Arthroplasty Today 6 (2020) 682–685

Contents lists available at ScienceDirect

Arthroplasty Today

journal homepage: http://www.arthroplastytoday.org/

Case Report

Periprosthetic Intertrochanteric Fracture between Hip Resurfacing and Retrograde Nail

Sandeep Soin, MD, Rami El-Shaar, MD, Aaron Taylor, MD *, John Ketz, MD

Department of Orthopeadic Surgery, University of Rochester, Rochester, NY, USA

ARTICLE INFO

Article history:
Received 1 May 2020
Received in revised form
7 July 2020
Accepted 8 July 2020
Available online xxx

Keywords:
Periprosthetic fracture
Hip resurfacing
Retrograde nail
Intertrochanteric fracture
Femur fracture
Hip implant

ABSTRACT

Periprosthetic femur fractures present a growing worldwide challenge for orthopaedic surgeons. Fractures around a hip resurfacing implant create unique management problems. When considering fixation, there can be limited options for ideal stabilization and some require creative constructs. We present an interesting case of a periprosthetic intertrochanteric femur fracture between a hip resurfacing implant and retrograde intramedullary nail.

Introduction

Hip resurfacing continues to be an option for the younger active patient in need of arthroplasty. In Australia alone, there have been 5360 hip resurfacings reported to their national registry from 1999 to 2012 [1]. As with all arthroplasties, hip resurfacing patients may suffer fractures around their implants. Femoral neck fractures are a well-described complication of hip resurfacing. Traumatic fracture to other areas of the proximal femur are uncommon, but orthopaedic surgeons may encounter patients with these injuries. Fractures around resurfacing implants can be challenging to stabilize as there is limited bone stock. Various methods of operative stabilization have been reported 2–8. In the following section, we present an interesting case where these options were considered in a patient who underwent hip resurfacing and a previous retrograde intramedullary nailing.

Case history

A 55-year-old otherwise healthy female presented to the emergency department with right thigh and groin pain after falling on her right side while playing pickleball. She has a history of right hip arthritis and underwent hip resurfacing approximately 8 years ago. Surgery was performed at an outside institution, and records were unavailable. Roughly 4 years ago, she sustained a right femoral shaft fracture while skydiving. This was successfully treated with retrograde intramedullary nailing. She had no complications after either surgery. She was doing well before this fall during pickleball. New radiographs revealed a periprosthetic intertrochanteric femur fracture (Fig. 1). She was neurovascularly intact, and after medical optimization, she was taken to the operating room for stabilization of her right intertrochanteric femur fracture.

In the operating room, the patient was positioned supine on a radiolucent operating table. The right leg was prepped and free draped. The previous proximal anterior thigh and distal lateral thigh incisions were used to identify and remove the proximal and distal interlocking screws. The previous incision over the anterior knee was used, and a medial parapatellar approach was used to create an arthrotomy. Bony growth over the intramedullary nail was removed by placing a guide pin into the intercondylar notch and using a cannulated opening drill to expose the intramedullary nail. The nail was removed with the intramedullary nail extractor. Incisions were thoroughly irrigated and closed. The patient was then transferred to a fracture table. The right lower extremity was reprepped and draped using a shower curtain–style drape. A lateral

* Corresponding author. 2424 Fenwick, University Heights, OH 44118, USA. Tel.: +1 248 302 5805.
E-mail addresses: Act41@case.edu, aaron_taylor@urmc.rochester.edu

https://doi.org/10.1016/j.artd.2020.07.004

Figure 1. Anteroposterior and lateral radiographs of the right hip and femur.

incision was made proximal to the greater trochanter. A guidewire was placed at the usual start point, and a stepped reamer, used to open the proximal fracture fragment. A ball-tipped guide was used to pass the fracture site. This was followed by reaming and passage of a Gamma3 Cephalomedullary Nail (Stryker, Kalamazoo, MI). The guide pin for the femoral neck lag screw was placed posteriorly to the stem of the hip resurfacing implant. An appropriate lag screw was chosen and placed in a compression mode. The nail was locked distally with 2 interlocking screws (Fig. 2).

The patient was maintained non–weight-bearing initially. She was discharged home on postoperative day 4 after an unremarkable stay. Interval follow-up was limited as the patient lived in another state. However, she returned to the area after 2 years and had clinic follow-up with her surgeon. She denied hip pain and stiffness. She had completed a European walking tour during which she walked 3 to 5 miles per day. On physical examination, she has no areas of tenderness, full active and passive hip flexion, and minor limitations in hip internal and external rotations. Two-year postoperative radiographs revealed robust callus formation and minor interval varus collapse (Fig. 3). She denied noticing any leg length differences. In addition, she reported Patient-Reported Outcomes Measurement Information System scores of 54 for adult physical function and 39 for adult pain interference. Both scores are better than those of the adult average responder.

Discussion

Spontaneous femoral neck fractures after hip resurfacing are a recognized but uncommon complication. Short-term rates of fractures have been reported to occur between 0.5% and 1.3% [9,10]. A large, single-surgeon series demonstrated 2 femoral neck fractures in a group of 1333 (0.15%) patients at an average follow-up of 4 years [11]. A recent series with 10-year follow-up documented only 2 cases of revision due to fracture [12]. However, early femoral neck fractures are generally attributed to the technical error of the primary surgery and patient factors [7,13,14]. Fracture risk increases with surgical errors such as excessive varus tilt of the implant, femoral neck notching, and poor seating of the implant [15]. Patient factors such as obesity, female sex, and osteoporosis increase the risk for femoral neck fractures [14,15]. Traumatic periprosthetic proximal femur fractures around hip resurfacing implants are uncommon and limited to case reports in the literature [2–8]. These case reports have detailed various patterns of traumatic injuries including the following: femoral neck, intertrochanteric, and subtrochanteric fractures [5,7]. Here, we present a case of an intertrochanteric fracture between a hip resurfacing and a retrograde femoral nail, which is, to the best of our knowledge, the only report of such injury.

Multiple methods of stabilizing proximal femur fractures below a hip resurfacing have been described. Cannulated screws have

Figure 2. Postoperative AP and lateral radiographs of the right hip and femur.

been used for femoral neck fractures [7]. Intertrochanteric fractures have been addressed with cephalomedullary implants [5], proximal femoral locking plates [6], reverse distal femoral locking plates [8], blade plates [16], and cannulated screws [3]. Dynamic compression plates [17], reconstruction nails [18], and cephalomedullary devices [4] have been used to treat subtrochanteric fractures. Successful nonoperative management of intertrochanteric and femoral neck fractures has been described [19,20]. An additional viable option to consider is conversion to total hip arthroplasty. Conversion may allow for early weight-bearing with good outcomes [21].

In considering options, we elected to proceed with operative fixation rather than arthroplasty. We felt that, for several reasons, conversion surgery of this extracapsular fracture would not be as reliable as a conversion for femoral neck fracture. First, the fracture of the posterior medial cortex of the hip would require a calcar substituting or diaphyseal engaging implant. Furthermore, fixation of the fractured greater trochanter would be needed as well, and failure of this fixation increases the risk of instability. Open reduction and internal fixation could allow for retention of current well-functioning hip implants and preservation of bone stock on both the acetabular and femoral sides in this relatively young patient. Fixation also allows for future conversion surgery should the patient need or want it. In considering open reduction and internal fixation, we felt a plate construct would provide inadequate fixation to the femoral diaphysis as there was a retrograde nail in place and diaphyseal screw placement would be unicortical with possible cerclage augmentation. Removal of the nail would leave a potential for fracture at the end of a proximal plate. The remaining options would be to leave the retrograde nail in place and use cannulated screw fixation or remove the nail and place a cephalomedullary nail. We felt the use of a cephalomedullary nail would provide a more stable construct. Biomechanically, a cephalomedullary nail is load sharing, stronger than a plate, and closer to the mechanical axis, decreasing the bending moment on the device as compared with the plate [22]. Furthermore, we feel a cephalomedullary device would allow for less time with protected weight-bearing and earlier return to function.

When planning for placement of hardware into the femoral neck, knowledge of the present hip resurfacing implant and careful scrutiny of the current implant's positing on imaging are necessary. Care must be taken to place screws or blades in a position within the head that does not abut the resurfacing stem or violate any cement mantle [5,8]. Because of the resurfacing implant, imaging cannot demonstrate the true tip apex distance or prove the mantle has not been violated. This is a challenge of this technique. We suggest, like prior authors, that scrutiny of intraoperative imaging and careful attention to clinical feedback from the drill can assist the surgeon [5,23]. Regular follow-up is ideal as secondary collapse of the femoral head due to osteonecrosis requiring revision to total hip arthroplasty has been reported [23].

While the use of hip resurfacing may be decreasing, the total number of active patients with these implants in place is considerable [5]. Periprosthetic fractures around resurfacing devices will remain a challenge. The literature reveals many creative ways to stabilize these fractures; however, the goals of fracture care should be maintained.

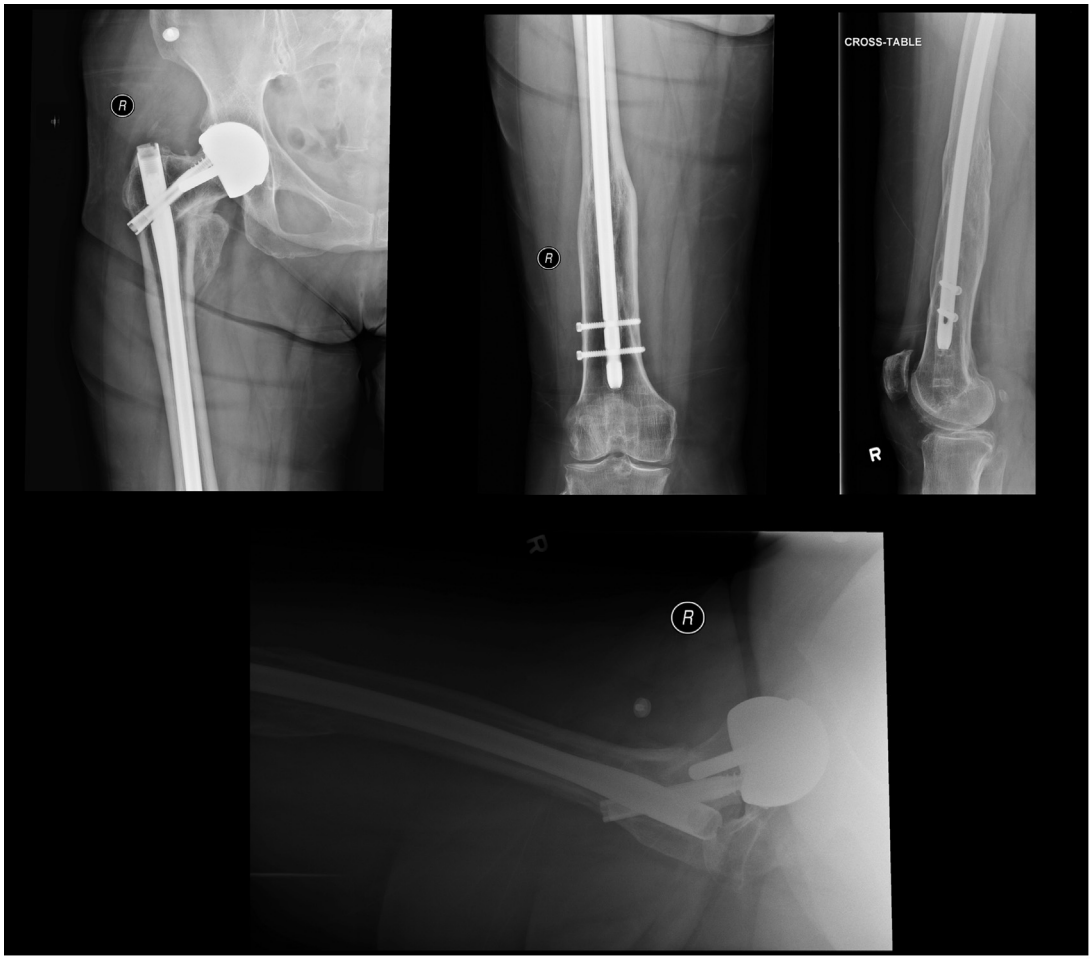

Figure 3. Two-year postoperative AP and lateral radiographs of the right hip and femur.

Conflict of interest

A.T. is a paid clinical consultant for Wolters Kluwer. The remaining authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper. No grants or outside funding were utilized to support the creation of this manuscript.

References

[1] Australian Orthopaedic Association National Joint Replacement Registry. Hip and knee arthroplasty. In: Annual Report 2013. Adelaide, Australia: Australian Orthopedic Association; 2015.
[2] Macdonald J, Robinson A, Brown I. Fixation of a periprostheteic intertrochanteric hip fracture below a Birmingham hip resurfacing. Case Rep Orthop 2014;2014:393984.
[3] Haddad BZ, Konan S, McAuliffe TB. Successful fixation of an intertrochanteric fracture after hip resurfacing arthroplasty using cannulated screws. J Arthoplasty 2013;28(1):e13.
[4] Perskun CJ, Townley JB, Schemitsch EH, Waddell JP, Whelan DB. Treatment of periprosthetic fractures around hip resurfacings with cephalomedullary nails. J Arthroplasty 2012;27(3):494.e1.
[5] Chou DT, Davis B. Trochanteric femoral fracture around a Birmingham hip resurfacing. J Bone Joint Surg Cases Connector 2017;7(1):e7.
[6] Macdonald J, Pagoti R, Cusick L. Bilateral fixation of periprosthetic intertrochanteric hip fractures below Birmingham hip resurfacing. BMJ Case Rep 2017;2017. bcr2016218840.
[7] Brenna A, Devitt BM, O'Neill CJ, Nicholson P. Periprosthetic fractures in the resurfaced hip- A case report and review of the literature. Injury 2013;44:263.
[8] Baxter JA, Krkovic M, Prakash U. Intertrochanteric femoral fracture after hip resurfacing managed with a reverse distal femoral locking plate: a case report. Hip Int 2010;20(4):562.
[9] Nam D, Nunley RM, Ruh EL, et al. Short-term results of Birmingham hip resurfacing in the United States. Orthopedics 2015;38(8):e715.
[10] Kohan L, Field CJ, Kerr DR. Early complications of hip resurfacing. J Arthroplasty 2012;27:997.
[11] Brooks PJ. Hip resurfacing: a large, US single-surgeon series. Bone Joint J 2016;98-B(1 Suppl A):10.
[12] Ford M, Hellman MD, Kazarian GS, et al. Five to ten-year results of Birmingham hip resurfacing implant in the U.S.: a signle institutions exerpience. J Bone Joint Surg Am 2018;100(21):1879.
[13] Shimmin AJ, Back D. Femoral neck Fracture Following Birmingham Hip Resurfacing: a national review of 50 cases. J Bone Joint Surg Br 2005;87-B(3):463.
[14] Shimmin AJ, Bare J, Back DL. Complications associated with hip resurfacing arthroplasty. Orthop Clin North Am 2005;36:187.
[15] Mont M, Ragland P, Etienne G, Seyler T, Schmalzried T. Hip resurfacing arthroplasty. J Am Acad Orthop Surg 2006;14:454.
[16] Weinrauch P, Krinkler S. Proximal femoral fracture after hip resurfacing managed with a blade-plate fixation. A case report. J Bone Joint Surg 2008;90(6):666.
[17] Whitingham-Jones P, Charnley G, Fracis J, Annapureddy S. Internal fixation after subtrochanteric femur fracture after hip resurfacing arthroplasty. J Arthroplasty 2010;25(2):334.
[18] Aning J, Mackinnon A. Fixation of a complex comminuted proximal femoral fracture in the presence of a Birmingham hip resurfacing prosthesis. Injury 2005;36(9):1127.
[19] Morgan D, Myers G, O'Dwyer K, Thomas AM. Intertrochanteric fracture below Birmingham hip resurfacing: successful non-operative management in two cases. Inj Extra 2008;39(9):313.
[20] Cossey AJ, Back DL, Shimmin A, Young D, Spriggins AJ. The nonoperative management of perioprosthetic factures associated with the birmingham hip resurfacing procedure. J Arthroplasty 2005;20(3):358.
[21] Ball S, Le Duff M, Amstutz H. Early results of conversion of a failed femoral component in hip resurfacing arthroplasty. J Bone Joint Surg Am 2007;89(4):735.
[22] Haynes RC, Poll RG, Miles AW, et al. An experimental study of the failure modes of the Gamma locking nail and AO dynamic hip screw under static load: a cadaveric study. Med Eng Phys 1997;19(5):446.
[23] Zustin J, Winter E. Failed internal fixation due to osteonecrosis following traumatic periprosthetic fracture after hip resurfacing arthroplasty. Acta Orthop 2009;80:666.