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Treatment of Femoral Neck Fractures with Arthroplasty Method and Our Results, 6 Years Follow-Up

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ABSTRACT

Background: While femoral neck fractures occur in elderly patients as a result of low-energy traumas, they occur in young patients as a result of high-energy traumas. Clinical findings indicate that it generally occurs in female and elderly patients who are not mobilized and patients with comorbidity, hip pain and fractured leg in external rotation. These fractures are associated with avascular necrosis and nonunion with high incidence. Early diagnosis is of great importance in order to prevent the complications. **Methods:** Various treatment methods are available for femoral neck fractures. Choosing the appropriate treatment in femoral neck fractures treatment is very significant for keeping potential mortality and morbidity at minimum level. Generally surgery is the treatment performed. Fixation is the prioritized treatment in young patients. Arthroplasty is preferred method in elderly patients. **Conclusion:** In our study, we shared 6-years follow-up results of the cemented partial prosthesis that we applied in 57 patients with femoral neck fracture (the mean age is 73,8). All of the patients were enabled to return to their normal lives with the surgery performed at an early period after fracture and with early mobilization. No serious complication arose except for acetabular cartilage erosion that we faced in the long-term and temporary complications in the early post-operative period (injury problems, sore throat and chest pain etc.). In elderly patients, cemented partial prosthesis use is safe and effective.

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INTRODUCTION

Femoral neck fractures occur in the intracapsular region of proximal femur (Keklikçi *et al.*, 2009). While femoral neck fractures result from low-energy traumas in elderly patients as a result of the negative progression of bone balance, they develop in healthy young patients as a result of high-energy traumas (Aytekin *et al.*, 2011; Bernstein and Ahn, 2010; Keklikçi *et al.*, 2009). These fractures commonly coexist with multiple injuries. Early and precise diagnosis is the most important steps in the treatment. Late diagnosis increases avascular necrosis and nonunion rates considerably (Kömürçü *et al.*, 2013; Mukherjee and Ashworth, 2010). Another major point is that osteonecrosis might develop in femoral neck fractures since the veins feeding the femoral head are injured and the circulation of the head is upset (Almazedı *et al.*, 2013; Aytekin *et al.*, 2011).

Various treatment methods like surgery, internal fixation and arthroplasty are available in femoral neck fractures. Hip arthroplasty is separated into three as unipolar hemiarthroplasty, bipolar hemiarthroplasty and total arthroplasty. It can also be separated into two as cemented and uncemented according to the property of femoral stem used (Hersekli and Atik, 1999; Parker, 2000; Usra, 2009). Femoral neck fractures account for 3% of all fractures. %40 of the fractures seen in patients over 60 years are femoral head fractures and %75 of these cases are seen in female patients. It is more frequently seen in the presence of early menopause, andropause, osteomalacia and osteoporosis (Lee and Jarun, 1992; Aytekin *et al.*, 2011). Also, white race, calcium deficiency, smoking and alcohol, postural instability, Parkinson's disease, dementia, malign tumors and cardiopulmonary diseases constitute some of the risk factors (Açıkgöz, 2003; Aytekin *et al.*, 2011; Eftekhari, 1993; Emery *et al.*, 1991; Jarnio and Thorngren, 1993; Mullen and Mullen, 1992). The diagnosis of femoral neck fractures can be easily made by the A-P and lateral graphs taken in line with the clinical findings (Zugkerman, 1996; Aytekin *et al.*, 2011). Over 90% of femoral head fractures develop posttraumatically. The cause of it in almost all elderly

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patients is low-energy traumas like simple falls in the house. It is seen among young adults following high-energy traumas and traffic accidents and falling from height can be given as the reasons (Bucholz and Heckman, 2001; Davis and Sher, 1990; Keklikçi *et al.*, 2009; Kömürçü *et al.*, 2013; Zaimoğlu, 2011). The incidence of fractures in femoral proximal is directly proportional to age. Majority of the patients are 80 years old in average and 75% of them are female patients. These fractures result from high-energy traumas or underlying pathological cause in young adults. Among elderly patients they result from low-energy traumas and even occur spontaneously as a result of the potential risk factors like osteoporosis, imbalance, cognitive function insufficiency, general muscle weakness and muscle atrophy. 90% of the hip fractures seen among elderly patients occur due to simple falling (Almazedı *et al.*, 2011; Keklikçi, 2009; Lu-Yao *et al.*, 1994; Naqvi *et al.*, 2012). There are two mechanisms available: Direct mechanism and indirect mechanism (Aytekin *et al.*, 2011; Bonfiglio, 1982). Femoral head fractures are separated into three according to anatomical location, direction of the fracture angle and fracture fragment displacement (Aytekin *et al.*, 2011; Keklikçi *et al.*, 2009).

1- According to anatomic localization: Subcapital (wedge shaped, classic and inferior head fractures) and transcervical (Aytekin *et al.*, 2011; Banks, 1962; Keklikçi *et al.*, 2009).

2- According to the direction of fracture angle: They are classified as 30° Type I, 50° Type II, 70° Type III (Keklikçi *et al.*, 2009; Aytekin *et al.*, 2011).

3- According to displacement degree of fracture fragments (Aytekin *et al.*, 2011; Keklikçi *et al.*, 2009; Garden, 1961): Garden Type I, II, III and IV.

The prioritized treatment alternative in “Femoral Head Fractures” with multiple pieces, which are physiologically old, and with clear osteopenia is arthroplasty. Arthroplasty is a reliable and suitable surgical alternative in order to avoid complications like nonunion and avascular necrosis and associated secondary surgical procedures in patients with low life expectancy (Aytekin *et al.*, 2011; Keklikçi *et al.*, 2009; Haidukewych, 2007; Robinson *et al.*, 1994; Shah *et al.*, 2002; Wilson and Michael, 2004). Arthroplasty is a procedure performed in patients with multiple pieced femoral head fractures and weak bone quality who underwent open reduction and interior fixation; however for whom good results were not obtained, and patients experienced degenerative joint disease on the same joint previously (Canale, 2007; Bucholz and Heckman, 2001; Green and Moore, 1987; Zaimoğlu, 2011).

As a whole, the disadvantages of prosthesis applications include broader wound, longer surgery time, longer anesthesia duration, more blood loss, dislocation risk, and increased cost. On the contrary, the advantages include enabling patient to apply total (Akman *et al.*, 1999; Köse *et al.*, 1999; Tomuş, 2007). Prosthesis application is regarded as the savior intervention for femoral neck fractures in complications like nonunion and screw stripping which emerge following internal fixation applications (Canale, 2007; Ege, 1994; Zaimoğlu, 2011). It is necessary to maintain long term functioning of internal joint mobility (metal- polyethylene surface) in postoperative period in order to obtain better results with bipolar hemiarthroplasty application by reducing the acetabular erosion (Aytekin *et al.*, 2011; Bochner *et al.*, 1988; Malhotra *et al.*, 1995; Phillips, 1987). Major disadvantage of bipolar prosthesis is that the dislocations emerge cannot be treated with closed reduction and it requires open reduction to a great extent (Aytekin *et al.*, 2011; Benterud *et al.*, 1996; Bochner *et al.*, 1988; La Belle *et al.*, 1990; Moshein *et al.*, 1990). The pain associated with acetabular erosion resulting from unipolar hemiarthroplasty application in young and active patients brought “bipolar hemiarthroplasty” and “total hip arthroplasty” in treating femoral head fracture forward as an option. Relatively young and active patients with femoral head fracture for whom internal fixation application is not possible and who has arthroplasty indication, patients with degenerative hip arthritis accompanied by neck fracture, elderly rotatoid arthritis patients with femoral neck fracture constitute the patient group in which total hip arthroplasty is appropriate to apply (Aytekin *et al.*, 2011; Coates and Armour, 1980; Delamarter and Moreland, 1987; Dorr *et al.*, 1986; Gebhard *et al.*, 1992; Pun *et al.*, 1987; Sim and Sigmund, 1986; Sim and Stauffer, 1980; Skinner *et al.*, 1989).

Total hip arthroplasty is preferred more since it yields superior clinical results. However, the indications of total hip arthroplasty following the fracture include accompanying arthrosis, rheumatoid arthritis, Paget disease and tumor that concerns both sides of the joint. While total hip prosthesis relieve symptoms significantly, postoperative dislocation rate is between 1,4-14 %, higher than hemiarthroplasty. Dislocation rate is higher in cases in which total hip arthroplasty is applied due to osteoarthritis compared to cases in which total hip arthroplasty is applied due to femoral head fracture (Keklikçi *et al.*, 2009; Lee *et al.*, 1998; Wilson and Michael, 2004). Since blood loss is higher and surgery time is longer in patients underwent total hip prosthesis compared to patients underwent hemiarthroplasty, morbidity and mortality of the total hip prosthesis patients show increase compared to other treatment groups. Acetabular erosion and pain secondary to it is completely eradicated since acetabulum is changed prosthetically in total hip prosthesis. The most commonly seen complication in the treatment of femoral head fractures with total hip prosthesis is dislocation (Aytekin *et al.*, 2011; Sim and Sigmund, 1986; Sim and Stauffer, 1980; Skinner *et al.*, 1989).

The reason for this is stated as the fact that movement limits in patients with fractures return to its preoperative state with total hip prosthesis, whereas arthritis patients act more conservatively due to soft tissue pathologies and because preoperative period movements are already limited (Gebhard *et al.*, 1992; Aytekin *et*

al., 2011). Arthroplasty is the appropriate treatment method in cases of advance age, bad mental status, the need for standing up by applying full force, bad bone quality and osteoporosis, coexisting degenerative arthritis, romatoid arthritis, Paget disease, Parkinson's disease, multiple pieced and deplaced fracture presence (Atik, 1997; Atik, 1998; Hersekli and Atik, 1999).

In arthroplasty application, factors like patient age, pre-fracture activity level, degenerative arthritis presence coexisting with fracture and averagely expected life span of the patient should be taken into consideration. One of the most effective methods in evaluating the success of arthroplasty alternatives is determining and comparing postoperative pain and function degrees of the patients. In case of arthritis presence coexisting with fracture in patients with femoral neck fracture, total hip prosthesis is the recommended method (Atik *et al.*, 1989; Cartlidge, 1981; Hersekli and Atik, 1999).

Application:

In all patients, hip anterioposterior and lateral graphs were taken. Deplaced collum femoris fracture was detected in all patients. All patients were hospitalized, prophylactic antibiotics (cefazolin sodium and gentamicin) and low molecule weighted heparin was initiated. Blood count, urine analysis and the swap samples of all patients were examined. Anesthesia specialist performed evaluation. Fluid replacement was performed in all patients and hemodynamics was achieved. Erythrocyte suspensions were prepared for all patients.

Spinal or general anesthesia was performed in line with the patient condition. Urine catheter was inserted. Patients were lied down on the bed in lateral decubitus position and fixed. Hip region was prepared in a sterile way and Ioban containing draping was adhered. 2-gr cefazolin sodium was prepared before surgery was performed. Posterior incision was performed in all patients. Tensor fascia lata was separated as split and was eradicated. Gluteal muscles were separated sharp hand dissection without inflicting damage. Sciatic nerve was protected. Joint capsule was opened with T incision. Fracture hematoma was emptied and washed. Fracture line was eradicated and fractured femoral head was removed via corkscrew. Head was measured with calliper tool. Femoral medulla was rasped with the appropriate scapers. Intense washing and bleeding control was performed. During operation, 1-3 unit erythrocyte suspension depending on the patient and in some patients 1-2 units frozen plasma infusion was performed. Upon making trails after tentative use of prosthesis, cementing was performed in femoral medulla by inserting aspirative drain hose, and drainage was removed when cementation was finalized and femoral stem was implanted. Femoral stems of 4 patients with Alzheimer and Parkinson's disease were implanted by increasing anteversion angles. Partial prosthesis head was inserted when cement is frozen and hip reduction was performed. Hip movements were controlled and capsule was repaired. 1 drainage was placed and all layers were closed anatomically. All of the patients were followed for half a day in postop follow-up room and were taken to normal services by being monitored.

Drainages were removed from all patients after 24 hours and were enabled to walk with walker by applying full force. All patients were discharged from the hospital on the post op 3-4 day upon arranging their medications, rehabilitation was started and they were followed in polyclinic. Antibiotics and antiembolic prophylaxis was applied in all patients.

Results:

57 patients who applied to us in an emergency state on different days after they fell were included in the study. 39 of the patients are female and 18 are male. The mean age of the patients is 73.8. Patients applied to our clinic within 2 days in average after they fell. Unilateral femoral head fracture was detected in all patients. All fractures are closed fractures. Among patients, 43 patients have hypertension, 22 patients have diabetes mellitus, 6 patients have hypothyroidism, 18 patients are chronic smokers, 5 patients underwent subtotal bowel resection, 3 patients have Alzheimer beginning, 1 patient has Parkinson's disease and 2 patients have proteinuria. 8 patients use 100 mg aspirin per day routinely. All patients were mobilized and were able to meet their own needs before facture occurred. All patients were operated on the 18th hour in average after they applied to our unit and partial cemented prosthesis was applied in all patients (Figure 1-2).

All of the patients were mobilized within 24 hours postoperatively. Patients were mobilized within 3,5 days in average after they fell. Our patients needed 1.8 units erythrocyte suspension in average. 12 patients described throat and chest pain, and they were regarded as the temporary complications secondary to anesthesia. The complaints like burning sensation and pain when urinating that we associated with catheter use vanished within a short time. Hematoma occurred on incision line in 14 patients, temporary spontaneous drainage emerged in 5 patients and was corrected with dressing. 2 Alzheimer patients fell in postop early period but no complication arose. 11 patients passed away for different reasons within 6 years of follow-up. 12 patients complained about mild hip pain from 5th year onwards and acetabular cartilage erosion was observed. No complication secondary to prosthesis developed in patients.

Discussion:

90% of the hip fractures seen among elderly patients occur due to simple falling (Almazedı *et al.*, 2011; Keklikçi *et al.*, 2009; Lu-Yao *et al.*, 1994; Naqvi *et al.*, 2012). Arthroplasty is a reliable and suitable surgical alternative in order to avoid complications like nonunion and avascular necrosis and associated secondary surgical procedures in patients with low life expectancy (Aytekin *et al.* 2011; Keklikçi *et al.*, 2009; Haidukewych, 2007; Robinson *et al.*, 1994; Shah *et al.*, 2002; Wilson and Michael, 2004). Arthroplasty is the appropriate treatment method in cases of advance age, bad mental status, the need for standing up by applying full force, bad bone quality and osteoporosis, coexisting degenerative arthritis, romatoid arthritis, Paget disease, Parkinson's disease, multiple pieced and deplaced fracture presence (Atik, 1997; Atik, 1998; Hersekli and Atik, 1999).

When the mean age of our patients reached 73.8, we preferred using partial prostheses with shorter operation time, less blood loss and with less probability of dislocation. We believe that we prevented potential complications by mobilizing our patients within a short time due to our cemented application. We assumed that patients underwent operation after 18 hours upon their arrival in our clinic and were not allowed to walk within 24 hours contributed to the positive results significantly. We believe in the importance of the short and rapid operation due to various risk factors in the majority of our patients. We observed that scar problems developed postoperatively emerged in patients using aspirin, however, we did not prefer waiting in order to achieve mobilization in the patients. We are not able to eradicate emboli totally since we cannot perform scintigraphic examination for the throat and chest complaints in 12 patients. It is of great importance that no patient died in association with prosthesis and surgery. We consider that acetabular erosion we observed in 5 patients has a low rate in total. Major disadvantage of bipolar prosthesis is that the dislocations emerge cannot be treated with closed reduction and it requires open reduction to a great extent (Aytekin *et al.*, 2011; Benterud *et al.*, 1996; Bochner *et al.*, 1988; La Belle *et al.*, 1990; Moshein *et al.*, 1990).

It is a drawback that all prosthesis in our study is partial and we did not prefer bipolar. However, we did not want to take the risks of a new surgical application for a dislocation that might happen in the years to come. We are of the opinion that application of arthroplasty with increased anterversion angle is effective in preventing dislocation. It is important that all patients return to their normal lives.



Fig. 1: Femur boyun kırığı nedeniyle sementli parsiyel protez uyguladığımız hastamız.



Fig. 2: Femur boyun kırığı nedeniyle sementli parsiyel protez uyguladığımız hastamız.

Conclusion:

Femoral head fracture is a fracture type that is frequently seen among elderly patients and that can create serious complications in case it is not treated. In young patients, osteosynthesis is the primary choice due to high bone union potential and long-term risks of arthroplasty. In elderly patients, partial prostheses enabling patients to be mobilized with shorter operation time within a short period are preferred. Cemented prosthesis applications help patients to walk within a very short period of time.

We prefer cemented partial prosthesis application in elderly patients with femoral head fracture. In the long term, the risk of acetabular cartilage erosion occurrence should not be disregarded. Increasing the anteversion angle of the femoral stem in patients with Alzheimer and Parkinson's disease reduces dislocation risk without causing serious movement limitation. Short operation time and early mobilization are among the advantages. We do not recommend bipolar prosthesis application since we think that it would not be appropriate in the elderly patients to take the risk of a new operation due to dislocation occurrence risk. In elderly patients, cemented partial prosthesis application with short operation duration that provides early mobilization within a short time following fracture is advantageous.

Contribution of Authors:

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