

Interprosthetic Femur Fracture with Broken Bipolar Stem Following Hip and Knee Arthroplasty. A Case Report and Review of Literature

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Abstract

Introduction: Interprosthetic femur fracture includes classification of fracture of the femur in ipsilateral total hip and knee arthroplasty. However, there are no classifications available till date which includes femoral stem fracture along with ipsilateral hemiarthroplasty.

Case Report: We present a case of 74-year-old rheumatoid female with interprosthetic femur fracture in a previously operated ipsilateral hemiarthroplasty and total knee arthroplasty. Evaluation revealed pre-existing broken bipolar stem. We managed the case by locking plate fixation after removal of distal broken stem.

Conclusion: Interprosthetic femur fracture classification system doesn't include broken femoral stem. Ipsilateral hemiarthroplasty also has not been mentioned in the literature. In Indian scenario, hemiarthroplasty is more common than total hip arthroplasty, hence we propose it to be included in the existing classification.

Keywords: Hemiarthroplasty; Total Knee Arthroplasty (TKA); Broken Femoral Stem; Interprosthetic Femur Fracture (IPFF)

Introduction

The life expectancy and functional demand of the elderly population is surging [1]; hence, the number of hip and knee arthroplasty are proportionately rising. The prevalence of THA/TKR in elderly population is gradually increasing due to more active people in this age group. Subsequently, the frequency of interprosthetic femur fracture (IPFF) is on rise [2]. There number of literatures available on individual IPFF and periprosthetic femur fracture (PPFF) on PubMed and Google Scholar, but they are very few and far. The classification system for IPFF [3] does not include broken femoral stem neither was included in any other classification system [4].

We are reporting a rare case of a IPFF with broken bipolar stem along with stable extended femoral component of TKA and how we managed this fracture.

Case Report

A 74-year-old female with rheumatoid arthritis was admitted with Left inter prosthetic femur fracture. She initially underwent Bipolar prosthesis following neck of femur fracture in 2007 elsewhere. The femoral stem of the prosthesis broke in 2012 (Figure 1), however she continued to comfortably bear weight and was doing her regular activities with ease. Patient was asymptomatic till she injured her left arthritic knee and had upper third fracture of tibia on 13/1/2019 for which TKA was done using extended femoral and tibial stems (Figure 2). The patient resumed her daily activities after 3 months post knee replacement. She started complaining of pain on her left thigh from March 2020. While doing physiotherapy as suggested by treating surgeon, she experienced sharp shooting pain and could not sustain the leg raising. She reported to emergency on 30th April 2020, five days after onset of new symptoms. X-ray done in our emergency revealed IPFF with a broken stem of bipolar prosthesis (Figure 3).



Figure 1: Shows broken femoral stem marked with red arrow following bipolar hemiarthroplasty.



Figure 2: X-ray showing knee replacement done with extended stems after proximal tibia fracture.



Figure 3: X-rays done at emergency showing IPFF at the same level of broken femoral stem of bipolar prosthesis.

In this case we had a dilemma regarding how to fix the fracture where there is near total obliteration of entire medullary canal. Replacing the bipolar prosthesis with longer stem revision implant was not possible because of the presence of pre-existing extended femoral component of the TKA. The other option was to put locking plate [5] which has two holes, one for locking screw and another for nonlocking screw. The disadvantage of locking screw hole is having a fixed direction which might hit the *in-situ* implant. The advantage of having nonlocking hole is that path of the screws can be manipulated to bypass the *in-situ* implant to get a solid bicortical purchase. In case it is not possible, then unicortical fixation with cerclage wiring for additional support was in consideration. This procedure also involves jeopardising the periosteal blood supply [6]. The other option was to put locking plates in two planes using either unicortical or bicortical purchase, however this also will extensively compromise the vascularity of the bone.

Patient was operated under Spinal Anaesthesia. Using lateral approach, the fracture site was exposed. The broken stem from the distal fragment was removed by making drill holes around the broken implant and was extracted with a Kocher’s forceps (Figure 4). This gave us approximately 3 cm of free medullary space for fracture fixation. A 9-hole locking plate was applied and fixed with 8 cortical screws having bicortical purchases (Figure 5). Intraoperatively, almost all screws were negotiated grazing the broken stem to have good purchase on the second cortex.



Figure 4: Intra operative images showing fracture exposure and fixation with plate. Adjacent picture shows extracted broken distal stem.

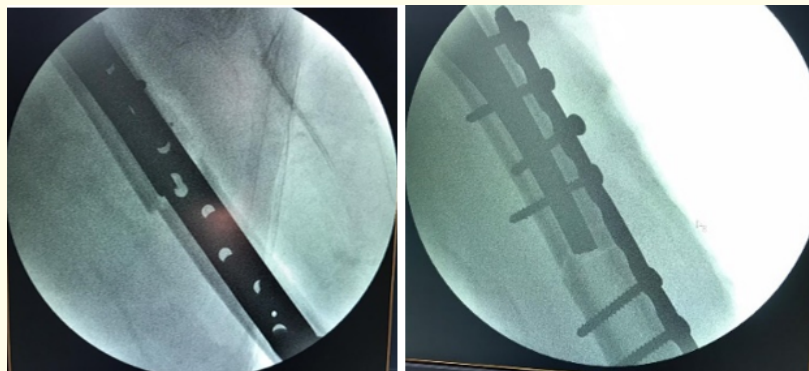


Figure 5: Intraoperative images showing stable proximal prosthesis and good reduction of fracture.

X-ray was done on 2nd post-operative day (Figure 6) and patient was discharged. Stitch removal was done at 2 weeks and physiotherapy was advised. We have encouraged aided non-weight bearing ambulation and expecting union as she follows up in OPD.



Figure 6: Post-operative x-ray.

Discussion

Literature from several studies shows periprosthetic (PF) ranging from 0.1 to 18% after total hip arthroplasty (THA) and is around 0.3 to 5.5% after total knee arthroplasty (TKA). The incidence of femoral intraoperative fracture is 1.7% for primary THA compared to 3.5% post-operative probability of fracture after 20 years [7]. Periprosthetic fracture following revision knee surgeries ranges from 4 - 11% and sometime the incidence might go up to 30% [8].

The mortality following treated periprosthetic femoral fracture varies from 13.1 to 15.8% after 12 months to 18 months [9].

Elderly population and females are commonly affected [10]. PPF are usually results from low energy trauma. Lindahl, *et al.* had analysed 321 PF femoral fractures and reported 75% of fractures are due to low energy trauma. Few of the most common comorbidities which significantly contribute PF are osteoporosis/osteopenia and rheumatoid arthritis [11]. Platzer, *et al.* reported 73% incidence of distal femoral PF with rheumatoid arthritis and severe osteoporosis [12]. Although there are different literatures available regarding the classification of PF following THA/TKA but there is no classification available for IPPF with broken femoral stem of bipolar prosthesis [13]. We are reporting a unique case of femoral IPPF with broken stem following ipsilateral hemiarthroplasty (HA) involving and TKA and way to deal with such type of fractures.

This is a unique case report because of two reasons, primarily all the literatures on IFF have documented periprosthetic femoral fracture following ipsilateral THA and TKR but there is no literature available for IFF with Hemiarthroplasty. Secondly, so far there is no classification available for IFF with broken stem in any of the literature [14].

The first PPF classification was introduced by Parrish and Jones in 1964 [15]. This classification was based on the fracture in relation to anatomical region of femur. Later, Whitker, *et al.* classified it in relation to the intertrochanteric or fracture distal to the lesser trochanter [16]. Another classification was provided by van Elegen and Blaimont, *et al.* depending upon their relationship of fracture to proximal, middle or distal third of femur [17]. During 1980s Johansson, *et al.* published a classification which focussed on stem stability in relation to the PPF [18]. Bethea, *et al.* classified the PPF in relation to tip of the stem. Gonzalez, *et al.* divided the fracture with respect to stability of the fracture to the prosthesis [19]. Vancouver [20] classified femoral fractures in relation to the hip stem, however it was Fink, *et al.* [21] who first described a classification system of femoral fractures between ipsilateral hip and knee arthroplasty. Platzer, *et al.* [22] modified Vancouver classification by dividing IPPF and illustrated three main types of fractures depending on the stability of the fracture and proximity of the fracture. It was Piers, *et al.* who classified IPPF based on the site of the fracture, stability of the implant and viability status of interprosthetic bone fragment [23]. In addition to the above classification, UCS system was introduced combining AO/OTA and Vancouver classifications [24].

None of the above classification mentioned about the broken femoral stem and its management. Moreover, all the classification system was based on THA and not bipolar prosthesis.

Initially IFF was treated with open fixation where a non-rigid stability was provided with Mennen plate [25]. Later, different types of non-fixed angle devices and circumferential implants were used with high failure rates. Although the first reported fixed angle Dynamic condylar plate with screws were successfully used by Della Valle [26] for patients with IFF with a non-stem TKA implant.

Presently IFF is mostly treated with locking plate implants because of improved stability especially in osteoporotic bones [27]. The other advantages being its application avoids excessive tissue stripping and varus collapsed is also negated.

There are several studies of tensioned circumferential cerclage wiring to supplement the fixation by compressing the plate to the bone. Some of the IFF can be managed with dual plates for providing better stability, the only disadvantage being the complication of excessive soft tissue stripping. Other methods include Locking and non-locking plates and screws devices to fix IPFF. Of late another device polyaxial locking plates have come to the armamentarium which can engage the plate in different direction [31].

Conclusion

This rare case of IPFF with broken bipolar stem is so far not yet reported in available literature. Piers has classified IPFF with intact stem.

In our view, broken femoral stem should be included in the IPFF classification as the management of this unusual case is challenging. Addition of this entity will help the surgeon in planning and executing such cases.

Clinical Message

The broken stem in interprosthetic femur fracture presents a challenging picture. Removal of broken stem and bicortical plate fixation is technically demanding. Locking plate fixation is a good stabilisation method in such scenario.

Learning Point of the Article

The lacunae in the interprosthetic femur fracture classification need to be relooked and broken femoral stem as well as ipsilateral hemiarthroplasty requires to be included in the classification system.

Conflict of Interest

Nil.

Source of Support

Nil.

Consent

The authors confirm that informed consent of the patient is taken for the publication of this case report.

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