

CASE REPORT

Adverse reaction to metal debris in a painful hemiarthroplasty of the hip

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Abstract

Adverse reaction to metal debris (ARMD) in total hip arthroplasty surgery is a well-known problem. We present the case of a unipolar hemiarthroplasty requiring revision within 18 months of insertion secondary to an adverse reaction to metal debris. This case demonstrates a rare cause for failure of a hemiarthroplasty following a fragility fracture. We feel that ARMD should be considered in all cases where pain and dysfunction in the presence of any hip prosthesis cannot be explained by routine investigations.

INTRODUCTION

Adverse reaction to metal debris (ARMD) in arthroplasty surgery of the hip is a well-known problem and has resulted in several products being withdrawn from the marketplace [1].

Complications related to the release of metal ions can be devastating for patients and represent a significant surgical challenge. Although the bearing surfaces are a causative factor for metal debris to accumulate, corrosion at the head–neck or neck–stem junction in a modular prosthesis has been described as a significant problem [2]. In the absence of any reciprocal articulating surface a hemiarthroplasty is not considered causative for ARMD. However, case reports have surfaced which highlight the potential for such a complication to arise [3–5].

We present the case of a unipolar hemiarthroplasty requiring revision within 18 months of insertion secondary to an adverse reaction to metal debris.

CASE REPORT

A 73-year-old lady presented to our clinic with hip pain. Six months previously she had sustained a fragility fracture of her hip whilst on holiday in Canada. She was treated locally with an uncemented hemiarthroplasty (Zimmer press fit ML taper titanium alloy stem, Zimmer Versys Cobalt-chrome femoral head and neck adapter).

The patient reported persistent groin pain and a leg length discrepancy since the time of surgery. She was listed for an EUA, aspiration and injection of local anaesthetic. She had a normal white cell count, ESR and CRP. On aspiration a turbid, green, ‘pea-soup like’ liquid was extracted. Microbiology tests were negative. With no convincing evidence for infection the suspicion of ARMD was raised. Serum Cobalt and Chromium levels were 34 and 7 nanomoles per litre, respectively. An MRI scan revealed fluid around the femoral head and neck but no evidence of soft-tissue compromise or pseudotumour formation.

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The injection of local anaesthetic afforded temporary relief and confirmed the hip as the source of pain. Subsequently, the decision was made to revise the hemiarthroplasty to a total hip replacement.

Intraoperatively a large amount of the 'pea-soup like' fluid was again noted together with some lysis of the proximal femur. The femoral head was explanted and corrosion was seen at the head neck junction with black staining around the trunnion and on the reciprocal surface of the adapter sleeve. Multiple soft tissue samples were taken and sent for both histology and culture. The femoral stem was found to be well-fixed and after cleaning the trunnion was left *in situ*. The area of lysis proximally was debrided and packed with reamings taken from the acetabulum. The hemiarthroplasty was revised to a total hip replacement.

Biopsies taken intraoperatively confirmed an adverse metal reaction with an ALVAL score of 8/10 (loss of synovial lining with attached surface fibrin [3], numerous perivascular lymphohistiocytic aggregates [3], loss of normal tissue arrangement with the presence of acellular hyalinised zones [2]) (Fig. 1).

A year post-operatively our patient is clinically improving and her metal ions are undetectable.

DISCUSSION

This case demonstrates a rare cause for failure of a hemiarthroplasty. The diagnosis was considered pre-operatively but only confirmed post-operatively with histological analysis.

Khair et al. [3] reported a similar case involving a patient who required revision surgery for ARMD 3 years after insertion of a hemiarthroplasty with components analogous to ours. The patient required two revisions and only improved after the CoCr head was changed to ceramic [3]. This led the authors to conclude that the trunnion mismatch between the adapter sleeve and the titanium stem caused both the initial and the on-going metal sensitivity [3].

Mann et al. [5] described two cases of patients experiencing severe trunnion corrosion and ARMD more than 10 years after insertion of a hemiarthroplasty. In one case the corrosion of the trunnion was so severe that the head disengaged from the stem [5]. Neither prosthesis had an intervening taper between the femoral head and neck [5].

A further case of ARMD complicating hemiarthroplasty has been reported in the literature [4]. In this case, high levels of titanium metal debris in specimens taken from the femoral-bone stem interface led the authors to conclude that ARMD resulted from metal release from the femoral stem itself [4].

The prosthesis concerned consists of a titanium alloy stem (zimmer ML taper Tivanium[®]) and a cobalt chromium (CoCr) femoral head and neck adapter (zimmer versys). It is our belief that there were two modifiable factors that contributed to ARMD in this case. Firstly, the torque produced by a large femoral head is sufficient to increase the risk of fretting corrosion at the head/neck junction similar to that seen in total hip replacement surgery. Secondly, the neck adapter interposing the femoral head and stem is an independent risk factor for both corrosion and metal ion release.

Clearly, ARMD complicating hemiarthroplasty is rare. To our knowledge this is the first case in the literature where the patient required revision surgery within 18 months of the primary procedure. We are familiar with the presentation of ARMD as there has been a large cohort of metal on metal

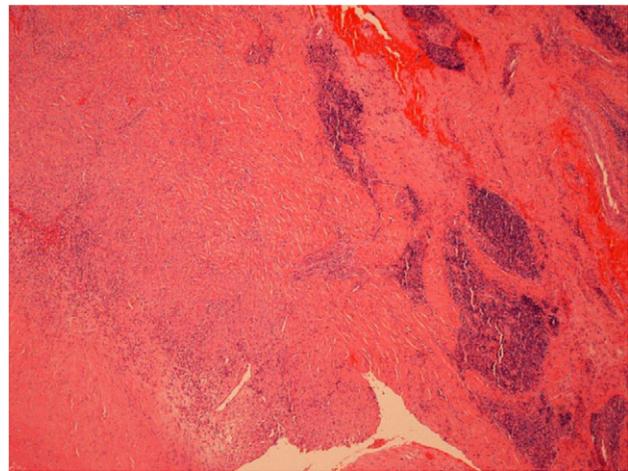


Figure 1: Intra-operative biopsies confirmed an adverse metal reaction with an ALVAL score of 8/10 (loss of synovial lining with attached surface fibrin [3], numerous perivascular lymphohistiocytic aggregates [3], loss of normal tissue arrangement with the presence of acellular hyalinised zones [2])

prostheses in this hospital. The fact that this was revised early meant there was less severe soft tissue damage at the time of surgery compared to similar cases in the literature [3–5].

We feel that ARMD should be considered as part of your differential diagnosis for a painful hemiarthroplasty especially if a modular prosthesis is involved. Such cases should be investigated thoroughly and the pain should not be ignored even when infection has been excluded.

ARMD complicating hemiarthroplasty is rare but must be considered. Corrosion at the head neck junction is possible in hemiarthroplasty when a modular system is used and is exacerbated by the large diameter femoral head inherent to this type of prosthesis. We feel that ARMD should be considered in all cases where pain and dysfunction in the presence of a hip prosthesis cannot be explained by routine investigations.

REFERENCES

1. U.S. Food and Drug Administration. Metal-on-Metal Hip Implants—Recalls [Internet]. U.S. Department of Health & Human Services. 2013. <http://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/ImplantsandProsthetics/MetalonMetalHipImplants/ucm241770.htm>. (25 March 2015, date last accessed)
2. Cooper HJ, Della Valle CJ, Berger R A, Tetreault M, Paprosky WG, Sporer SM, et al. Corrosion at the head-neck taper as a cause for adverse local tissue reactions after total hip arthroplasty. *J Bone Joint Surg Am* 2012;**94**:1655–61.
3. Khair MM, Nam D, DiCarlo E, Su E. Aseptic lymphocyte dominated vasculitis-associated lesion resulting from trunnion corrosion in a cobalt-chrome unipolar hemiarthroplasty. *J Arthroplasty* 2013;**28**:196.e11–4.
4. Sakamoto M, Watanabe H, Higashi H, Kubosawa H. Titanium alloy stem as a cause for adverse reaction to metal debris after bipolar hemiarthroplasty. *Case Rep Orthop*. 2014. <http://dx.doi.org/10.1155/2014/209461> (3 January 2016, date last accessed).
5. Mann M, Tanzer D, Tanzer M. Severe metal-induced osteolysis many years after unipolar hip endoprosthesis hip. *Clin Orthop Relat Res* 2013;**471**:2078–82.