

CASE REPORT

The Practice of Emergency Medicine

Recurrent and radiographically unrecognized iatrogenic intra-prosthesis hip dislocations

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Abstract

Hip dislocation is a common complication after total hip arthroplasty surgery. Newer prosthetic implants aim to reduce the risk of dislocation. The new dual mobility implant has a unique design that may result in intra-prosthetic dislocation. We report a case of a recurrently missed iatrogenic intra-prosthetic dislocation following closed reduction efforts in the emergency department (ED). Emergency physicians must be aware of the design, pitfalls, and management of this new prosthetic hip design.

KEYWORDS

arthroplasty, dislocation, dual-mobility, hip, iatrogenic

1 | INTRODUCTION

It is projected that by the year 2030, >572,000 total hip arthroplasties will be performed each year in the United States alone.¹ One of the most common complications following a hip replacement is dislocation.² Implants have been developed that aim to reduce rates of dislocation, one of which is the dual mobility acetabular component or dual mobility implant. In the dual mobility implant, a comparatively small femoral head is press-fit into a larger polyethylene liner, which in turn articulates and rotates within the acetabular shell (Figure 1A).

A complication unique to the dual mobility design is that of intra-prosthetic dislocation, in which the small and radiopaque femoral head dislocates from the surrounding, radio-lucent polyethylene liner, which in turn dislocates from the acetabular shell (Figure 1B). This report presents a case of a missed iatrogenic intra-prosthetic dislocation following closed reduction in the emergency department setting.

2 | CASE REPORT

A 82-year-old female presented to the ED following a mechanical fall in which she sustained a right sub capital neck of femur fracture. She had a background history of poorly controlled hypertension and early stage vascular dementia. Prior to this fall, she was independently mobile and active. She underwent a posterior approach right total hip arthroplasty 2 days later. Only 4 months later, the patient represented to the ED after an unwitnessed fall sustaining a superior dislocation of the right hip. The hip was reduced in the department under sedation (Figures 2A and 2B). A week later, the patient presented again after her right leg “gave way” when she bent over, sustaining another superiorly dislocated right hip, and reduction was performed by the emergency physicians, with the post-reductions films being reported as satisfactory. A further 6 days following her second dislocation, the patient presented to the ED with a painful and restricted range of movement of her right hip; imaging confirmed her third dislocation of her right hip. Her hip

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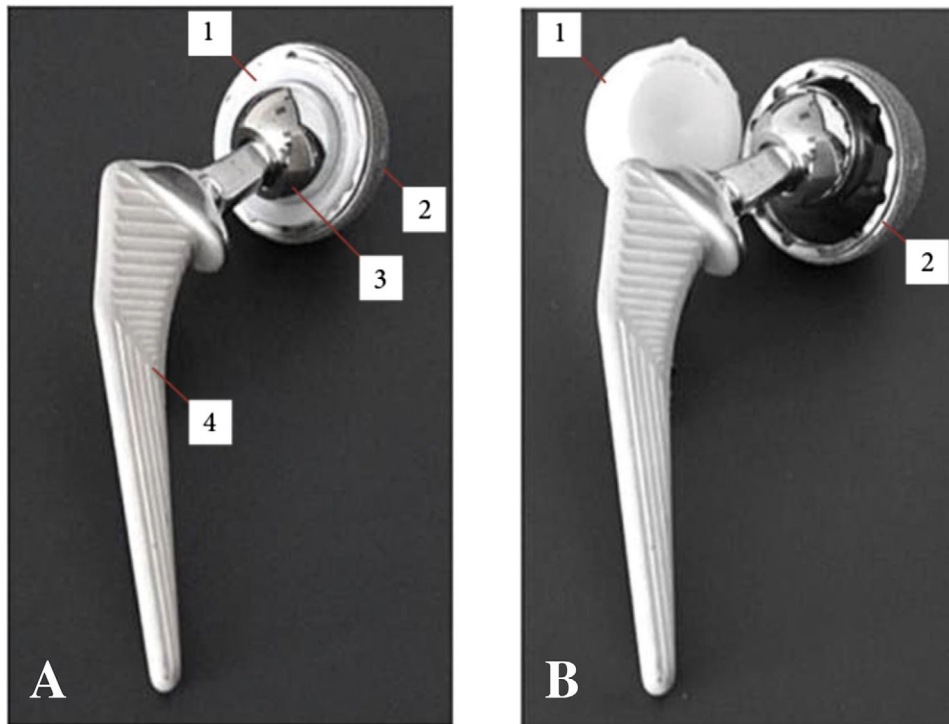


FIGURE 1 Dual mobility system. (A) 1: acetabular liner; 2: acetabular shell; 3: femoral head; 4: femoral stem. (B) Demonstrating dislocation of the liner post reduction. Adapted from O'Neill et al¹¹

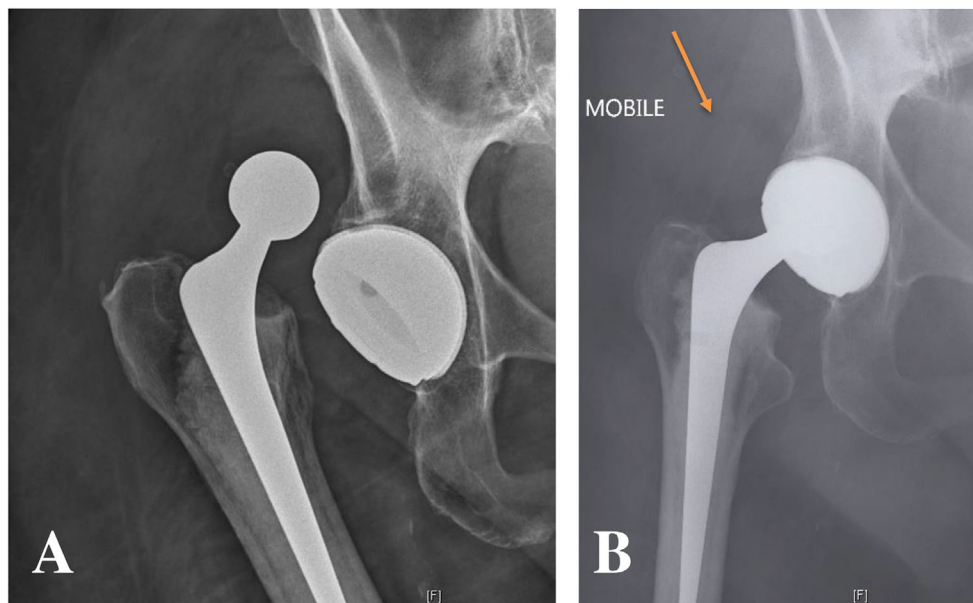


FIGURE 2 (A) Pre-reduction image with superior dislocation. (B) Post-reduction x-ray demonstrating eccentric positioning of the femoral head in the acetabular shell, and a subtle circular opacity or the "bubble sign" (orange arrow)

was relocated by the emergency physicians under sedation and she was discharged home.

Just 4 days later, the patient had ongoing atraumatic hip pain and presented to the ED with her fourth superior dislocation of the right hip. Enlocation was unsuccessful under sedation and the orthopedic services were consulted. A computed tomography (CT) scan of the

hip was performed, and although retrospectively a circular opacity is appreciable in the right gluteal musculature (Figure 3), it remained undetected by both the reporting radiologists and treating orthopedic team. The decision was made to attempt closed reduction in the operating theatre under direct imaging guidance, with a plan to convert to a revision if the closed reduction was unsuccessful. The closed reduction

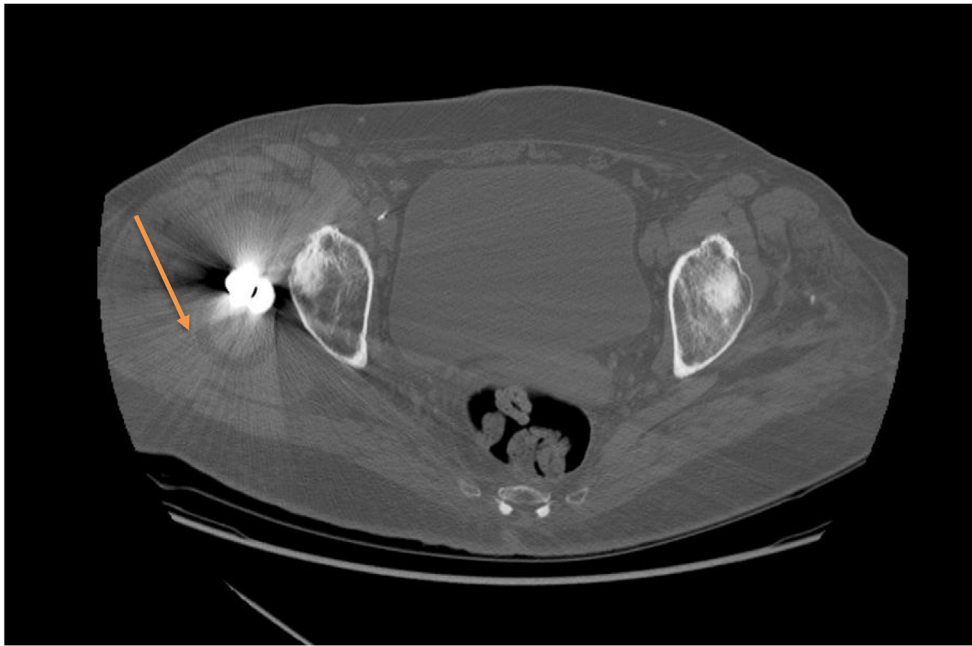


FIGURE 3 Pre-operative computed tomography demonstrating the MDM liner lying within the gluteal musculature

in theatres failed and the procedure was converted into a revision right total hip arthroplasty.

The patient was weight-bearing the following day, and after a short duration in rehabilitation with protected weight-bearing as to protect soft tissue repair, she returned to her premorbid function, ambulating independently without any aids. She was followed up routinely by the orthopedic surgeon at 2 and 6 weeks postoperatively, then again at 6 and 12 months. There were no further complications or dislocations.

3 | DISCUSSION

With the increase in numbers of total hip arthroplasties, so comes a rapid increase in the utilization of the dual mobility system.³⁻⁵ Closed reductions of traditional prosthetic hip dislocations are commonly and successfully performed within the ED.⁶ However, only limited case reports reported worldwide describe the iatrogenic intra-prosthetic dislocation and outline the difficulty identifying complications radiologically. The likely mechanism for this iatrogenic intra-prosthetic dislocation is engagement of the outer polyethylene liner on the rim of the metal cup or on pelvic bony prominences, with subsequent dissociation of the inner bearing couple during the closed reduction maneuver. Loubignac and Boissier⁷ termed this the “bottle-opener” effect.

Radiological features suggestive of intra-prosthetic dislocation include a halo around the prosthesis, coined the “bubble sign” or “crescent sign” and/or the eccentric position of the femoral head bearing within the acetabular shell.^{6,8} The eccentric positioning of the femoral head in the correct clinical context has been shown to be the most sensitive of diagnosis of intra-prosthetic dislocation.⁹

Reducing the risk of iatrogenic intra-prosthetic dislocation includes appropriate sedation with adequate muscle relaxation and to con-

sider fluoroscopic guidance for real-time feedback that may reduce the risk of intra-prosthetic dislocation and more dynamically confirm the position of the femoral head at the end of the procedure.^{8,10} Gentle reduction maneuvers rather than forceful levering have been suggested to avoid the bottle opener effect.⁶ We also support performing a CT if there is any doubt of a persistent sensation of instability after reduction.¹⁰ One recent analysis found that 71% of dual mobility dislocations resulted in an intra-prosthetic dislocation after closed reduction.⁸

This case represents a scenario where the dual mobility prosthesis was not recognized, and a closed reduction resulted in an iatrogenic intra-prosthetic dislocation. The liner is now dissociated from the prosthesis resulting in multiple atraumatic dislocations. It is a unique scenario of a recurrently missed intra-prosthetic dislocation despite clear radiological evidence to suggest liner dissociation. This case demonstrates a unique but likely typical history of an initial traumatic hip dislocation followed by multiple atraumatic hip dislocations in quick succession. We hope that patients with similar presentations will alert the emergency physician to have a strong suspicion of polyethylene liner dissociation.

We suggest that polyethylene liners be marked or impregnated with a radio-lucent ring, so that intra-prosthetic dislocation does not go unnoticed in prosthetic dislocations. However, until that change is implemented, we suggest the current management algorithm for emergency physicians: review medical record for the type of prosthesis, if a dual mobility implant is suspected, to then either (1) discuss with the orthopedic surgeon prior to reduction, or (2) perform the reduction with adequate sedation and relaxation, then only using gentle reduction maneuvers under fluoroscopy. A post reduction x-ray should be thoroughly reviewed for evidence of the “bubble sign” or “Crescent sign” in addition to the eccentric position of the femoral

head. If any concern, a low threshold for a CT of the hip is strongly suggested.

4 | CONCLUSIONS

Patients with dual mobility hip prostheses or recurrent hip dislocations should warrant suspicion for intra-prosthetic dislocation with the emergency physician taking care with reduction techniques and attention to imaging. Orthopedic services should be made aware of these patients as closed reduction is often not adequate and may require revision surgery.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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