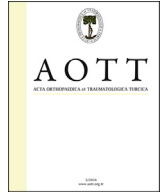




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Five cases of early dissociation between the bipolar hip endoprosthesis cup components; either spontaneously or during reduction maneuvers

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ABSTRACT

Bipolar hemiarthroplasty is frequently used in the treatment of intracapsular hip fractures. Dissociation of the bipolar components can happen during the hip dislocation, the reduction maneuvers, or spontaneously without any dislocation. Here we report early dissociation between bipolar components in two cases during the attempt of closed reduction maneuvers and three cases with spontaneous dissociation without any trauma. To prevent or minimize this complication; the reduction of dislocated hips must be achieved very gently under general anesthesia with fluoroscopic control. During the initial operation the surgeons must be sure that the bipolar components are locked to each other and after final reduction, especially in osteoarthritic acetabulums, that the cup position is not in varus position.

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Bipolar hemiarthroplasty is frequently used in the treatment of intracapsular hip fractures.^{1,2} Although the dissociation between the bipolar components is a very rare complication it has very serious results and almost always leads to reoperation with revision of the prosthesis. In this regard, there are very few cases reported in the literature.^{3–21} Dissociation can happen during the hip dislocation, the reduction maneuvers, or spontaneously without any trauma. Here we report dissociation between bipolar components in two cases during the attempt of closed reduction maneuvers and three cases with early spontaneous dissociation without any trauma.

Case reports

Case 1

Two years ago a 71-years-old male patient was treated with a bipolar endoprosthesis (TST, Istanbul, Turkey) after sustaining a subcapital fracture of his right femur (Fig. 1a). Three months after the operation, during climbing stairs he suddenly felt a pain in his

thigh, and could not walk anymore. The x-rays revealed the dissociation between the polyethylene cup and the prosthetic femoral head with both items still in the acetabulum (Fig. 1b). During the open reduction, the polyethylene cup and the head were found to be completely separated because of the failure of the locking mechanism. No erosion was seen. Both the polyethylene cup and the head were revised with the same size (Fig. 1c). The hip stability was tested. No problems have been experienced in the postoperative period.

Case 2

Five years ago, an 85-years-old male patient presented with a right side subcapital femur fracture and was treated with bipolar hemiarthroplasty (Ortopro, İzmir, Turkey). Three months after the operation he sustained a posterior hip dislocation during wearing his shoes (Fig. 2a). Closed reduction was attempted in the emergency department. During routine maneuvers, dissociation between the polyethylene cup and the small femoral head occurred. The cup was out of the acetabulum while the small femoral head was fully reduced (Fig. 2b). Subsequently open reduction was performed. The capturing ring of the polyethylene cup was found open but without any signs of erosion on the locking mechanism. The polyethylene cup was revised with the same size (Fig. 2c). The stability and acetabulum coverage were tested. Hip abduction

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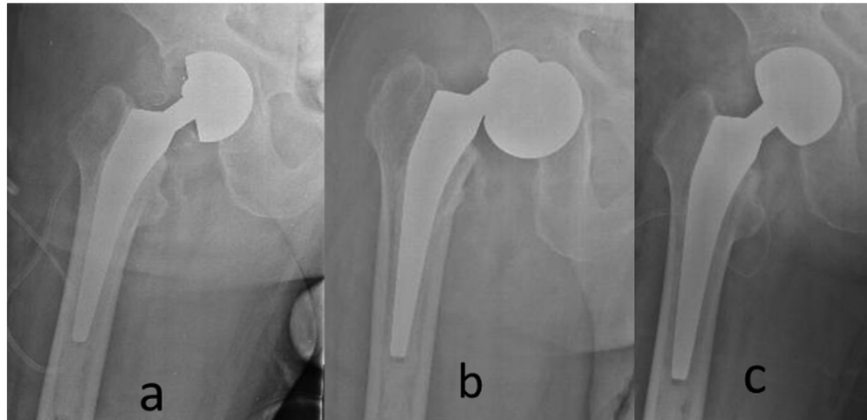


Fig. 1. (a) Case 1: Plain roentgen showing initial excessive varus position of the bipolar cup. (b) Case 1: Plain roentgen revealing dissociation between bipolar components. (c) Case 1: post-operative image after revision of the bipolar components.

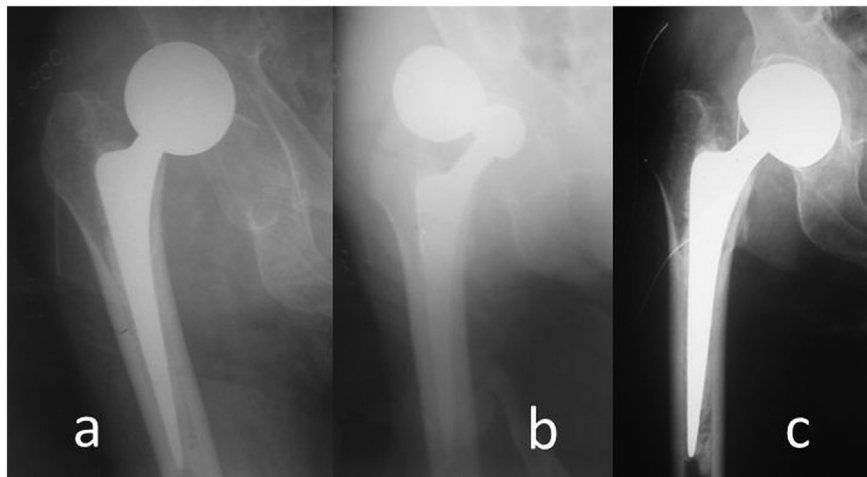


Fig. 2. (a) Case 2: Plain roentgen showing posterior dislocation of the hip. (b) Case 2: Plain radiograph showing dissociation between bipolar cup components after reduction maneuvers. (c) Case 2: Postoperative appearance after revision of the bipolar cup.

orthosis was used for 8 weeks. No further complication was seen during the postop period.

Case 3

One year ago a 75-year-old female patient was treated with a bipolar hemiarthroplasty (TST, Istanbul, Turkey) after a subcapital fracture of her left femur. Six weeks later, while getting out of bed, she sustained a posterior hip dislocation (Fig. 3a). She was admitted to the emergency department of our hospital. Closed reduction was attempted here. During routine maneuvers dissociation between the polyethylene cup and small femoral head happened, with the cup out of the acetabulum and the small femoral head fully reduced in the acetabulum (Fig. 3 b). Subsequently open reduction was performed, revising the polyethylene cup with the same size (Fig. 3c). No erosion was detected on the polyethylene cup. The hip was stable during the final testing. Hip abduction orthosis was used for 8 weeks. The patient died 6 months after surgery due to a heart attack. No redislocation was seen up to this time.

Case 4

Two years ago a 78-year-old woman was treated with a bipolar hip hemiarthroplasty (TST, Istanbul, Turkey) for an

intertrochanteric right femur fracture (Fig. 4a). Three weeks after the operation she began to complain of severe hip pain and worsening difficulty to weight bear. She stated that she had not sustained any injury after surgery. Roentgenograms showed dissociation between the small femoral head and the polyethylene cup, with both components remaining in the acetabulum (Fig. 4b). The patient was reoperated, revising the polyethylene cup with the same size and the hip was stable during the final evaluation (Fig. 4c). No erosion was seen on the polyethylene cup. Post-operative period has been uneventful.

Case 5

A 78-year-old female patient was treated with a bipolar hemiarthroplasty (TST, Istanbul, Turkey) after an intertrochanteric fracture of her left femur (Fig. 5a). Two months after the initial surgery she felt a sudden pain in her left hip while she was walking outside. Plain X-ray revealed dissociation between the polyethylene cup and the prosthetic ball head with both items in the acetabulum (Fig. 5b). The patient was re-operated, revising the polyethylene cup with the same size (Fig. 5c). No erosion was seen. The stability was tested intra-operatively. One year has been passed after the revision surgery and no dislocation and/or dissociation was assigned.

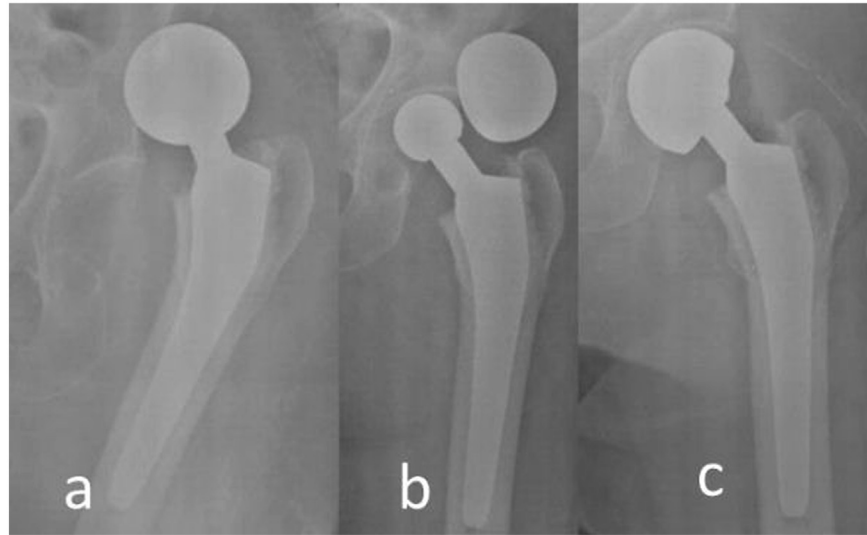


Fig. 3. (a) Case 3: roentgenogram showing the dislocated hip. (b) Case 3: Plain radiograph showing dissociation between bipolar cup components after the attempt of closed reduction. (c) Case 3: postoperative roentgen after revision of the bipolar cup.

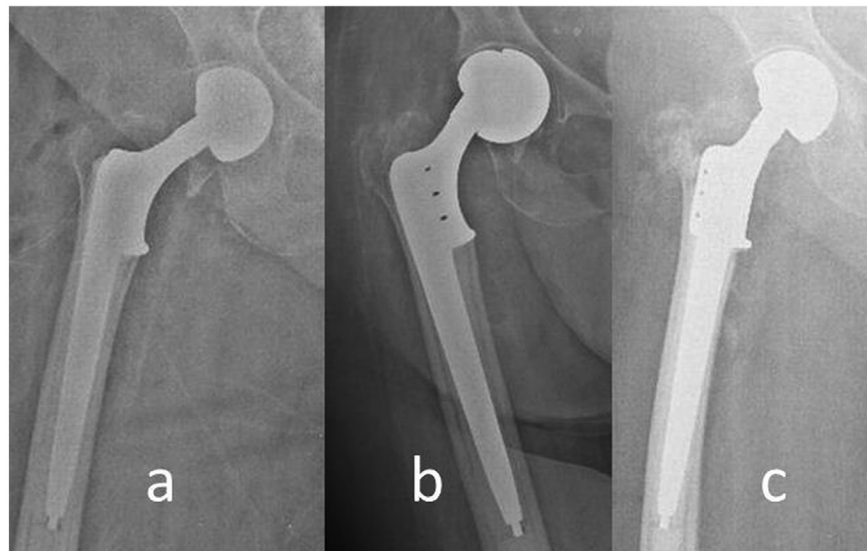


Fig. 4. (a) Case 4: Plain roentgen showing initial excessive varus position of the bipolar cup. (b) Case 4: Plain roentgen revealing dissociation between bipolar components. (c) Case 4: post-operative image after revision of the bipolar components.

Discussion

The use of bipolar hemiarthroplasty in the treatment of femoral head fractures has gained in popularity since their development in the early 1970s.^{22,23} Bipolar hemiarthroplasty has some advantages over unipolar components; increased range of motion, variable choice of head size, neck length and decreased wear of acetabulum.²⁴ There is no difference in terms of dislocation incidence between unipolar and bipolar endoprosthesis.²⁵

Modular arthroplasty systems have a potential for component dissociation which is characteristically unique to modularity.²⁶ There are very few case reports available in the literature about the dissociation of bipolar cups.^{3–17,19–21} The dissociation between the components may occur during the hip dislocation, the reduction maneuvers, or spontaneously without any dislocation.^{8,10} Three types of dissociation are described.¹¹ Type I; the locking ring is detached from its place and is present at the femoral neck, but the small femoral ball is not dislocated. Type II; the femoral ball

is dislocated and the locking ring is at the femoral neck. Type III; the small femoral head is dislocated, but the locking ring remains in the outer cup. Dissociations of our cases were type III dissociations. The patients were elderly, but had an active life prior to surgery.

In case 1, 4 and 5, the immediate postoperative roentgens revealed excessive varus position of the bipolar cups (80° – 90°). It is previously reported that varus position of the outer cup produces excessive stress on the superior lateral part of the polyethylene insert and finally causes dissociation between the components.²⁶ There are two factors effecting the varus position, one is the implant design and the other is osteoarthritis of acetabulum.^{27,28} The cartilage damage and presence of osteophytes in osteoarthritis restricts the movement of the outer cup in acetabulum and finally causes varus fixation. Subsequently, impingement between femoral neck and inferior part of polyethylene insert occurs. As a result of polyethylene wear, lever action of impingement and excessive load to the superior lateral part of the insert, dissociation between the inner and outer components happens.^{15,18,26} In our

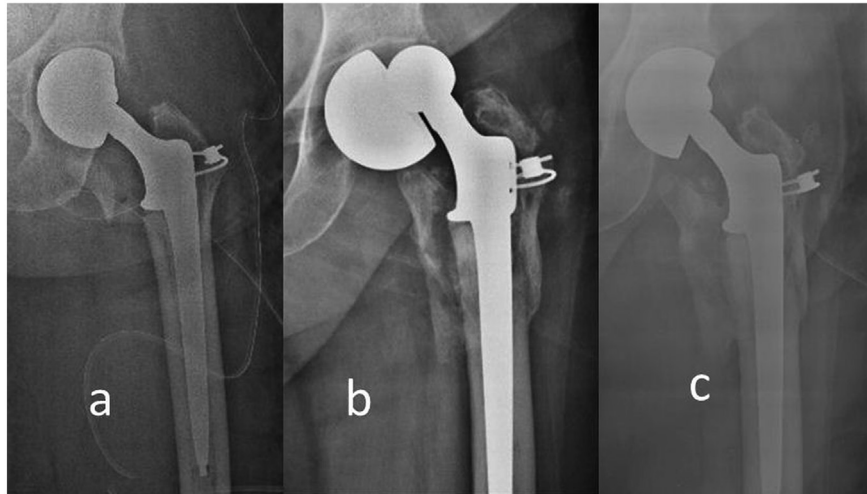


Fig. 5. (a) Case 5: Plain roentgen showing initial excessive varus position of the bipolar cup. (b) Case 5: Plain roentgen revealing dissociation between bipolar components. (c) Case 4: post-operative image after revision of the bipolar components.

cases, the excessive varus positions of bipolar cups, just after surgery, brought us to think that the initial varus position of the bipolar cup may play a key role in the early dissociation. In the literature the range of time between the initial surgery and spontaneous dissociation was reported between 4 days and 11 years.^{3–21} In our cases this time was between 3 weeks and 3 months. In both early and late failures the excessive varus position is blamed for dissociation.²⁶ To overcome this problem self-centering bipolar implants were developed. In this design the center of the outer cup is more distal than the center of the femoral head.²⁶ Mollers M et al compared the concentric and positive eccentric (self-centering) systems. They reported lower dissociation rates in self-centering systems.²⁹ Barmada R et al reported early breakage of polyethylene locking ring and dissociation in 3 patients treated with Bateman bipolar prosthesis. They reported good results after the revisions of these cases with a new self-centering bipolar endoprosthesis.³ Although the self-centering systems have reduced dissociation they could not completely finish it. Hasegawa et al reported disassembly in 7 Zimmer Bi-Articular cup of six patients.¹¹ Ito et al reported one polyethylene cup dissociation in 23 hips, treated with Osteonics Universal Hip Replacement (UHR®) system and one of 6 hips treated with the Zimmer Bi-Articular Cup.³⁰ Tanaka et al reported a dissociation of Bateman UPF-II bipolar endoprosthesis, which has a self-centering system.²¹ TST and Ortopro, which were used in our cases, have also self-centering cup systems. In our knowledge, this is the first report of dissociations of both TST and Ortopro modular cup systems.

Dissociation between bipolar cup components can also happen during reduction maneuvers of the dislocated hip.^{8,16,19} In addition; the implant design or iatrogenic reasons may also play role in this complication. The dissociations in case 2 and case 3 happened during reduction maneuvers applied at the emergency department. In our opinion this attempt of reduction without general anesthesia and fluoroscopic control contributed to the final dissociation. However, bipolar component dissociations have been reported during reduction maneuvers, even under general anesthesia and fluoroscopic control.⁸

In conclusion bipolar cup dissociation is a rare complication, but almost always results with revision surgery. Reduction maneuvers should be realized very carefully under general anesthesia and fluoroscopic control. Also preventing excessive varus cup position

at the initial surgery may reduce the early dissociation between modular components. Further studies are needed to develop advanced implant designs.

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