CASE REPORT

Dissociation of bipolar components following bipolar hemiarthroplasty: A report of two different cases and review of the literature

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ABSTRACT

In elder patients, the treatment for femoral neck fracture generally involves bipolar hip hemiarthroplasty. Hip dislocation is one of the most common complications of bipolar hip hemiarthroplasty. In many studies, hemiarthroplasty dislocation frequency ranged from 1.2% to 8.4%. However, dissociation between femoral head and femoral components is an extremely rare complication in bipolar hemiarthroplasty. Component dissociation was reported following polyethylene break after Bateman bipolar hemiarthroplasty which has been used since 1985. Self-centering systems have been developed to varus positioning of femoral head within in bipolar plate. In a self-centering system, normal forces on articular surface between acetabulum and femoral head should rotate femoral head into valgus position. However, dissociation of acetabular components was also reported with self-centering systems. In the literature, the largest case series reporting dissociation between components after bipolar hemiarthroplasty was reported in 2014 by Hasegawa et al., which included seven cases. Other larger studies were reported by Uruç et al. in 2017 (5 cases) and by Georgiou et al. in 2016 (5 cases). In this study, two different cases are reported dissociation between components after bipolar hemiarthroplasty. In conclusion, dissociation between components is a rare complication following bipolar hemiarthroplasty; however, it results in revision surgery in almost all cases. As spontaneous or traumatic dissociation can occur during maneuvers of closed reduction after hip dislocation, one should be careful during closed reduction of hip dislocation.

Keywords: Bipolar components; dissociation; hemiarthroplasty.

INTRODUCTION

Femoral neck fracture in the elderly population is a problem that demands the attention of the orthopedic community as life expectancy continues to increase.[1] Hemiarthroplasty is a common treatment for femoral neck fractures in the elderly population. The main complications are periprosthetic dislocation and infection, which potentially impact morbidity and quality of life and may contribute to mortality.[2] Periprosthetic dislocation is one of the most common complications of bipolar hip hemiarthroplasty. In many studies, periprosthetic dislocation frequency ranged from 1.2% to 8.4%. [3] However, dissociation between femoral head and femoral components is an extremely rare complication of bipolar hemiarthroplasty.[4–27]

CASE REPORT

Case 2– A 67-year-old woman was treated using cementless bipolar hemiarthroplasty for neck fracture of the left femur. (Fig. 1a). The patient was mobilized post-operative day 1 with an assistant walker device. Any complication was not encountered on early post-operative period. On post-operative month 10, the patient presented to the emergency department with a history of trauma. On direct radiographs, it was seen that dissociation between polyethylene ring and femoral

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head was observed, but bipolar plate was observed within acetabulum (Fig. 1b). Revision arthroplasty was applied to the patient. Intraoperatively, it was observed that locking mechanism of polyethylene ring was unlocked, but there was no erosion in polyethylene. Thus, polyethylene ring and bipolar plate were replaced with the same sizes of primer arthroplasty (Fig. 1c). The patient was mobilized on post-operative day 1 with an assistant walker device. No complication was observed at 1-year follow-up. The patient was informed that data from the case would be submitted for publication and gave her consent.

Case 2– An 81-year-old man was treated using cemented bipolar hemiarthroplasty for neck fracture of the right femur (Fig. 2a, b). The patient was mobilized post-operative day 1 with an assistant walker device. Any complication was not encountered on early post-operative period. The patient with comorbid Alzheimer's disease presented to the emergency department with a history of trauma. On direct radiographs, periprosthetic dislocation was observed (Fig. 2c. After closed reduction was applied in ED, dissociation was observed between polyethylene ring and femoral head, but femoral head was reduced within acetabulum; however, bipolar plate was dislocated (Fig. 2d). Revision arthroplasty surgery was applied. Intraoperatively, it was observed that locking mechanism of polyethylene ring was unlocked, but there was no erosion in polyethylene. Thus, polyethylene ring and bipolar plate were replaced with the same sizes of primer arthroplasty (Fig. 2e). The patient was mobilized on post-operative day 1 with an assistant walker device. No complication was observed at 1-year follow-up.

DISCUSSION

Bipolar hemiarthroplasty has gained increasing popularity since early 1970s due to its advantages including less acetabular erosion and protrusion, varying head options, and increased range of motion.[7,8] However, each modular component arises a potential weak point for failure.[22] In the literature, component dissociation was reported following polyethylene break after Bateman bipolar hemiarthroplasty which has been used since 1985.[13–16] However, there are a limited number of case reports about dissociation between components in bipolar hemiarthroplasty.[4–27]

Dissociation following hemiarthroplasty may occur during maneuvers of closed reduction after periprosthetic disloca-

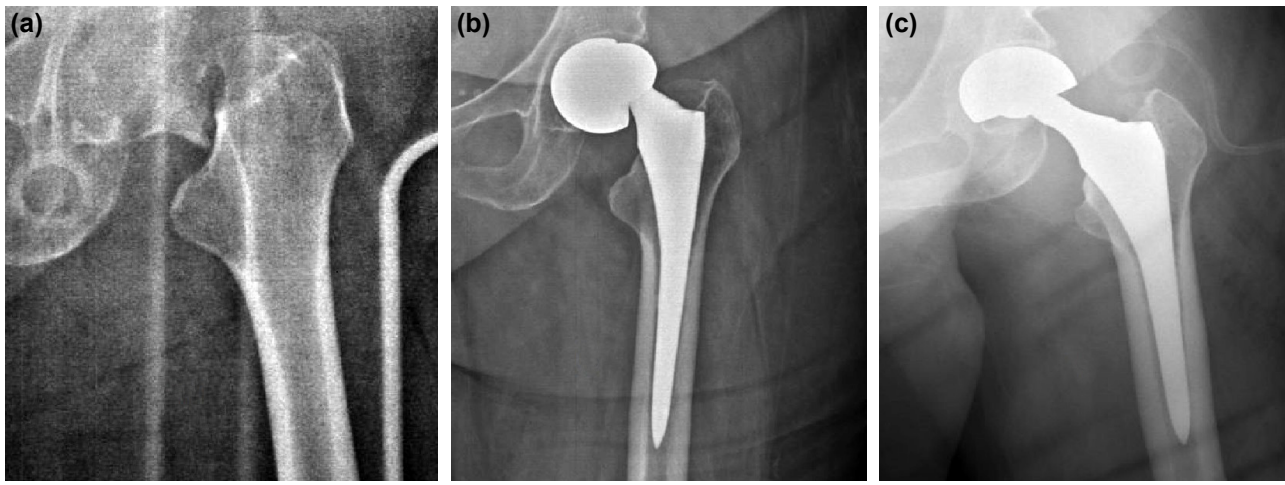

Figure 1. Case 1 **(a)** Pre-operative radiographs. **(b)** Radiograph of dissociation between bipolar components. **(c)** Radiograph of post-operative revision of the bipolar components.

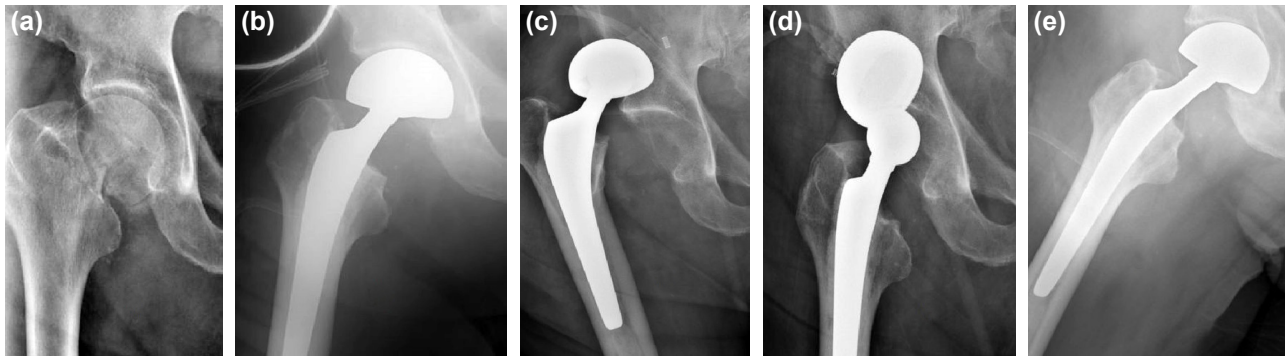

Figure 2. Case 2 **(a)** Pre-operative radiographs. **(b)** Post-operative day 1 radiograph. **(c)** Radiograph of dislocated hip arthroplasty. **(d)** Radiograph of dissociation between bipolar cup components after closed reduction. **(e)** Radiograph of post-operative revision of the bipolar components.

tion or after trauma or spontaneously.[9,11,23] In the first case, dissociation occurred following trauma. In the second case, dissociation occurred during closed reduction of periprosthetic dislocation.

Several reasons have been reported for bipolar dissociation. The first reason is termed as "bottle opener." Dislocation force or reduction maneuver caused dissociation if plate is locked within posterior rim of acetabulum. The second reason is frictional deformation of polyethylene plate. The third reason is failure of polyethylene plate. The fourth reason is inadequate locking of polyethylene component with inaccurate localization of locking ring.[7,9] In the second case, dissociation was caused by reduction maneuver named "bottle opener."

Another mechanism for failure is stress loading on superior lateral segment of polyethylene by varus positioning of femoral component, resulting in dissociation.[12,13,23] In the first case, varus positioning of femoral component predisposed to dissociation which occurred following trauma. Self-centering systems have been developed to varus positioning of femoral head within in bipolar plate. In a self-centering system, normal forces on articular surface between acetabulum and femoral head should rotate femoral head into valgus position. However, dissociation of acetabular components was also reported with self-centering systems.[12,23]

Hasegawa et al.[12] classified three types of dissociation. In type I dissociation, locking ring is displaced to femoral neck, but there is no dislocation of minor femoral head. In type II dissociation, femoral head is dislocated and locking ring is at femoral neck. In type III dissociation, minor femoral head is dislocated and locking ring is located out of plate.[12,17,23] The first case had type I dissociation while the second case can be defined as type II dissociation.

In a study comparing concentric and positive eccentric (self-centering systems), Möllers et al.[28] reported lower dissociation rate with self-centering systems. Although self-centering systems have decreased dissociation rate, they are not able to eliminate dissociation completely.[23] There are case reports on dissociation in many self-centering hemiarthroplasties.[12,14,23,26] In both cases, self-centering bipolar hemiarthroplasty was used.

In the literature, the largest case series reporting dissociation between components after bipolar hemiarthroplasty was reported in 2014 by Hasegawa et al., which included 7 cases.[12] Other larger studies were reported by Uruç et al.[23] in 2017 (5 cases) and by Georgiou et al.[9] in 2016 (5 cases). In this study, two different cases are reported dissociation between components after bipolar hemiarthroplasty.

Conclusion

Dissociation between components is a rare complication following bipolar hemiarthroplasty; however, it results in revision surgery in almost all cases. As spontaneous or traumatic dissociation can occur during maneuvers of closed reduction after hip dislocation, one should be careful during closed reduction of hip dislocation.

Informed Consent: Written informed consent was obtained from the patient for the publication of the case report and the accompanying images.

Peer-review: Internally peer-reviewed.

Conflict of Interest: None declared.

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OLGU SUNUMU - *ÖZET*

Bipolar hemiartroplasti sonrası komponentler arası disosiyasyon: İki farklı olgu sunumu ve literatür taraması

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Yaşlı hastalarda femur boyun kırığının tedavisi çoğunlukla bipolar kalça hemiartroplastidir. Bipolar kalça hemiartroplastinin sık görülen komplikasyonları arasında kalça dislokasyonu gelmektedir. Birçok yayında hemiartroplasti dislokasyon sıklıkları %1.2 ile %8.4 arasında değişmektedir. Ancak bipolar hemiartroplastide femur başı ile femur komponentleri arasında disosiyasyon oldukça nadir görülen bir komplikasyondur. 1985 yılından itibaren kullanılan Bateman bipolar hemiartroplasti sonrası polietilen kırılması sonrası komponent ayrışmaları bildirildi. Femur başının bipolar kap içerisinde varus pozisyonu önlemek için self-centering sistemler geliştirilmiştir. Self-centering bir sistemde, asetabulum ile femoral baş arasındaki eklem yüzeyindeki normal kuvvet, femoral başı valgus pozisyonuna döndürmelidir. Bununla birlikte, asetabuler bileşenlerin disosiyasyonu self-centering sistemiyle de bildirilmiştir. Literatürde bipolar hemiartroplasti sonrası komponentler arasında disosiyasyonu bildiren olgu raporları içinde en fazla hasta sayısı içeren 2004 yılında yayınlanan Hasegawa ve ark. bildirdiği yedi hasta içeren çalışmadır. Diğer hasta sayısı fazla olan yayınlar 2017 yılında Uruç ve ark. bildirdiği beş hasta içeren çalışma ve 2006 yılında yayınlanan Georgiou ve ark. bildirdiği beş hasta içeren çalışmadır. Bu çalışmada bipolar hemiartroplasti sonrası komponentler arası disosiyasyon olan iki farklı olgu raporlanmıştır. Sonuç olarak, bipolar hemiartroplasti sonrası komponentler arası disosiyasyon nadir görülen bir komplikasyondur, ancak hemen her zaman revizyon cerrahisi ile sonuçlanmaktadır. Spontan veya travma sonrası oluşabilen disosiyasyon kalça çıkığı sonrası kapalı redüksiyon manevraların ardından da oluşabileceği için kapalı redüksiyon sırasında oldukça dikkatli olunmalıdır.

Anahtar sözcükler: Bipolar komponent; disosiyasyon; hemiartroplasti

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