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Case report

Disassembly of the inner head of a bipolar hip prosthesis

Tsuyoshi Toyota, MD *, Hiroshi Horiuchi, MD, PhD, Yoshiyuki Nakamura, MD, Ikuya Yamazaki, MD, Tsutomu Takizawa, MD, PhD

Department of Orthopedic Surgery, Nagano Matsushiro General Hospital, Nagano, Japan

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ABSTRACT

We report an extremely rare case of inner head displacement from the stem of a bipolar hip prosthesis (BHP). An 88-year-old woman underwent BHP implantation for right femoral neck fracture. However, severe right hip joint pain occurred 12 days after surgery. A plain radiogram film revealed displacement of the inner head from the neck of the stem, accompanied by sinking of the stem. At reoperation, the inner head was disassembled from the stem, and Vancouver type A1 fracture was confirmed. Disassembly may have been caused by the pumping phenomenon or micromovement of the stem due to periprosthetic fracture. To our knowledge, this is the first report about disassembly of the BHP inner head, probably due to periprosthetic fracture.

Introduction

In patients with a bipolar hip prosthesis (BHP), dislocation of the prosthesis from the acetabulum is occasionally observed, but there have been very few reports about disassembly of the components. Although there have been some cases involving disassembly of the outer and inner heads, it is rare for the inner head to become displaced from the stem. Here, we report an extremely rare case of inner head displacement from the BHP stem, which was associated with sinking of the stem due to fracture.

Case history

An 88-year-old woman underwent surgery for a trochanteric fracture of the left femur 2 years earlier at another hospital, after which she was almost independent for activities of daily living and walked with a stick. Then, she fell at home and presented to our department with difficulty in moving due to right hip pain. A right femoral neck fracture (Garden class IV) was diagnosed. A BHP was implanted via the posterolateral approach under general anesthesia on hospital day 4, using a Multipolar bipolar cup and a Trabecular Metal cementless stem (Zimmer Biomet, Warsaw, IN). During surgery, an obvious femoral fracture could not be identified when the stem was inserted, and the metal head (−2.0 mm and 22 mm diameter) of the prosthesis was gently impacted along the axis of the trunnion once after being assembled. After impaction, we confirmed the safety of the head. All prostheses were produced by Zimmer Biomet.

Then, reduction of the hip joint was performed, and the posterior joint capsule was repaired as completely as possible. There were no problems related to surgery (Fig. 1). The patient was mobilized on the next day and commenced walking with full weight bearing.

However, at 12 days postoperatively, she developed severe pain in the right hip joint when lying in the right lateral decubitus position after walking. A plain radiogram film revealed displacement of the inner head of the BHP from the neck of the stem as well as sinking of the stem by about 8 mm relative to its postoperative position (Fig. 2). Tomographic imaging and computed tomography scanning (Fig. 3) confirmed displacement of the inner head of the prosthesis from the stem. It was considered that closed reduction would be impossible, so reoperation was performed 2 days later (14 days after initial surgery). The posterior joint capsule showed no significant changes from the initial operation, without any new damage. The bipolar cup was removed and carefully checked, revealing no foreign bodies or macroscopic damage to the inner head, polyethylene bearing, or neck of the stem. However, a

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* Corresponding author. 183 Matsushiro-cho Matsuhiro Nagano-shi, Nagano 381-1231, Japan. Tel.: +81 90 7016 4456.
E-mail address: driveyourdreams0817@yahoo.co.jp

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Figure 1. Anteroposterior radiograph film obtained immediately after implantation of the right bipolar hemiarthroplasty. There are no obvious abnormalities.

fracture line was identified trending in the axial direction toward the lesser trochanter, and sinking of the stem was observed (Fig. 4), leading to a diagnosis of Vancouver type A1 fracture around the stem. Sinking of the stem had occurred without rotation, and it was still fixed firmly with no notable instability. Therefore, wiring of the fracture site was done using a Dall-Miles cable (Stryker, Mahwah, NJ). We tried ±0-mm inner head at the trial of reposition. However, it was so tight for extension of the hip, so we recognized that an inner head of −2.0 mm was suitable. Then, a new Zimmer metal inner head (−2.0 mm and 22 mm diameter, same size as the initial surgery) and bipolar cup were fitted to the stem, after carefully confirming that there were no foreign bodies, blood, or fatty tissue in the neck or within the operating field (Fig. 5). At revision, we did not see any evidence of impingement of outer head and greater trochanter. It indicates that the impingement-related stem subsidence has not occurred.

The removed bipolar cup and inner head were sent to Zimmer Biomet for inspection, but no foreign materials or breakage were found, and there was no obvious defect of the product.

The patient was restricted to non–weight-bearing walking on the affected limb for 1 week postoperatively and then was gradually transitioned to partial weight bearing, with full weight bearing

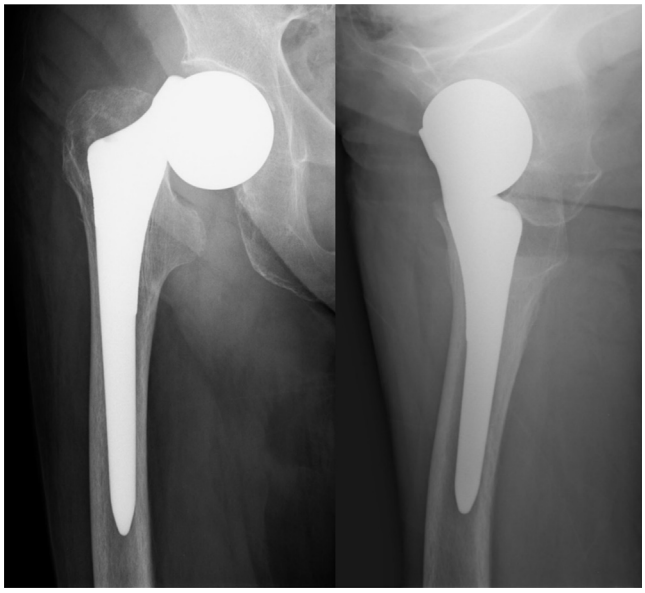

Figure 2. Displacement of the inner head from the neck of the stem. Sinking of the stem compared with the primary surgery was also observed.

from 4 weeks after surgery. She recovered well and is ambulatory with a walking stick. No displacement of the inner head, stem sinking, or progression of the fracture has been observed on follow-up radiogram films.

The patient gave informed consent to publication of this report, and this case report was approved by the institutional review board of our hospital.

Discussion

The BHP was developed to reduce stress on the acetabular component and is composed of an outer head, inner head, and stem. Dislocation of the outer head from the acetabular roof is one of known complications associated with the BHP although it is uncommon. Disassembly of BHP components is even rarer [1].To the best of our knowledge, there are only 2 previous cases of inner head displacement in patients with a BHP, including one reported by Shiga et al. [2] and one by Fukuda et al. [3].

According to Asgian et al. [4], greater force is required for the disruption of the inner head from the stem neck than that causing disassembly of the outer head and inner head, which may explain why displacement of the inner head from the trunnion is very rare in BHP.

However, when we reviewed previous reports of inner head displacement, we found that it had occurred in the absence of strong external force. Shiga et al. [2] reported a patient who sustained a trochanteric fracture by falling out of bed after BHP implantation for femoral neck fracture. She underwent open reduction and internal fixation with exchange of the inner head. Difficulty with ambulation occurred at 1 month postoperatively, and an investigation revealed displacement of the inner head. Fukuda et al. [3] reported a patient who underwent revision for stem malalignment after BHP implantation. Then they reused the inner head from the initial operation. Displacement of the inner head occurred subsequently although the patient had been bedridden for approximately 2 years postoperatively.

Our patient was lying in the lateral position when the inner head was displaced, and there was no obvious trauma with only slight

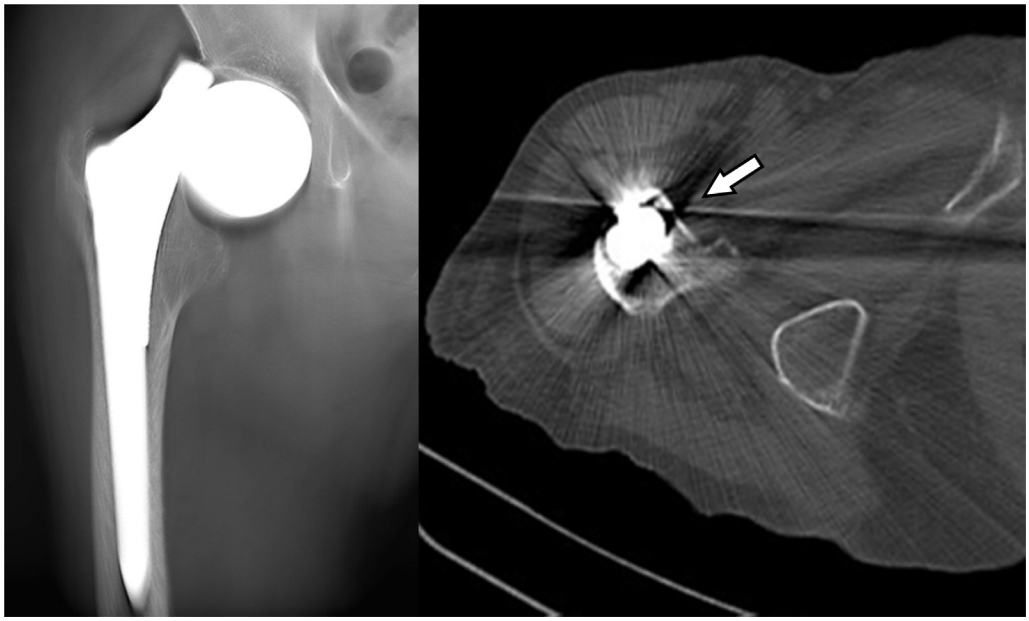

Figure 3. Tomographic image and computed tomography scan. The inner head is displaced from the stem. There is a crack in the lesser trochanter, suggesting a fracture (arrow).

external force, as in the 2 cases described previously. Because no defects were found by examination of the removed components, the mechanism leading to displacement in this patient is unclear.

The following possibilities can be considered with regard to displacement of the BHP inner head from the stem: (1) the pumping phenomenon, (2) inadequate insertion of the inner head (hammering in), and (3) micromovement associated with sinking of the stem due to fracture. The pumping phenomenon can occur if air is trapped when the head of the prosthesis is inserted into the neck of the stem. Adherence of fat and blood components to the neck of the stem can seal in the trapped air, leading to backpressure on the head of the prosthesis and taper lock dysfunction. Shiga et al. [2] suggested that disassembly of the inner head from the stem could be attributed to this phenomenon. To avoid this phenomenon, we always clean the neck of the stem with fresh gauze when inserting the inner head into the BHP stem or performing total hip arthroplasty (THA). It is unclear whether the pumping phenomenon occurred in our patient, but it could be one reason for displacement. Because the neck of the stem was cleaned (as described previously) and the inner head was hammered in with a relatively strong force, inadequate insertion of the head was unlikely. In the present case, we confirmed the security of the head assembly after impaction.

Accordingly, it seems most likely that the fracture around the stem led to displacement of the inner head in our patient. It is assumed that the fracture caused sinking of the stem and induced micromovement, after which repeated telescoping of the stem might have dislodged the taper lock between the inner head and the neck. The Morse-type taper lock used in the present BHP is designed so that the components can be disassembled by removing the inner head from the stem through repeated tapping on the neck side. Therefore, the inner head could possibly be displaced by slight external force if micromovements were generated as described previously. To our knowledge, this is the first report about displacement of the BHP inner head due to fracture around the stem. In previous reports by Woolson and Pottorff [5] and Pellicci and Haas [6], disassembly of the inner head from the stem was due to impingement on the acetabular component during closed reduction of the dislocated femoral component after THA. If we assume that sinking of the stem due to periprosthetic fracture led to displacement of the inner head in the present case, this complication could occur after THA as well as after BHP implantation.

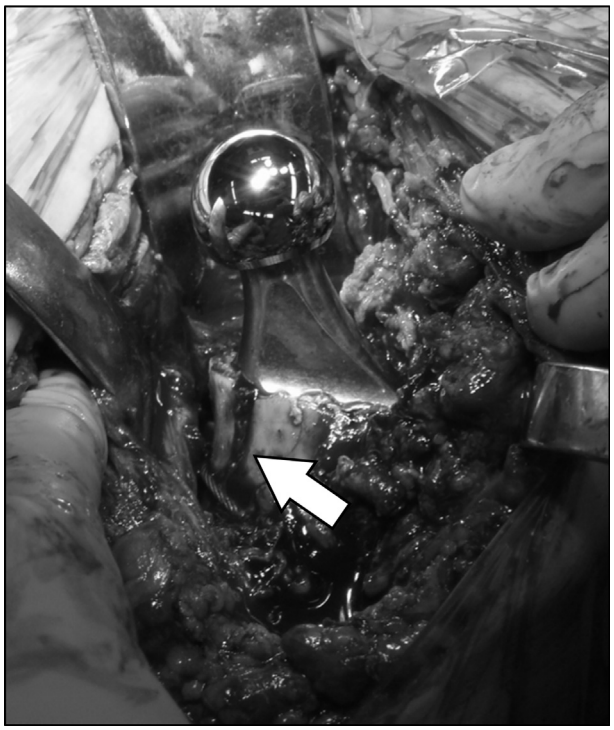

Figure 4. Intraoperative photograph. A fracture line (arrow) runs toward the lesser trochanter, and sinking of the stem is evident. (The inner head has been fitted into the stem neck for confirmation.)

Figure 5. Postoperative radiograph. Wiring of the fracture site was performed with Dall-Miles cable. Then, a new inner head and bipolar cup were fitted into the stem.

Based on the knowledge from the present case, our recommendation for preventing disassembly of the femoral head from the stem neck is to carefully clean up trunnion, undoubtedly perform head insertion, and finally confirm head fixation. In addition, after attaching femoral head, the stem should not be impacted again. These processes would be useful to avoid this complication. As in discussion, it seems most likely that the postoperative fracture around the stem led to displacement of the inner head in the present case. We should recognize that intraoperative and postoperative fracture would lead to displacement of the inner head after BHP and THA.

Summary

We experienced a very rare case of disassembly of the inner head of a BHP possibly caused by stem subsidence due to periprosthetic fracture. Also, the pumping phenomenon and micromovement induced by stem subsidence might be the causative factors of disruption of the taper lock of inner head and trunnion. In addition, the inappropriate assembly and not to confirm the security around the inner head could also be the reason for disassembly. To avoid this complication, we should carefully clean up trunnion before the inner head insertion, undoubtedly perform head insertion, and finally confirm head fixation. In addition, after attaching femoral head, the stem should not be impacted again. We should recognize that intraoperative and postoperative periprosthetic fracture would lead to displacement of the inner head after BHP and THA.

Acknowledgment

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References

[1] Barmada R, Mess D. Bateman hemiarthroplasty component disassembly; a report of three cases of high-density polyethylene failure. Clin Orthop 1987;224:147.
[2] Shiga T, Mori M, Hayashida T, Fujiwara Y, Ogawa T. Disassembly of a modular femoral component after femoral head prosthetic replacement. J Arthroplasty 2010;25:659.e17.
[3] Fukuda S, Kuge A, Nakamura M. Inner head - stem displacement after bipolar hip prosthesis replacement: a case report. Seikeigeka (Orthopedic Surgery) 2002;53:554.
[4] Asgian C, Gilbertson L, Hori R. Fatigue of tapered joints. Transactions of 2nd World Congress on biomaterials, 10th Annual Meeting of Society for biomaterials, Washington D.C. April 27-May1, 1984; 145.
[5] Woolson ST, Pottorff GT. Disassembly of a modular femoral prosthesis after dislocation of the femoral component. A case report. J Bone Joint Surg 1990;72:624.
[6] Pellicci PM, Haas SB. Disassembly of a modular femoral component during closed reduction of the dislocated femoral component. A case report. J Bone Joint Surg 1990;72:619.