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RESEARCH ARTICLE

SPONTANEOUS SUB-CAPITAL FRACTURE NECK OF FEMUR COMPLICATING A UNITED TROCHANTERIC FRACTURE IN A DIABETIC- CASE REPORT AND REVIEW OF LITERATURE

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ABSTRACT

**Introduction:** Spontaneous subcapital femoral neck fracture is one of the rare complications arising after metallic fixation of peritrochanteric fractures. Its association with osteoporosis, old age, female sex and alcohol induced osteoporosis has been described in literature but to the best of our knowledge its association with diabetes has not been described.

**Case Presentation:** A 60 year old male, Diabetic, Asian Indian in origin presented to us as trauma right hip with intertrochanteric fracture. The patient developed spontaneous subcapital femoral neck fracture after 24 months of Dynamic hip screw fixation. The patient was reoperated, after removal of hardware appropriate size bipolar prosthesis was placed.

**Conclusion:** Spontaneous subcapital femoral neck fracture even though being an uncommon complication, one should still be very vigilant about this sort of a complication after any metallic trochanteric fracture fixation or after removal of the implant, especially in patients who are elderly osteoporotic or have added risk factors like being alcoholic or being diabetic as was our patient.

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INTRODUCTION

Intertrochanteric fractures are one of the very common injuries especially in elderly accounting for more than 200,000 patients each year in the United States (David, 2008). Introduced in 1970's, Dynamic hip screw (DHS) fixation is still one of the common methods of fixing such type of fractures despite introduction of intramedullary devices and other modifications of DHS fixation. Orthopaedic surgeon should be well versed with the operative technique as well as the complications associated with such type of metallic fixation devices. In addition one should have enough knowledge to tackle such complications. Spontaneous sub capital fracture neck of femur is one such rare complication about which there is little mention in literature despite not being such an uncommon entity. Surgeons should be well aware of this complication and should be careful while following patients who undergo open reduction and fixation of peritrochanteric fractures. We report one such patient, a diabetic, 60 year old male with an intertrochanteric fracture in whom DHS fixation was done, who had an uneventful immediate follow up but later developed spontaneous subcapital fracture neck of femur.

CASE REPORT

A 60 years old male, Diabetic, Asian Indian in origin reported to our emergency department on 5<sup>th</sup> august 2006. Patient had sustained a fall with trauma to right hip and was diagnosed as having intertrochanteric fracture (Figure 1).

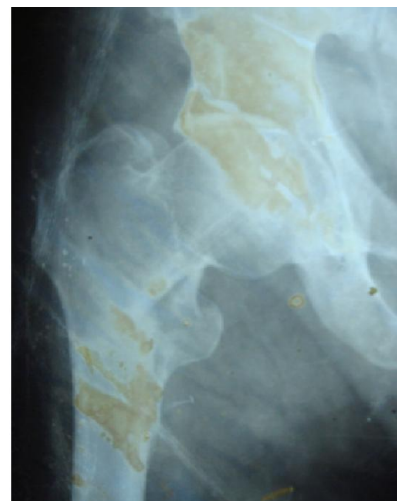


Figure 1. Fracture intertrochanter right

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The patient was operated and fracture was fixed using a dynamic hip screw fixation -135 angled 4 hole plate with 80mm Richard's screw (Figure 2 and Figure 3). Immediate post-operative period was uneventful. Patient was full weight bearing by 5 months and fracture united. 24 months after surgery, patient started with pain same hip. There was no antecedent history of trauma associated with this pain. X-ray showed sub capital fracture neck of femur with a united intertrochanteric fracture (Figure 4). The patient was re-operated. Removal of hardware was done. After preparing the stem, appropriate size bipolar prosthesis was placed.

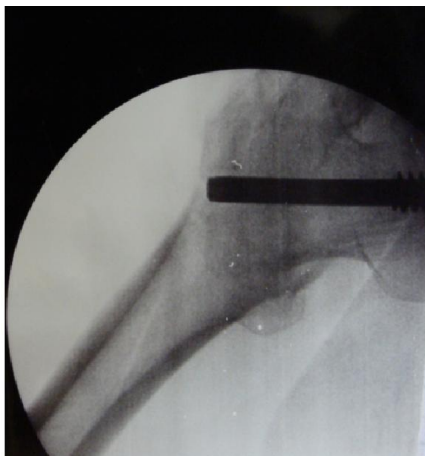


Figure 2 and 3. Intra operative pictures showing placement of the screw (note no neck fracture is present)



Figure 4. Fracture neck of femur with a united trochanteric fracture

## DISCUSSION

There have been cases reported on spontaneous development of fracture neck of femur and its association with some sort of fixation of peri-trochanteric fractures. Whether be it use of zickel nail fixation (Ross, 1980), Mclaughlin nail plate fixation (Baker, 1975; Mariani, 1989; Wilson-MacDonald, 1985), Ender's nails (Chan, 1986) or AO blade plate fixation (Cameron *et al.*, 1975) all have been reported as leading to this complication. After going through the literature, cases reported with sub-capital fracture femoral neck subsequent to the fixation of trochanteric fractures can be divided into three broad categories. One group belongs to those in whom after a successful treatment of a peri-trochanteric fracture, patient develops a spontaneous neck fracture with hardware still in the bone. Second one is a similar patient but fracture neck of femur occurs after removal of hardware. Third group of patients are those in whom after a trochanteric fracture is united, hardware is still in the bone, fracture neck of femur occurs after sustaining an antecedent trauma.

Parker and Walsh described 4 cases 1993, all female, aged 75 to 89 with an interval of 5 to 36 months between a trochanteric fracture and development of spontaneous neck fracture. Heck *et al.* 1996 describes 4 patients with femoral neck fracture following intertrochanteric fracture. Though they believed one case to be clearly traumatic, rest of the three, they believed could have been caused by multiple factors- elderly female and osteoporosis (Parker and Walsh, 1993). Fairbank *et al.* 1993 described a case with spontaneous sub-capital fracture femoral neck complicating a united peri-trochanteric fracture. The patient was 82 year old female and spontaneous neck fracture occurred after 9 months of fixation of trochanteric fracture (Fairbank *et al.*, 1993). Gogan *et al* described a similar case, 42 year old male. He attributed the development of spontaneous neck fracture after peri-trochanteric fixation to the chronic alcohol induced osteoporosis (Gogan *et al.*, 1988). Mariani and Rand described 3 cases of sub capital femoral neck fracture using DHS, McLaughlin, Ender nail. They attributed it to the osteoporotic bone and improper placement of the implant.

The case, which occurred after DHS fixation, was 82 years old female and spontaneous fracture neck occurred after 7 months of fixation (Mariani, 1989). Wolf and Kessler described a case of a 79 years old female who sustained a fracture neck of femur after 3 months of trochanteric fracture fixation without any antecedent trauma<sup>12</sup>. Kanai *et al* studied 274 patients treated for intertrochanteric fractures and were followed up to 5 years. They found 7 fractures of the subcapital femoral neck, all were women 74 to 92 years of age. Fractures occurred 4-36 months after fixation of trochanteric fractures. They concluded that high grade osteoporosis to be most important predisposing factor in spontaneous development of subcapital femoral neck fracture after healed intertrochanteric hip fracture. They also concluded that with regard to the placement of the screw, spinal score, age, ambulation, height, weight and type of fracture were not significant (Kanai *et al.*, 1999). Lung *et al* reported 5 cases of spontaneous neck fracture, all female 77 to 90 years of age. Fracture neck of femur occurred after 2 months to 36 months of trochanteric fixation. They believed that advanced age, female gender, osteoporosis, smaller size of

the femoral neck and head, and basicervical type of fracture to be important risk factors for the development of a spontaneous neck fracture (Lung *et al.*, 2007). Arrington *et al* reported a case 86 years old female with a spontaneous neck fracture after 4 months of trochanteric fixation. They believed that this complication could be prevented by making a deeper placement of the dynamic hip compression lag screw to within 5mm- 8 mm of the subchondral bone (Arrington, 1999). There have been cases reported regarding spontaneous fracture neck of femur in a healed trochanteric fracture following removal of hardware. Buciuo *et al.* after studying 233 patients of peritrochanteric fractures reported development of a spontaneous neck fracture in 7 patients in whom hardware was removed after an average period of 20.5 months. Among them four of the seven patients had been treated with the fixed angle blade plate and three with the sliding screw plate. The mechanism of this sort of complication as per them was unknown (Buciuo, 1997). Kukla *et al.* 2001 studied the biomechanics of the femur after implant removal. Removal of the Gamma nail decreased the resistance to fracture of the femoral neck by about 41% compared to the 20% of dynamic hip screw (DHS). The lag screw diameters of the DHS, PFN, and Gamma nail are 8, 11 and 12 mm, respectively. When the diameter of the lag screw reaches a certain size, the incidence of fracture increases geometrically. Their findings demonstrate that removing relatively big implants such as standard gamma interlocking nails (SGN) can cause serious complications such as femoral neck fractures. They therefore recommend to leave this type of device in place even after fracture healing except in cases of deep and chronic infection (Kukla *et al.*, 2001).

The spontaneous development of fracture neck of femur after a healed trochanteric fracture in our case cannot be explained on the basis of patient parameters, which are known to be associated with such type of complication. Since our patient was a 60 years old male, he did not fit in the typical description of an elderly looking osteoporotic female who are prone to get such type of fractures as described in literature. Because our patient was diabetic on oral hypoglycaemics, it could be a reason for the spontaneous development of neck fracture in him. Hou *et al* described effects of severe diabetes and insulin on the femoral neck of immature rats. As per them rats with severe insulin-dependent diabetes had significantly lower total body mass than did control rats, as well as significantly less femur mass, femur length, total-bone cross-sectional area, and cortical-shell cross-sectional area. Insulin therapy ameliorated some, but not all, of the detrimental effects of diabetes on femoral neck geometry (Hou *et al.*, 1993). Krakauer *et al.* in a 12 year prospective study, showed that diabetic humans have a reduced bone forming capacity due to diminished osteoblastic activity compared with normal individuals (Krakauer *et al.*, 1995). Also patients with diabetes exhibit reduced bone mineral density as measured by dual x-ray absorptiometry of the lumbar spine and proximal femur (Muntoz-Torres, 1996).

## Conclusion

Spontaneous development of femoral neck fracture after using any sort of metal for peri-trochanteric fracture fixation is a rare complication. Though being uncommon one should be very vigilant about this sort of a complication after trochanteric

fracture fixation or after removal of the implant, especially in patients who are elderly osteoporotic or have added risk factors like being alcoholic or being diabetic as was our patient. Further this sort of a complication of trochanteric fracture fixation should have a mention in standard textbooks of Orthopaedics.

**Conflict of interest statement:** The authors declare that they have no competing interest

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