for persistent patient, pain and/or radiological evidence indicating loosening of the acetabular or femoral component.

Results

All the patients were satisfied with the results of surgery. The main success was pain relief. At the time of the final follow-up all hips in the 12 hemodialysis patients functioned well without any loosening, and with a Harris hip score (HHS) of more than 80. The mean HHS was 90 (Range, 82–100). Of those patients who received cementless components, one patient showed loosening of femoral component in right and later in left hip one year after surgery. He underwent revision of femoral component to cemented one.

There was one intraoperative displaced fracture of the greater trochanter, postoperative hematoma in one hip, and one superficial infection with prolonged antibiotic administration for 4 days. There was one intraoperative distal femur fracture due to large cystic lesion. This was fixed with plate. None of the patients had deep vein thrombosis, thromboembolism, or iatrogenic nerve injury. One hip dislocation repaird open reduction. There were no periprosthetic fracture during the follow-up. One patient died of cardiopulmonary arrest 10 days after surgery. One patient died on operating table after spinal anesthesia and before an incision made.

Discussion

The risk of femoral neck fracture is high in the ESRD patients who undergo hemodialysis [1]; femoral neck fracture is a common cause of mortality and reduce function in ESRD patients and general population [2, 3]. Metabolic bone disease is observed on bone biopsy in 75—100% of patients with ESRD [7]. Patients with chronic renal failure may develop hyperparathyroid disease associated with increased bone turnover and/or osteomalacia with low bone turnover [16]. Patients with low bone turnover disease are probably at greater risk of developing a fracture [17, 18]. In light of this metabolic bone changes and susceptibility to fracture, femoral neck fracture is a real challenge The ESRD, chronic hemodialysis, and transplantation failure may cause multiorgan insufficiency, metabolic bone imbalance, and a high risk of postoperative complications and mortality. Despite the high risk of complications, operative treatment of femoral neck fracture has been recommended in this group of patients [19]. After internal fixation is unusually high compared to that in the general population [11]. Risk of non-union or avascular necrosis or failure following internal fixation of even in minimally displaced fractures is sufficiently high to recommend primary replacement arthroplasty in all patients with ESRD [11].

Pathology associated with hemodialysis may lead to early loosening of the implant because

of poor bone quality or migration of amyloid deposits into the bone-implant interface [20]. One of our 13 patients on hemodialysis died during the first postoperative year. Higher mortality rates (10–100%) have been reported [9, 11, 12, 21, 22]. We must stress that an expert team of nephrologists treated all of our patients postoperatively. There was delay in surgery beyond 5 days in our series. This can be explained by the need to optimize the preoperative medical condition of these patients in terms of fluid status, serum potassium level and hematocrit.

Reduced immune reactivity in patients on long-term hemodialysis may increase the risk of infection [23, 24]. None of our hemodialysed patients had a deep infection diagnosed. Low infection rates in such patients were also reported by Karaeminogullari et al. [12] and Nagoya et al. (2005) [25].

The literature contains conflicting results regarding clinical and radiographic outcome of hip arthroplasty in patients on hemodialysis. Lieberman et al. (1995) [23] reported poor results in 13 of 16 patients, Naito et al. (1994) [26] presented poor results in 6 of 15 patients, whereas Gualtieri et al. (1995) showed 6 good or excellent results in a series of 8 patients. Hardy et al. (1994) [10] obtained excellent long-term results in 11 of 13 cases of hemiarthroplasty. Sakalkale et al. (1999) [24] reported good-to-excellent clinical results for 11 of 15 hips in 12 patients despite the fact that 7 patients had early complications.

In our short follow-up, we did not observe any failure of prosthesis such as migration or progressive loosening in cemented cases. We did not observe development of radiolucencies or osteolysis around the stem in these hemodialysed patient. Probably due to short-term follow up and good-cementing technique. In the hemodialysed patients, migration of the stem occurred without radiographic evidence of osteolysis. Subsidence of the stem is due to unsatisfactory bone support and failure of the bone-cement interface. Pathology associated with long-term hemodialysis may lead to poor bone quality, which may fail to support the implant. [27]

Naito et al. (1994) [26] reported loosening of cemented prostheses in 5 of 15 hips after an average of 5 years follow-up. Toomey and Toomey (1998) [28] reported migration of 8/15 cemented stems with a mean time to failure of 8 years. Karaeminogullari et al. (2007) [12] reported a cumulative survival of 63% at 32 months, of 8 unipolar and bipolar hip arthroplasties that were performed for femoral neck fracture. Nagoya et al. (2005) [25] reported no loosening of 11 uncemented stems and suggested that the use of uncemented implants with extensively coated stems may prevent loosening of the femoral components. On the other hand, Gualtieri et al. (1995) [29] recommended the use of cemented stems in hemodialysis patients because of poor bone quality. Sakalkale et al. (1999) [24] reported no revision of the cemented or cementless femoral stem in hemodialysed patients who had undergone total hip arthroplasty for osteoarthritis or osteonecrosis. It should be noted that the quality of bone in these patients might be different from that in hemodialysed patients with femoral neck fracture. We believe that poor quality of bone precludes the use of uncemented arthroplasty. It would be useful to know the long-term rate of revision after cemented primary hip arthroplasty in this group of patients. Additional factors that need to be taken into account include the higher mortality rate and lower life expectancy in patients with ESRD [1].

Based on the results of our study, it appears that cemented total hip arthroplasty in patients on hemodialysis (performed by an orthopedic surgeon with postoperative management by a nephrologist and a physiotherapist) helps to reduce postoperative complications and mortality. Most of the patients had a good or excellent clinical outcome. Adequate stability of the stem is a crucial consideration for satisfactory long-term results of cemented T.H.A in patients on hemodialysis. Thus, improvements in cemented technique is needed.

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