

Bifocal Femoral Neck and Atypical Subtrochanteric Fractures Treated with Cemented Long Stem Hemiarthroplasty A Case Report

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ABSTRACT

Introduction: Bisphosphonate related fractures present a quandary for orthopaedic surgeons due to the presence of adynamic bone and complex deforming forces around the fracture. With the increased use of anti-resorptive medication, such fractures are becoming increasingly common with a variety of unique presentations reported in the literature.

Case Report: A 82-year-old woman was diagnosed with acute displaced transcervical neck of femur fracture with concomitant bisphosphonate-related atypical subtrochanteric femur fracture. She was treated with a bipolar hemiarthroplasty using a long-cemented stem to bypass the subtrochanteric fracture. The surgery was complicated by transient bone cement implantation syndrome which responded promptly with sympathomimetics. To our knowledge, this is the first case report of this unique bifocal fracture, and we discuss the merits and challenges of various treatment options.

Conclusion: Cemented hip hemiarthroplasty is a good option for treating bifocal proximal atypical femoral fractures. Pre-emptive optimization and synchronous coordination between surgeon and anaesthetist are mandatory to prevent complications.

Level of evidence – V

INTRODUCTION

Atypical femoral fractures associated with bisphosphonate use continue to remain a challenge for physicians and surgeons worldwide due to the increasing use of anti-resorptive osteoporosis treatment and the unique location and poor healing potential of these fractures [1-3]. There is limited literature on atypical femoral fractures outside of the subtrochanteric region as described by the American Society of Bone Mineral Research [4]. Limited case reports have described atraumatic femoral neck stress fractures from prolonged bisphosphonate use [5,6]. Surgical fixation of such fractures appear to be fraught with complications such as fracture propagation [7], non-union [8], persistent pain and limping [9].

CASE REPORT

An 82-year-old woman presented to our emergency department after sustaining a fall from standing height and associated left groin pain. She did not complain of any prodromal hip or thigh pain in both lower limbs and was a community ambulator with

a walking stick. She had a significant past medical history of hyperlipidaemia and right internal carotid artery stenosis. She was on alendronate which was started after she sustained a right distal femur shaft fracture that was treated with a retrograde femoral nail six years prior.

Radiographs (Figure 1 and 2) and magnetic resonance imaging (MRI) of the hip revealed a displaced transcervical neck of femur fracture and an un-displaced subtrochanteric femur fracture with focal lateral cortical thickening. T2 weighted imaging of the left femur revealed periosteal oedema and increased signal intensity which suggested an acute-on-chronic or subacute atypical subtrochanteric stress reaction (Figure 3).

During her inpatient stay, she was treated for community acquired pneumonia, paroxysmal atrial fibrillation with mild fluid overload and likely type 2 myocardial infarction prior to surgery. She was counselled regarding a high-perioperative cardiac risk, but elected to undergo a bipolar hemiarthroplasty due to her desire for independent mobilisation.

Spinal anaesthesia was administered for the surgery and a standard posterolateral approach was utilized to access the hip joint. The proximal femur was prepared to receive an Exeter V40 Long (205mm) Stem, Size 1 with 37.5mm offset [Stryker™ UK Ltd., Newbury, UK] to bypass the subtrochanteric femur lesion.

Canal preparation and cement insertion was performed using a third generation cementing technique. Minimal pressurization was employed in lieu of the patient's comorbidities and potential risk for bone cement implantation syndrome (BCIS). Despite adequate pre-filling with an albumin bolus and phenylephrine infusion, the patient went hypotensive and eventually unresponsive and pulseless about 12 minutes, shortly after hip reduction with the trial head and bipolar cup. 100µg of phenylephrine and 10µg of adrenaline boluses were administered to the patient who eventually responded, with return of spontaneous circulation. Upon notification of the BCIS event, the actual implant head and shell were inserted and the hip was reduced and closed. The patient was observed in the surgical intensive care unit (SICU) post-operatively where she remained hemodynamically stable.

The patient was allowed to weight bear as tolerated and started sit to stand exercises with a walking frame by post-operative day (POD) 2. She was able to ambulate with a

frame by POD5 and was transferred to a rehabilitation facility. Her bisphosphonate medications were discontinued while maintaining her calcium and vitamin D supplements. When reviewed at 6 weeks post-operation, she reported no pain in the hip or thigh, was ambulating well with just a walking stick and able to cross kerbs and small obstacles. Radiographs showed a well-fixed stem and cement mantle that had bypassed the subtrochanteric lesion by at least 2 cortical widths without any new fractures, dislocations or stem subsidence (Figure 4).

DISCUSSION

The prolonged use of bisphosphonate has been known to increase risk of atypical femoral fractures [10]. However, the reduced risk of osteoporotic related fractures far outweighed the risk of atypical femoral fractures. Recent studies have reported that the Asian ethnicity has increased risk associated with atypical femoral fracture [10,11]. It was hypothesized that greater concentration of bisphosphonate on smaller femur size and a more bowed femur could potentially lead to higher local stress and microfracture development [12,13]. Studies have shown that the risk of atypical femoral fracture drops rapidly after a 2-year bisphosphonate drug holiday, suggesting that predisposed individuals reduce their risk of atypical femoral fracture while also benefiting from a prolonged antiresorptive response with a well-timed drug holiday [14,15]. However, challenges occur when individual presents with a femoral fracture and an atypical femoral fracture concurrently.

Multifocal femoral fractures are commonly seen in high-energy trauma and present unique challenges due to the complexity of obtaining reduction and suitable fixation of multiple fractures [15]. In elderly frail patients, arthroplasty may present an elegant solution for the appropriate fracture pattern but is also fraught with challenges due to patient's reduced physiological reserves. Conservative management may have reduced the peri-operative cardiac and anaesthetic risk but would likely have resulted in poorer outcomes for the patient due to the loss of mobility [16,17].

For displaced intracapsular femoral neck fractures in the elderly, an open reduction would likely be required and surgical fixation is associated with an increased risk of reoperation, chronic pain and poorer outcomes [18]. Previous

case reports utilizing screw fixation of bisphosphonate related femoral neck stress fractures have also shown to be associated with non-union, fracture propagation and persistent pain [7-9] that may be due to the reduced regenerative capacity of adynamic bone [3]. Arthroplasty for patients with atypical subtrochanteric femur fractures and hip osteoarthritis have been described using uncemented long stemmed implants supplemented with plates and cables [10] or strut allografts [20], but have also reported complications such as stem subsidence.

To the best of our knowledge, there are no current guidelines on the optimal femoral stem type for patients with atypical subtrochanteric fractures. Previous case studies have utilized uncemented stems for fixation of displaced and un-displaced atypical subtrochanteric fractures with concomitant hip osteoarthritis to varying degrees of success [19,20]. Most of the surgeons had concerns about bony osseointegration and augmented their fixations with cables, plates, or strut allografts. Biomechanical and cadaveric studies have shown increased rates of subsidence and reduced load to fracture for uncemented stems in bone with reduced mineral density [22,23]. In addition, uncemented stems have been shown to be associated with increased risk of intraoperative and early postoperative femoral fractures [24] and loosening in patients aged >75-years-old [25].

BCIS consists of a constellation of symptoms ranging from moderate hypoxia and hypotension to cardiovascular collapse requiring cardiopulmonary resuscitation (CPR) [26]. It can occur at any stage of canal preparation, cement implantation, prosthesis insertion or joint reduction and has been associated with significantly increased mortality rates up to 30 days [27,28].

Effective communication between surgical and anaesthetic teams, invasive monitoring, pre-emptive fluid administration, meticulous canal preparation, cement plug insertion, vacuum mixing and retrograde insertion of cement utilizing a cement gun are tenets of good cementing technique to reduce BCIS risk. Further studies may also be carried out to determine the optimal stem type for arthroplasty in elderly patients with atypical subtrochanteric femoral fractures.

CONCLUSION

In conclusion, this case report describes the successful treatment of a patient with bifocal femoral neck and atypical subtrochanteric fractures with a cemented long stemmed bipolar hemiarthroplasty. While it is a viable treatment option, multi-disciplinary management of these patients is mandatory to mitigate significant peri-operative morbidity and mortality.

STATEMENTS AND DECLARATIONS

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None

COMPETING INTERESTS

The authors declare that there are no competing interests directly or indirectly related to the work submitted for publication.

CONFLICT OF INTEREST

The authors report no conflicts of interest in this work.

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INFORMED CONSENT

Informed consent was taken from patient for the publication of this case report.

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