



**BILATERAL PERI-PROSTHETIC FRACTURES AFTER TOTAL
KNEE ARTHROPLASTY IN A PATIENT WITH SEVERE
RHEUMATOID ARTHRITIS. A CASE REPORT AND MANAGEMENT
APPROACH**

Mohammed K.M Ali^{1*}, Abid Hussain², Ahmed Al wadyia², CA Mbah², Simon Cockshott³

¹Registrar Trauma and Orthopaedics, Trauma and Orthopaedics, Royal Derby Hospital, Derby, UK, DE22 3NE.

²Junior Clinical Fellow, Trauma and Orthopaedics, Royal Derby Hospital, Derby, UK, DE22 3NE.

³Consultant Orthopaedics Surgeon, Royal Derby Hospital, Derby, UK, DE22 3NE.

Corresponding Author:- **Mohammed K.M Ali**
E-mail: Mohammedkholder84@hotmail.com

<p>Article Info Received 15/07/2015 Revised 27/08/2015 Accepted 01/09/2015</p> <p>Key words: Bilateral Peri-prosthetic fractures; Total knee replacement; Management.</p>	<p>ABSTRACT Periprosthetic fractures following previous total knee replacements are rare injuries and can be extremely challenging and problematic .Rheumatoid arthritis has been reported to be one of the risk factors for periprosthetic fractures A 71 year-old female with a history of severe Rheumatoid arthritis and bilateral total knee replacement, tripped and fell forwards landing onto her knees and sustained minimally displaced left supracondylar fracture and right complex proximal tibia fracture. The left side was treated non-operatively with a hinge brace, non-weight bearing while the right knee needed revision with a long stem. The patient was discharged home after 6 weeks of physiotherapy and rehabilitation, and then subsequently seen in follow-up clinic with a satisfactory outcome. Bilateral periprosthetic fractures are very rare, however extremely challenging for surgeons. This is due to the fact that there is not enough experience in treating these fractures, further complicated due to the large variety of implants and designs together with concepts, and principles needed to be considered in each individual presentation. The management outcome of this particular case was evidently satisfactory for both the patient and the surgical team. Thus by reporting on this case we would like to share our positive experience; very different from the previously reported cases.</p>
---	--

INTRODUCTION

The risk of periprosthetic fracture following TKA is particularly high because most of the TKA patients are advanced in age and have osteopenia [1, 2]. These fractures are becoming more frequent; most likely due to the growing number of knee arthroplasties [3] performed. Rheumatoid arthritis has been reported as one of the many risk factors for periprosthetic fractures.

The Incidence of distal femoral metaphyseal periprosthetic fractures associated with total knee replacement has been reported to range between 0.3% and 2.5% [4, 5] and the complication rates of treatment

reported in the literature range widely, from 25 to 75 percent irrelevant of surgical experience [3, 6, 7,8, 9].

Chen F in 1994 [10] reviewed 195 fractures in twelve published reports of ipsilateral supracondylar femoral fractures and found that the complication rates are about 30 percent with both non-operative and operative treatment methods. Periprosthetic tibial fractures are also very rare. The incidence is between 0.4% to 1.7% and usually involve the medial tibial plateau in the presence of a loose component and mal-alignment or malposition of implants [2, 11].



The following case report describes the management of a bilateral total knee replacement with asymmetrical periprosthetic fractures, the right was supracondylar type 1A according to Kim's [12] classification and the left was tibial fracture type IV according to Felix's [13] classification type 4 according to Mayo classification.

A 71 year old female presented with a past medical history of severe Rheumatoid arthritis, on Methotrexate treatment and previous bilateral total knee and hip replacements (figure-1). Normally, she mobilised independently when at home and used a tripod on occasions when in pain or mobilising outside. The patient tripped and fell forwards, landing on her knees. She presented to accident and emergency department with a painful, swollen and bruised right knee. The left knee was tender over the distal femur. X rays confirmed bilateral fractures, both were closed and neurovascularly intact, a subsequent CT scan confirmed a minimally displaced and well aligned left supracondylar fracture (figure-2).

Unfortunately the right side was more complicated with a tibial collapse and avulsion of the tibial tuberosity (figure-3).

The patients' left total knee replacement was undertaken seven years ago with satisfactory recovery and follow-up. The right total knee replacement was sixteen years old and of a Genesis type. This also had uneventful recovery and follow-up.

This current left sided fracture was managed conservatively using a knee hinge brace and the patient was kept non weight bearing on the left leg.

As the right side was a first generation Genesis TKR, this had to be revised to a modular link hinge prosthesis. The tibial tubercle aspect of the fracture was treated similar to a patellar tendon rupture as the bone piece was relatively small and not suitable for fixation. The patient was allowed to bear weight on this leg from the first day post-op. (Figure-4 and 5)

Attention then turned to rehabilitation which involved physiotherapy, bed care and DVT prophylaxis. The patient then spent a total of four weeks in hospital prior to discharge, she was then followed up in the out-patient follow-up clinic to enable monitoring of wound healing, callus formation, extensor mechanism function and progress of mobility. Nine weeks following surgery the patient was allowed to fully weight bear out of brace on the right side, on the left side the hinged knee brace was unlocked from 0 to 90 degrees and partial weight-bearing was permitted. The x-rays confirmed callus formation on the left side (fig-6). The patient was followed up again after 6 weeks with a satisfactory outcome.

DISCUSSION

Historical background

In 2011 V.G Reddy reported bilateral symmetrical periprosthetic fracture of knees, he referred to them as mirror fractures. Both fractures were OTA 33A2 and

according to Rorabeck they were classified as type II. Bilaterally the fractures were fixed by utilising a dual plating technique using non locking plates. An intra operative fracture site biopsy revealed marked osteopenia and hence the patient was treated for osteoporosis [14].

This report was followed by Ozcan in 2013, who also reported bilateral supracondylar femoral periprosthetic fractures which were also treated with locking plates. The functional results were excellent during a two-year follow-up [15].

M.Carvalho et al [16] in 2014 reported a case of a 78-year-old poly-trauma patient, which included bilateral symmetrical periprosthetic femoral fractures after a violent car accident. Both fractures were classified as OTA: 33-A3, Rorabeck Type II, and closed reduction and internal fixation with distal femoral nails were performed.

Classifications

For supracondylar fractures there are many classifications alluded to in the literature. Neers et al in 1967 introduced a classification based on the displacement and comminution of the fracture, followed by DiGioia and Rubash in 1991, who identified three groups based on the degree of the displacement and angulation and whether it was intercondylar. In 1994 Chen et al further classified this type of fracture into two types; type I being nondisplaced and type II being displaced or comminuted. Furthermore, Lewis and Rorabeck in 1997 introduced a classification based on the displacement of the fracture and the condition of the component. Sue et al also identified a further three types; in type I, the fracture is proximal to the femoral component, type II the fracture originates at the proximal aspect of the femoral component and extends proximally, type III, being any part of the fracture line that is distal to the upper edge of the anterior flange of the femoral component.

Kim et al in 2006 [12] introduced a classification system dependent upon: the remaining bone stock, prosthesis fixation status, and reducibility of the fracture. Type I being defined as a fracture that occurs in the knee with an intact prosthesis and sufficient bone stock, which is subcategorized into type IA that is amenable to conservative treatment and reduction and type IB that requires surgical reduction and internal fixation. Type II is assigned if a revision surgery is required due to unstable fixation or malposition of the prosthesis in spite of sufficient bone stock and reducibility; and type III is defined as a severely comminuted fracture with poor bone stock. In our case the fracture was class 1A.

According to the most widely used classification system suggested by Felix et al [13], periprosthetic fractures of the tibia can be categorized into four types predicated on: anatomic location, plateau, adjacent to stem, distal to stem, or tibial tubercle, and whether the prosthesis is well fixed or loose. Type 1, medial or lateral plateau fractures, tend to occur with a failing prosthesis with osteolysis. Type 2 are metadiaphyseal tibial fractures.



Type 3 are diaphyseal tibial fractures and are usually treated independent of the knee replacement because there is generally sufficient bone thus allowing for standard open reduction internal fixation techniques. In a Mayo type 4 there is a tibial tubercle fracture as was in our case.

MANAGEMENT

The literature describes good results with intramedullary nailing for supracondylar periprosthetic

fractures and this seems to be the best treatment for most displaced osteoporotic supracondylar fractures [17, 18]. In our case, the patient had a left supracondylar periprosthetic fracture, which was well aligned with very minimal displacement; hence we decided to treat conservatively with a knee hinged brace. The right side was a very complex type 4 fracture, as described above, and needed revision surgery with a long stem Modular link hinge prosthesis, thus giving a good stability which allowed for the start of early mobilisation.

Figure 1. CT scanogram, performed prior to injury for leg length. Shows bilateral THRs and TKRs.



Figure 2. left supracondylar femoral fracture:



Figure 3. Proximal tibia fracture



Figure 4 and 5. post-operative



Figure 4 and 5. post-operative



Figure 6. X-rays after 9 weeks show callus formation



CONCLUSION

Periprosthetic fractures following previous TKRs are projected to be an increasing problem and can be extremely challenging to manage. With appropriate treatment a favourable outcome can be achieved both non-operatively or surgically or in combination in this unusual case.

In our case at 3 months post injury follow-up the patient had resumed her previous functional status without pain.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

REFERENCES

1. Cordeiro EN, Costa RC, Carazzato JG, Silva Jdos S. (1990). Periprosthetic fractures in patients with total knee arthroplasties. *Clin Orthop Relat Res*, (252), 182-9.
2. Dennis DA. (2001). Periprosthetic fractures following total knee arthroplasty. *J Bone Joint Surg Am*, 83, 120-30.
3. Douglas A. Dennis. (2001). Periprosthetic Fractures Following Total Knee Arthroplasty. *J Bone Joint Surg Am*, 83(1), 120-120.
4. Figgie MP, Goldberg VM. (2000). The results of treatment of supracondylar fracture above total knee arthroplasty. Figgie HE 3rd, Sobel M.
5. Rorabeck CH, Taylor JW. (1999). Periprosthetic fractures of the femur complicating total knee arthroplasty. *Orthop Clin North Am*, 30, 265-277.
6. Henry SL, Booth RE Jr. (1995). Management of supracondylar fractures above total knee prostheses. *Tech Orthop*, 9, 243-52.
7. Bogoch E, Hastings D, Gross A, Gschwend N. (1988). Supracondylar fractures of the femur adjacent to resurfacing and MacIntosh arthroplasties of the knee in patients with rheumatoid arthritis. *Clin Orthop*, 229, 213-20.
8. Figgie MP, Goldberg VM, Figgie HE 3d, Sobel M. (1990). The results of treatment of supracondylar fracture above total knee arthroplasty. *J Arthroplasty*, 5, 267-76
9. Merkel KD., Johnson EW Jr. (1986). Supracondylar fracture of the femur after total knee arthroplasty. *J Bone Joint Surg Am*, 68, 29-43
10. Chen F, Mont MA, Bachner RS. (1994.). Management of ipsilateral supracondylar femur fractures following total knee arthroplasty. *J Arthroplasty*, 9, 521-6
11. Rand JA, Coventry MB. (1980). Stress fractures after total knee arthroplasty. *J Bone Joint Surg Am*, 62, 226.
12. Kim KI, Egol KA, Hozack WJ, Parvizi J. (2006). Periprosthetic fractures after total knee arthroplasties. *Clin Orthop Relat Res*, 446, 167-75.
13. Felix NA, Stuart MJ, Hanssen AD. (1997). Periprosthetic fractures of the tibia associated with total knee arthroplasty. *Clin Orthop Relat Res*, 345, 113-24.
14. Venkata Gurava Reddy, Aditya Krishna Mootha, T Chiranjeevi, Pareen Kantesaria, Vinodh Kumar Ramireddy, and Divakar Reddy. (2011). Bilateral symmetrical periprosthetic (mirror) fractures of knee fixed with dual plating technique. *Int J Surg Case Rep*, 2(7), 175-177.
15. Ozcan O¹, Boya H, Ateş A, Doğruöz F. (2013). Bilateral periprosthetic distal femoral fractures following total knee arthroplasty. *Eklemler Hastalıkları Cerrahisi.*, 24(3), 178-81.
16. Marcos Carvalho, Ruben Fonseca, Pedro Simões, André Bahute, António Mendonça, and Fernando Fonseca. (2014). Bilateral Distal Femoral Nailing in a Rare Symmetrical Periprosthetic Knee Fracture. *Case Reports in Orthopedics*, Article ID 745083, 4 pages
17. ET Su, H DeWal and PE Di Cesare. (2004). Periprosthetic femoral fractures above total knee replacements. *The Journal of the American Academy of Orthopaedic Surgeons*, 12(1), 12-20.
18. WJ Smith, SL Martin and JD Mabrey. (1996). Use of a supracondylar nail for treatment of a supracondylar fracture of the femur following total knee arthroplasty. *The Journal of Arthroplasty*, 11(2), 210-213.

