

Femoral neck fractures complicating metal-on-metal resurfaced hips: A report of 2 cases

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ABSTRACT

Metal-on-metal hip resurfacing arthroplasty is increasingly popular for younger patients with advanced hip disease. Intra-operative or immediate postoperative femoral neck fracture after metal-on-metal hip resurfacing is a well-described technical complication, ranging from 0% to 1.5%. We report 2 cases of late femoral neck fracture occurring 8 and 15 months following the index operation, with a review of the literature. We recommend that patient selection should be of prime importance before embarking on metal-on-metal surface hip replacement to avoid such complications.

Key words: arthroplasty, replacement, hip; femoral neck fractures; hip prosthesis; prosthesis failure

INTRODUCTION

The choice of treatment for younger patients (<65 years) with advanced hip disease remains controversial. Evidence has shown a high failure rate of 30% to 56% within 10 to 12 years in patients younger than 40 years who had undergone conventional primary total hip arthroplasty.^{1,2}

Although the incidence, techniques, and technologies for metal-on-metal surface hip replacement surgery have been rapidly advancing, we are still unclear about the long-term functional outcomes, safety, clinical effectiveness, and cost effectiveness of the index procedure.

Metal-on-metal hip resurfacing arthroplasty is recommended for younger patients with advanced hip disease, who are reasonably active and likely to outlive a conventional primary total hip arthroplasty. It has an extremely low incidence of dislocation (0.05%), preserves bone stocks for subsequent hip

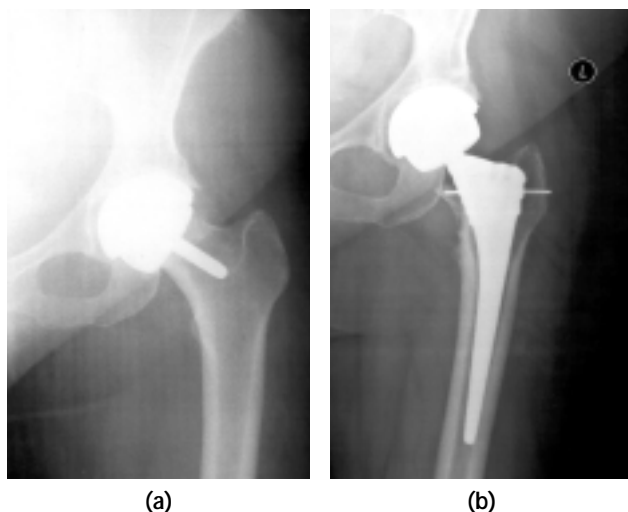


Figure 1 Case 1: (a) preoperative radiograph showing femoral neck fracture of the left hip with metal-on-metal hip resurfacing prosthesis *in situ*; (b) postoperative radiograph showing revision of the femoral component.

operations, and produces less wear debris because of improved tribological metal-on-metal articulations. However, the clinical outcome of systemic absorption of metal degradation products remains contentious.³

Metal-on-metal hip resurfacing arthroplasty is a technically demanding procedure. Intra-operative or immediate postoperative femoral neck fracture is a well-described technical complication ranging from 0% to 1.5% as a result of notching the femoral neck and stress shielding of the femoral head.⁴⁻⁷ We report 2 cases of femoral neck fracture that occurred 8 and 15 months following the index operation, which were treated by revising the femoral component, using large heads, and leaving resurfaced cups *in situ*.

CASE REPORTS

Case 1

A 47-year-old grossly obese woman was admitted to Monklands Hospital, UK in July 2001 after sustaining a fall. Radiography confirmed left femoral neck fracture with resurfacing prosthesis *in situ*. She underwent metal-on-metal surface hip replacement 15 months earlier for advanced coxarthrosis using Cormet 2000 dual coated cup 52 mm and femoral head 44 mm (Corin Medical, Gloucestershire, UK). The periprosthetic fracture was treated by revising the femoral component, using a Eurocone Cormet modular endo head size 44 mm (Corin Medical, Gloucestershire, UK). Three months after the revision

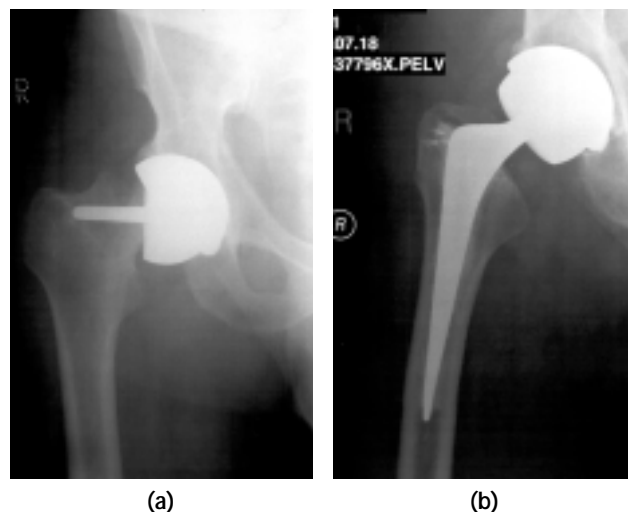


Figure 2 Case 2: (a) preoperative radiograph showing femoral neck fracture of the right hip with metal-on-metal hip resurfacing prosthesis *in situ*; (b) postoperative radiograph showing revision of the femoral component.

surgery, she had dislocation of the hip, which was reduced under sedation and stabilised with a hip abduction brace for 3 months. At one-year follow-up, she was able to mobilise unassisted and had a good range of motion (Fig. 1).

Case 2

A 52-year-old man presented to Monklands Hospital, UK in April 2001 with a painful right hip after a sudden click in the right hip following an epileptic seizure in a supermarket. He had a significant epilepsy history. Radiography confirmed right femoral neck fracture with resurfacing prosthesis in place. The metal-on-metal surface hip replacement was performed 8 months earlier for advanced avascular necrosis using Cormet 2000 dual coated cup 58 mm and femoral head 52 mm (Corin Medical, Gloucestershire, UK). The femoral component was revised, using a Eurocone Cormet modular endo head 52 mm (Corin Medical, Gloucestershire, UK). Six months after the revision surgery, he sustained minor greater trochanteric avulsion fracture of the right hip after a fall, which was treated non-operatively by leaving alone. At an 18-month follow-up after the periprosthetic fracture, he had made satisfactory progress (Fig. 2).

DISCUSSION

Treating younger patients with advanced hip disease

is a challenging problem. The treatment of choice has moved from conventional primary total hip arthroplasty to conservative metal-on-metal surface hip arthroplasty, which is increasingly popular worldwide. However, its long-term safety and efficacy remain uncertain. The incidence of intra-operative or immediate postoperative femoral neck fracture after metal-on-metal hip resurfacing arthroplasty ranges from 0% to 1.5%.⁴⁻⁷ Freeman et al.⁸ even reported a femoral neck fracture incidence as high as 25% after double cup resurfacing. In this study, we report 2 (6.66%) cases of neck fracture in 30 metal-on-metal hip resurfacing arthroplasty. However, these 2 cases of late femoral neck fracture occurred as a result of minor trauma with underlying obesity and epilepsy, rather than iatrogenic femoral neck notching or implant variation.

Femoral neck fracture as a result of stress shielding of the femoral head is well documented in the literature. In the past, failure of clinical application of the early versions of metal-on-metal resurfaced hips was common. This was due to difficulties in the appropriate design and material of the bearing surfaces and the proper method of fixation. The main causative factors for femoral neck fractures are superior and inferior femoral neck notching during preparation and varus positioning of the femoral component.⁹ Other factors include simple overload with gross osteoporosis, osteonecrosis (especially at the junction of viable and non-viable bone), prosthetic design, large trochanteric osteotomy, and stress riser effect of screw holes or drill holes used for trochanteric osteotomy.^{8,10} Improvements in the insertion technique, fixation method, and implant designs have reduced the incidence of femoral neck fracture to a negligible level.^{5,10}

The treatment of femoral neck fracture with resurfaced hip *in situ* is subject to the surgeon's preference. Incomplete femoral neck fractures can be treated conservatively with close supervision of the patient.¹⁰ Recently, a case of conservatively treated complete femoral neck fracture following hip resurfacing has been reported.¹¹ Exchange of femoral component through metal-on-metal hip arthroplasty or cementless total hip arthroplasty are other available

options.⁴⁻⁷ Wagner and Wagner¹² reported a similar case of a femoral neck fracture that was observed 6 months postoperatively after a traffic accident. The resurfacing cup was left in place and cone prosthesis was implanted. We treated both patients by revising the femoral component, using a large head, and leaving resurfaced cups in place.

The complexity of surgery after femoral neck fracture is obvious. Attention to detail and meticulous preparation of the femoral head is crucial. It has been recommended that hip resurfacing should ideally be carried out in the context of a prospective trial by orthopaedic surgeons trained in the technique who should perform the index procedure on a regular basis. Strict non-weight-bearing rehabilitation protocol in the early postoperative period may be necessary if the surgeon is cognisant of causing neck notching on the table to avoid neck fracture. This may not be true for late femoral neck fractures complicating hip resurfacing as observed in our 2 cases. Fixation of the femoral head in varus angulation should be avoided at all costs. Placing the femoral component in slight valgus alignment helps biomechanics by increasing compressive forces and decreasing shear-tensile forces. Compliance, co-morbidities, state of osteoporosis, and degree of osteonecrosis should be thoroughly considered prior to the selection of the patient. In addition, the age of the patient can affect the outcome. In our case report, both patients, aged 47 and 52 years old, were considered within the margin of young patient group. The National Institute for Clinical Excellence of the UK recommends placing emphasis on the current evidence and principal for the clinical outcomes and cost effectiveness of metal-on-metal hip resurfacing arthroplasty for patients younger than 65 years.

We consider that patient selection is of prime importance before embarking on metal-on-metal surface hip replacement. In the first case, obesity was the crucial factor for her poor mobility and compliance. In the second case, epilepsy increased the risk of falls and fractures. Large multicentric trials are needed to evaluate the exact incidence of periprosthetic fractures in metal-on-metal hip resurfacing.

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