CASE REPORT

Disassociation at the head–trunnion interface: an unseen complication of modular hip hemiarthroplasty

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SUMMARY

A woman in her mid-90s underwent a left uncemented bipolar hemiarthroplasty for an intracapsular femoral neck fracture. Postoperative radiographs at 48h showed a disassociation of the left femoral prosthesis at the head–trunnion interface, with the bipolar head remaining in the acetabulum. There was no preceding trauma and the patient had mobilised postoperatively. The hip was revised to a monopolar head, and the patient's hip was protected postoperatively in a brace limiting flexion and external rotation. At 30 days following revision she was mobilising pain-free with a stable hip. Disassociation at the head–trunnion interface has never been reported in hip hemiarthroplasty, and is only described in relation to primary or revision total hip replacements (THR) following dislocation or trauma to the THR. This demonstrates a potential complication of modular prostheses for trauma.

BACKGROUND

The UK National Institute for Health and Care Excellence (NICE) recommend Orthopaedic Data Evaluation Panel (ODEP) 10A rated hip prostheses for the treatment of intracapsular neck of femur fractures.¹ To fulfil these guidelines and meet the best practice tariff, modern modular hip prostheses are used. These have replaced traditional monoblock hemiarthroplasties (Austin-Moore/Thompsons). This case demonstrates a previously unreported complication of hip hemiarthroplasty for femoral neck fractures using modular prostheses.

CASE PRESENTATION

A woman in her mid-90s fell sustaining a left intracapsular femoral neck fracture (figure 1) and underwent an uncemented hip hemiarthroplasty (Taperloc stem with a +3 offset and 44 mm bipolar head). On day 1 postsurgery, leg lengths were equal on clinical review, and she was able to move pain-free to a 90° sitting position. Within 24 h postoperatively she became confused, and although she had managed a single episode of assisted standing, she was primarily only transferring from bed to chair. Owing to her confusion immediate postoperative radiographs were not deemed safe and she continued to mobilise with supervision. On day 2 postoperatively, her leg lengths and attitudes remained symmetrical on clinical review, prior to transferring to a chair and attempting further assisted weight-bearing. Forty-eight hours postoperatively, after a transfer from chair to bed, her left leg was noted to be shortened and externally rotated. The radiographs revealed a dislocated left hip hemiarthroplasty at the head–trunnion interface, with the bipolar head remaining within the acetabulum (figure 2).

The patient returned to the theatre for revision hip hemiarthroplasty, with exchange from a bipolar to a monopolar femoral head. The intraoperative findings showed the soft tissue repair from skin down to prosthesis was intact in each layer. The components and Morse tapers were checked and were correct for the original implants. The head and trunnion were disassociated and there was a notable channel of bone removed through the anterior–superior lip of the acetabulum. The

Figure 1 Preoperative anteroposterior (A) and lateral (B) radiographs showing a left intracapsular hip fracture.

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Figure 2 Postoperative anteroposterior (A) and lateral (B) radiographs showing disassociation at the head–trunnion interface.

femoral implant was stable with satisfactory femoral anteversion. This injury pattern was suggestive of a mechanism of dislocation involving hip flexion and external rotation. A 44 mm monopolar head was inserted with good soft tissue tension, and the joint was washed with 1 L saline before closure. Postoperative radiographs were satisfactory (figure 3). A hip brace was fitted limiting hip movements.

OUTCOME AND FOLLOW-UP

At 4 weeks follow-up the patient was mobilising pain-free with a stable hip, and no longer required the hip brace. She progressed well with physiotherapy, mobilising well with two sticks in a care home environment, and was discharged at 3 months from routine follow-up. Nine months following discharge she passed away of unrelated causes.

DISCUSSION

Modular ODEP 10A prostheses are now advocated by NICE¹ as best practice for hip hemiarthroplasty for intracapsular fractured neck of femurs. There are no monoblock ODEP 10A rated prostheses, and therefore modular systems need to be used in order to fulfil the best practice tariff guidelines.¹ Modular hip systems offer intraoperative flexibility, enabling good restoration of leg length, femoral offset and anteversion, and soft tissue balancing. However, each modular interface offers a potential point of failure, and disassociation at the head–trunnion interface has always been a theoretical complication of using a modular hip system in hemiarthroplasty. This is however thought to be an

unlikely complication, due to the inherent stability of large head diameters used.

This differs from total hip replacements (THR) where small heads (22–36 mm) are more commonly used, and there have been several cases reporting this complication in modular THR systems used in primary or revision procedures. However, these are usually related to THR dislocation, with disassociation occurring either during intraoperative relocation of the dislocated hip or after a traumatic event such as a fall.^{2–3} In the cases of disassociation at the time of attempted closed reduction of a dislocated THR, it has been suggested that the inferior edge of the head has made contact with the acetabular components rim, with the inline distracting force permitting disassociation of the head from the trunnion.⁴

The reasons for head–trunnion disassociation in hemiarthroplasty include component selection and alignment, surgical technique and patient factors. It is possible in this case that the modularity of the bipolar head meant that it was not adequately impacted onto the trunnion. Although the patient had been weight-bearing, which should cause impaction of the tapered head–trunnion interface, there was limited cyclical loading due to the acute confusional state and concern for patient safety. In addition, our patient was elderly, and although she had no major comorbidities, she had limited preoperative mobility and may have had poor abductor strength and function. Acute postoperative confusion is another potential cause; these patients may be unable to follow instructions and keep the hip within a safe range of motion. In addition, confusion related

Figure 3 Postrevision anteroposterior (A) and lateral (B) radiographs showing revision to a monopolar head.

aggressive outbursts may cause momentary excessive movement of the joint, causing components to impinge and act as a fulcrum, allowing distraction or disassociation.⁴ Although not thought to be the cause in this case, incorrect surgical technique and component selection can cause incorrect offset and femoral antversion, leg length discrepancy and poor soft tissue tensioning, which may contribute to disassociation.

Learning points

- ▶ Disassociation at the head-trunnion interface is a rare, previously theoretical complication of modular hip prostheses.
- ▶ There is no clinical evidence that bipolar heads are superior to monopolar heads for hip hemiarthroplasty, and therefore either can be used depending upon surgeon preference. Monopolar heads have less modularity, with fewer interfaces for potential complications.
- ▶ During surgery, careful application of the head to the trunnion using manufacturing guidelines should be undertaken, paying particular attention to the following:
 - Correct offset to preserve normal soft tissue tension, which preserves stability while maintaining range of movement.
 - Meticulous cleaning of trunnion prior to head fitting to prevent fluid or tissue interposition.
 - Secure impaction of the head on the trunnion with a single firm strike using the appropriate tools and then checking that the head is unable to be disassociated from the trunnions' Morse taper prior to reduction.
 - Clear documentation that this was checked intraoperatively before reduction.

In this case the head which disassociated at the head–trunnion interface was a bipolar head, with a small 28 mm metal head contained within a larger polyethylene lined 44 mm metal head. Bipolar heads are thought to give good early increased range of motion but stop moving at the small head to polyethylene liner interface over time and then function as a monopolar head.⁵ There is no evidence that a bipolar head is superior to a monopolar head,⁵ as both have similar head socket depths and head–trunnion contact surface areas. However, the increased modularity of the bipolar head may make impaction more difficult and allow excessive rotation at the modular interfaces, which may enable disengagement at the head–trunnion interface. This would not occur in the monopolar head, and may therefore provide an advantage in preventing this complication.

Contributors All doctors have been involved in writing the case or at the time of operation.

Competing interests None.

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