



## A groin mass caused by metal particle debris after hip resurfacing

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**We present the case of a benign groin mass associated with metal particle debris after hip resurfacing. We discuss the histological diagnosis of 'aseptic lymphocytic vasculitis associated lesions' (ALVAL).**

**Keywords:** ALVAL ; groin mass ; hip resurfacing ; arthroplasty.

### INTRODUCTION

The current incarnation of hip resurfacing is a hydroxyapatite-coated press fit acetabular component and a cemented stemmed femoral component (4,13). These prostheses are becoming increasingly popular (11), but potential side-effects and problems are not yet fully understood.

We report the case of a young woman who was referred to the tumour clinic with a groin mass following a hip resurfacing procedure one year earlier.

### CASE REPORT

A 40-year-old woman underwent a BHR (Birmingham Midland Medical Technologies, UK) left hip resurfacing for osteoarthritis at a district general hospital (DGH). She received a 48-mm acetabular cup and a 42-mm cemented femoral head. At one year post-operatively she complained of a lump in front of her left groin. This lump was associated with pain radiating down the antero-medial aspect of her left leg and around the groin.

The patient had no other significant past medical history.

Examination revealed a tender lump in the left groin. The discomfort worsened with exertion and coughing. All hip movements were restricted and painful.

Plain radiographs revealed a vertical cup with more than 60 degrees of abduction. There was no evidence of prosthetic loosening (fig 1).

Inflammatory markers were normal.

A computerised tomography (CT) scan of the pelvis, abdomen and thorax was carried out. An area of well-defined homogeneous attenuation in the left groin was demonstrated. It lay posterior to the femoral vessels in an intermuscular septum between pectineus medially and iliacus laterally. The lump was 4 cm in diameter and firm.

The patient was referred to the regional soft tissue tumour centre for further investigation and management.

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*Fig. 1.* — Radiographs of the hip (AP and Lateral)

Isotope bone scan showed increased uptake in the area of the acetabular component and suggested an element of loosening. This was further supported by an indium mixed leukocyte scan revealing active accumulation in the acetabular bone, suspicious of infection.

In a further attempt to establish a diagnosis, ultrasound (US) guided biopsy was performed. The scan revealed a large, intermediate echogenicity soft tissue mass in the left proximal thigh measuring  $9 \times 2 \times 2$  cm, lying just lateral to the femoral vessels. Three millilitres of thick, viscous, grey fluid was aspirated. Microbiological culture did not reveal any evidence of infection. Histological examination suggested the aspirate may have been resorbed suture material.

A magnetic resonance imaging (MRI) scan was undertaken to ascertain whether the mass communicated with the joint, but was inconclusive.

With no definitive diagnosis reached and persistent symptoms, the patient was admitted for exploration of the lump. Pre-operatively she was prepared for the possibility of a one or two-stage revision total hip arthroplasty.

Exploration of the groin lump revealed an encapsulated, grey-brown lump lying lateral and deep to the femoral vessels. It was approximately  $3 \times 3$  cm in size and extended deeply towards the joint capsule (fig 2).

The capsule of the lesion was opened (fig 3). This revealed a thick, grey, paste-like substance (fig 4). The paste was removed, the capsule of the lesion debrided, and the wound was closed.

Microbiological examination of the paste revealed no organisms on standard culture, but did identify a coagulase negative staphylococcus on enrichment. Histological examination was in keeping with the recently described 'aseptic lymphocytic vasculitis associated lesions' (ALVAL) (fig 5).

The patient was referred back to her original surgeon for conversion of her resurfacing to a total hip replacement.

## DISCUSSION

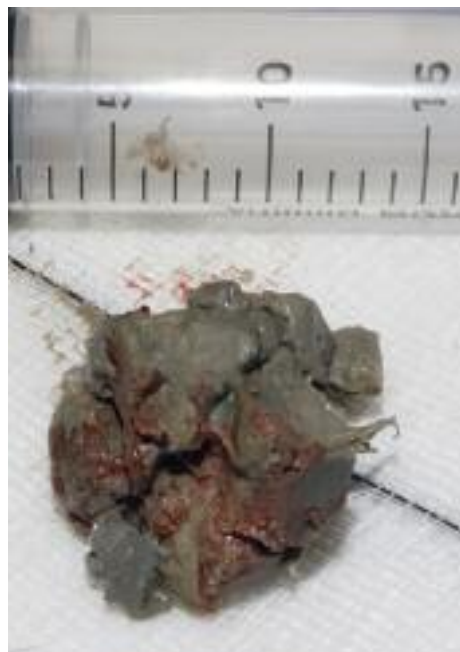
The use of metal-on-metal hip resurfacing has become increasingly popular, attracting high levels of media and patient interest. However, there is increasing concern regarding the long-term safety of such implants. As these implants are used predominantly in the younger and more active population, this concern is amplified.



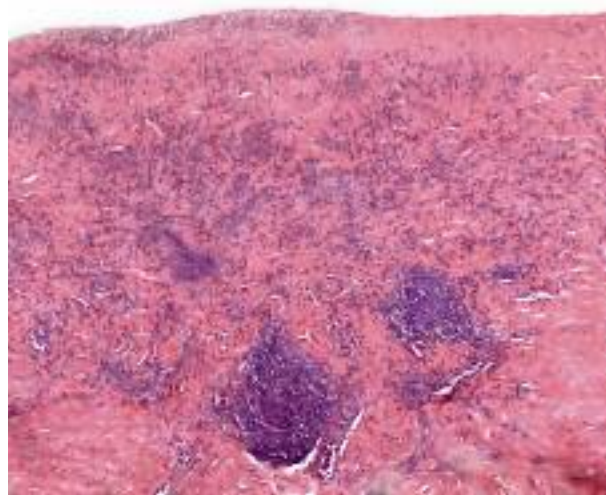
**Fig. 2.** — Exploration of groin lump prior to opening capsule



**Fig. 3.** — Following the capsule being opened



**Fig. 4.** — Contents of capsule



**Fig. 5.** — Histology. The top surface is synovium which is generally necrotic. Lymphocyte aggregates are found in the deeper layers.

High metal ion concentrations in blood, lymphatics and urine have been shown in previous studies (3,5), but the biological risk of this is not fully understood. Cobalt and chromium have been shown in animal models to increase the risk of cancer, raising concern that such a risk could also be evident in humans if sufficiently high levels were reached (8,10). Davies *et al* reported evidence of DNA damage in tissue from revision cobalt / chromium arthroplasty (6).

All metals in a biological environment corrode, releasing ions, thus activating the immune system. This triggers hypersensitivity reactions, usually in the form of delayed cell-mediated responses (20,21). More recently, lymphocytic infiltrations which were either diffusely spread or aggregating around

small post capillary vessels, have been described around metal-on-metal prostheses. The tissues around the metal-on-metal implants also showed significant ulceration of the pseudo-synovial surface (6). These immunological reactions have

been described by the term ALVAL (Aseptic lymphocytic vasculitis-associated lesions) (6). Hypersensitivity has been proposed as a mechanism of aseptic loosening of these components (19). Metal-on-metal implants have also been shown to cause lymphocyte suppression (9).

Lymphocytic perivascular aggregates in the hip capsule have been described previously in studies on metal-on-metal prostheses (7,19,21). Boardman *et al* reported a psoas mass after a Birmingham Hip resurfacing (1). This mass showed areas of fibrous tissue, metal debris, and dense infiltration of lymphocytes, giant cells, and histiocytes. Mandan *et al* described an intra-pelvic synovial cyst communicating with a McKee-Farrar hip arthroplasty through a defect in the acetabular floor. This cyst contained metallic and cement debris (16). Pandit *et al* recently reported a series of 17 patients with metal-on-metal hip resurfacings who presented with a variety of symptoms, most commonly groin pain and also a soft tissue mass. The majority had cystic posterolateral masses, although 6 patients had anterior masses. Thirteen cases had available histology showing extensive necrosis of dense connective tissue, marked cystic degeneration and lymphocytic infiltration (19).

The mass described in this case tracked anteriorly to the femoral vessels from the hip joint. With histological evidence of ALVAL, metallic particle debris from the hip resurfacing seems to be the obvious cause.

Component positioning is extremely important in producing low wear rates. Excessive abduction of the acetabular cup has been shown to increase the risk of high wear rates. This has been shown both in simulator (15,22) and retrieval studies (2,17,18).

Furthermore an increase in abduction angle has been associated with higher blood ion levels (9,12,14). This is a direct result of a minimised contact area. Good metal-on-metal bearing wear characteristics are based on the generation of a fluid-film layer. As the contact zone between cup and head approaches the rim (edge loading), the contact area decreases, stresses increase and the fluid film is disrupted.

The acetabular component in this case was seated in a very vertical position with an abduction

angle of more than 60 degrees. An abduction angle of less than 55 degrees is recommended (2,15,17,22), with many surgeons preferring approximately 40 degrees. The cup position in this patient may have resulted in excessive wear and higher blood metal ion concentration triggering the immunological reaction, ALVAL.

Metal-on-metal resurfacings continue to demonstrate promising clinical results and survival rates, but the potential problems associated with metal debris are not fully understood. This case report has described a new clinical presentation of ALVAL ; it also highlights the importance of component positioning in metal-on-metal prostheses.

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