

# Rotating Hinge Distal Femur Replacement: A Turn for the Worse

Bryce N. Clinger, MD<sup>a</sup>; Kathryn C. Helmig, MD<sup>a</sup>; Scott Plaster, MD<sup>a</sup>; and Kenneth Yaw, MD<sup>b</sup>

Preoperatively periprosthetic joint infection with a postoperative complication of 180° rotation of the press-fit femoral component is a rare event, and knowledge of this possible complication is important for arthroplasty surgeons.

Author affiliations can be found at the end of the article.

**Correspondence:**

Bryce Clinger  
(bnclinger@salud.unm.edu)

*Fed Pract.* 2022;39(1).  
Published on January 12.  
doi:10.12788/fp.0212

The use of a rotating hinge distal femur replacement (DFR) for significant bone and soft tissue defects in the setting of total knee arthroplasty (TKA) revision has become increasingly more common. Although significant advancements have been made in modern DFR components, complications and failure rates remain high. The unanticipated early failure presented serves as the first reported case in the literature to our knowledge of a 180° rotation of a press-fit DFR.

Originally, DFRs were used primarily for oncology patients with substantial bone loss following large mass excisions. The utility of DFRs has grown to include massive bone loss in the setting of TKA revision, periprosthetic fractures, and periprosthetic joint infections.<sup>1-3</sup> DFRs help restore the joint line in the setting of significant bone loss and contain a rotating hinge mechanism that provides functional movement despite the loss of soft tissue constraints around the knee.<sup>1-3</sup>

DFRs have been associated with early postoperative mobilization and decreased need for ambulatory devices at 1 year in revision TKA and periprosthetic and geriatric distal femur fractures.<sup>4-6</sup> Advances in prosthetic design, biomechanics, and fixation technique have led to improved survival rates.<sup>3</sup> Despite these improvements, the overall complication rate remains high at 30 to 40%.<sup>3-7</sup> Commonly reported complications after DFR include infection, aseptic loosening, soft tissue failure, and structural failure.<sup>3,4,7</sup> Recent case studies also have reported on dislocation or disengagement of the rotating hinge.<sup>8-11</sup>

In this case report, we present a patient who had a DFR as the second stage of a

2-stage TKA revision due to a periprosthetic joint infection with a postoperative complication of 180° rotation of the press-fit femoral component. Although this is a rare event, knowledge of this possible complication is important for arthroplasty surgeons.

## CASE PRESENTATION

A patient with a history of hypertension, osteopenia, and rheumatoid arthritis underwent a primary right TKA in 2007. Ten weeks postoperatively, the patient had a ground-level fall that resulted in a right periprosthetic supracondylar distal femur fracture that was treated with a distal femur locking plate. The patient healed, however, with a significant golf club deformity (Figure 1). The patient did well for more than a decade but in 2019 was admitted with pelvic inflammatory disease and adnexal abscess that was treated with broad-spectrum IV antibiotics. Shortly after this admission, the patient developed a right knee periprosthetic infection with cultures positive for *Ureaplasma parvum*.

The patient then underwent a 2-stage revision of the infected TKA. Stage 1 consisted of explant of the TKA components as well as removal of the distal femur plate and screws and placement of an articulating antibiotic cement spacer (Figure 2). The patient completed 6 weeks of IV antibiotics. Following completion of the antibiotic course, we obtained a serum erythrocyte sedimentation rate, C-reactive protein level, and white blood cell count, which were all within normal limits. A knee aspiration was performed and did not show signs of residual infection. Frozen histopathology was sent

**FIGURE 1** Initial Anteroposterior and Lateral Radiographs



Healed periprosthetic distal femur fracture with golf club deformity can be seen.

**FIGURE 2** Postoperative Anteroposterior and Lateral Radiographs



First stage revision with articulating antibiotic cement spacer are visible.

**FIGURE 3** Immediate Postoperative Anteroposterior and Lateral Radiographs



After Zimmer Biomet Orthopedic Salvage System distal femur replacement.

during the second stage of the revision and did not show infection. After the results of the frozen histopathology returned, the antibiotic spacer was removed, and the femoral canal was thoroughly debrided. Cement and fibrous tissue in the femoral canal were carefully removed. In the setting of significant bone loss and soft tissue compromise due to the previous infection and distal femur fracture, the Zimmer Biomet Orthopedic Salvage System (OSS) with porous coated press-fit elliptical femoral stem was utilized.

The femoral canal was reamed until good cortical chatter was obtained at 16 mm. Per the Biomet OSS guide, “For bowed (curved) long and short press-fit stems, the final flexible reamer shaft diameter may need to be larger than the definitive trial and implant diameter.” After trialing, size 15.5 mm was selected for implantation. Intraoperatively the final stem was noted to have good interference fit after insertion and was stable throughout knee range of motion and varus/valgus stress testing. The patient did well with mobilization while in the hospital postoperatively and was discharged home (Figure 3).

Five days after discharge, the patient kicked the repaired knee onto a chair for rest and elevation and experienced extreme pain and was unable to flex the knee. On presentation to the emergency department, the X-rays showed 180° rotation around the longitudinal axis of the

femoral component without any other obvious component failure or fracture (Figure 4). The patient was taken back to surgery the following day. Intraoperatively, the femoral stem was found to be loose and rotated 180° (Figure 5). No failure or dislocation of the tibial or rotating hinge components were identified. The press-fit femoral stem was removed and replaced with a cemented stem (Figure 6).

The postoperative course after the revision surgery was uneventful, and the patient is doing well clinically with no pain, functional range of motion of 5 to 105°, and has returned to regular activities without difficulty.

## DISCUSSION

Despite advancements in DFRs and increasing use in the setting of revision TKA, the procedure remains high risk with respect to postoperative complications.<sup>3-7</sup> Vertesich and colleagues demonstrated that 43.3% of patients who underwent DFR for failed TKA developed at least 1 postoperative complication that required a return to the operating room.<sup>7</sup> Physicians need to be aware of the high rate of complications and counsel patients appropriately preoperatively.

Complications after DFR include infection, aseptic loosening, soft tissue failure, and structural failure.<sup>4,7</sup> Soft tissue failures include insufficiency or rupture of the extensor mechanism and patella

**FIGURE 4** Anteroposterior and Lateral Radiographs

180° rotation of the femoral component around its longitudinal axis can be seen.

**FIGURE 5** Intraoperative Photograph

Rotated distal femur component is visible.

**FIGURE 6** Postoperative Anteroposterior and Lateral Radiographs

Revised cemented Zimmer Biomet Orthopedic Salvage System distal femur replacement.

dislocation.<sup>4,7</sup> Structural failures include fracture of the hinge mechanism, dissociation of the component from the stem, rotating hinge-bushing failure, and dislocation of the hinge.<sup>4,7</sup> In the acute postoperative period, the most common complications are infection and rotating-hinge dislocation/failure.<sup>3,12</sup> There are various component options available for DFRs, including straight vs curved, cemented vs cementless/press-fit, and long vs short stems.<sup>13</sup> Studies have sought to elucidate the ideal implant to decrease the rate of complications. Lu and colleagues demonstrated that curved press-fit short stems provided a stable interface without loosening over the short term (2 years) in 42 patients.<sup>13</sup> No implant failures or incidences of aseptic loosening occurred in their study.<sup>13</sup>

The implant used in this case was a curved press-fit short-stem DFR. It was thought that this patient was young and with good enough bone quality that a press-fit short stem would be best in preserving bone stock. Both the technique guide and literature support reaming 0 to 2 mm greater than the planned stem size to accommodate the implant curvature.<sup>13</sup> In this case, the intramedullary canal was reamed 0.5 mm larger than the curved stem that was implanted (16 mm and 15.5 mm, respectively). Intraoperatively

during the index DFR, the component was stable and seemed to have a good press-fit interface. Despite this, obvious loosening of the component occurred with a relatively low-energy mechanism when the patient kicked the leg onto a chair, causing just enough force and femoral rotation to result in 180° rotation of the component.

## CONCLUSIONS

We present this case report to make surgeons aware of this rare but serious complication. Although the final implant is a porous and curved stem, careful attention should be made during trialing to use the best-fitting implant to prevent this complication. If an adequate interference fit cannot be obtained, cementing the component may be required to prevent its loosening and catastrophic failure.

## Author affiliations

<sup>a</sup>Department of Orthopaedics and Rehabilitation, University of New Mexico, Albuquerque

<sup>b</sup>Department of Orthopaedics, US Department of Veterans Affairs New Mexico Healthcare System, Albuquerque

## Author disclosures

The authors report no actual or potential conflicts of interest or outside sources of funding with regard to this article.

## Disclaimer

The opinions expressed herein are those of the authors and do not necessarily reflect those of *Federal Practitioner*, Frontline Medical Communications Inc., the US Government, or any of its agencies. This article may discuss unlabeled or investigational use of certain drugs. Please review the com-

plete prescribing information for specific drugs or drug combinations—including indications, contraindications, warnings, and adverse effects—before administering pharmacologic therapy to patients.

### Ethics and consent

The authors report that they received verbal consent. The authors also report that the patient did not provide written informed consent to report this case in the literature. Details about the patient and the case have been changed to avoid identification.

### References

1. Sculco PK, Abdel MP, Hanssen AD, Lewallen DG. The management of bone loss in revision total knee arthroplasty: rebuild, reinforce, and augment. *Bone Joint J.* 2016;98-B(1 suppl A):120-124. doi:10.1302/0301-620X.98B1.36345
2. Harrison RJ Jr, Thacker MM, Pitcher JD, Temple HT, Scully SP. Distal femur replacement is useful in complex total knee arthroplasty revisions. *Clin Orthop Relat Res.* 2006;446:113-120. doi:10.1097/01.blo.0000214433.64774.1b
3. Smith EL, Shah A, Son SJ, et al. Survivorship of megaprotheses in revision hip and knee arthroplasty for septic and aseptic indications: a retrospective, multicenter study with minimum 2-year follow-up. *Arthroplast Today.* 2020;6(3):475-479. Published 2020 Jun 29. doi:10.1016/j.artd.2020.05.004
4. Wyles CC, Tibbo ME, Yuan BJ, Trousdale RT, Berry DJ, Abdel MP. Long-term results of total knee arthroplasty with contemporary distal femoral replacement. *J Bone Joint Surg Am.* 2020;102(1):45-51. doi:10.2106/JBJS.19.00489
5. Haidukewych GJ. Role of distal femoral replacement for periprosthetic fractures above a total knee arthroplasty: when and how?, *J Orthop Trauma.* 2019;33(suppl 6):S33-S35. doi:10.1097/BOT.0000000000001566
6. Hart GP, Kneisl JS, Springer BD, Patt JC, Karunakar MA. Open reduction vs distal femoral replacement arthroplasty for comminuted distal femur fractures in the patients 70 years and older: *J Arthroplasty.* 2017;32(1):202-206. doi:10.1016/j.arth.2016.06.006
7. Vertesich K, Puchner SE, Staats K, et al. Distal femoral reconstruction following failed total knee arthroplasty is accompanied with risk for complication and reduced joint function. *BMC Musculoskelet Disord.* 2019 Jan 31;20(1):47-54. doi:10.1186/s12891-019-2432-4
8. Biswas D, Haughom B, Mayle RE Jr, Della Valle CJ. Case report: Failure of rotating-hinge total knee prosthesis by disengagement of the hinge-post extension. *Clin Orthop Relat Res.* 2013;471(4):1389-1392. doi:10.1007/s11999-012-2736-2
9. Ward WG, Haight D, Ritchie P, Gordon S, Eckardt JJ. Dislocation of rotating hinge knee prostheses. A report of four cases. *J Bone Joint Surg Am.* 2005;87(5):1108-1112. doi:10.2106/JBJS.00837pp
10. Pacha-Vicente D, Malik A, Castellet-Feliu E, Nardi-Villardaga J. Dislocation of rotating-hinge knee prostheses with antidislocation mechanism. *J Arthroplasty.* 2008;23(2):299-303. doi:10.1016/j.arth.2006.11.020
11. Manzano G, Schwarzkopf R. Posterior dislocation of the hinge-post extension in a rotating hinge total knee prosthesis. *Case Rep Orthop.* 2013;2013:756538. doi:10.1155/2013/756538
12. Vaishya R., Thapa, SS, Vaish A. Non-neoplastic indications and outcomes of the proximal and distal femur megaprosthesis: a critical review. *Knee Surg Relat Res.* 2020;32(1):18. Published 2020 Apr 9. doi:10.1186/s43019-020-00034-7
13. Lu M, Wang J, Xiao C, et al. Uncemented, curved, short endoprosthesis stem for distal femoral reconstruction: early follow-up outcomes. *World J Surg Onc.* 2018;16(1):183. doi:10.1186/s12957-018-1486-3