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Severe Metallosis in an Isoelastic Hip Prosthesis

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ABSTRACT

Severe black staining due to metallic wear debris has been reported in metal-on-metal hip prosthesis[3]. This problem is not commonly seen because of the popular use of metal-on-polyethylene component and has not been previously reported with the use of isoelastic femoral prosthesis. We report a case of severe metallosis in an isoelastic prosthesis, four years after implantation.

Keywords: metallosis, isoelastic hip prosthesis

CASE REPORT

A 55-year-old Indian male had a left isoelastic hip replacement for osteoarthritis. The surgery was complicated by a spiral fracture of the shaft of femur as a result of reaming. This was recognised at the time of surgery and cerclage wiring was done. A size 32 mm coated Rob-Mathys acetabular polyethylene cup and a size 10 mm second generation isoelastic stem were used. The acetabular cup was fixed with two screws and the femoral component was anchored with two cancellous screws proximally into the greater trochanter.

The post-operative rehabilitation was uneventful. The patient attained a hip flexion of 120°, abduction and adduction of 30°, internal and external rotation of 30°, six weeks following surgery. X-rays revealed a perforation of the antero-lateral shaft of the mid-femur, which was not displaced.

Four years after the primary hip surgery, the patient began to complain of pain in his left groin. He had had it for about four months. There was no history of fever, chills or rigors. He had no night pain but his walking ability was restricted and he was finding it difficult to manage the activities of daily living.

Clinical examination revealed a left hip flexion of 50° from the neutral position. Both internal and external rotation were 15°. There was very minimal abduction and adduction present. He had an antalgic gait with gluteal wasting. The Trendelenburg test was positive. X-rays of the left hip (Fig 1) revealed a broken cancellous screw from the femoral component fixation. There was a clear zone of lucency between the femur and the femoral component compatible with loosening.

There was no obvious wear of the acetabular cup. The erythrocyte sedimentation rate was 40 mm per hour and the total white cell count was 7200/mm^3. A diagnosis of aseptic loosening was made.

A revision of the left isoelastic component was performed. At surgery, the left hip joint was covered with black metallic debris, involving the capsule, the synovial lining and the muscles around the hip. The broken femoral cancellous screw was in close proximity to the lateral aspect of the femoral head.

The femoral head in this region was dull in appearance compared with the shiny surface elsewhere on the prosthesis. The black debris was a result of the broken femoral cancellous screw head abrading against the femoral head. The black debris was also seen at the site where the prosthesis had perforated through the femur and it was also present within the medullary canal. The broken screw and the loose femoral component were easily removed and revised with a size 15, 265 mm length Wagner uncemented prosthesis. The acetabular cup was not loose and it was left intact. A 32 mm ceramic head was used. Histology of the specimen from the left hip showed a hypertrophied synovium with abundant dark granular material (Fig 2).

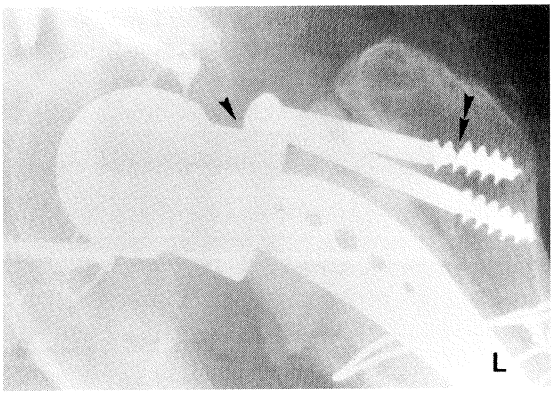

Fig 1 – X-ray of an isoelastic hip showing the screw heads to be in contact with the femoral prosthesis (single arrow) and a broken screw (double arrow).

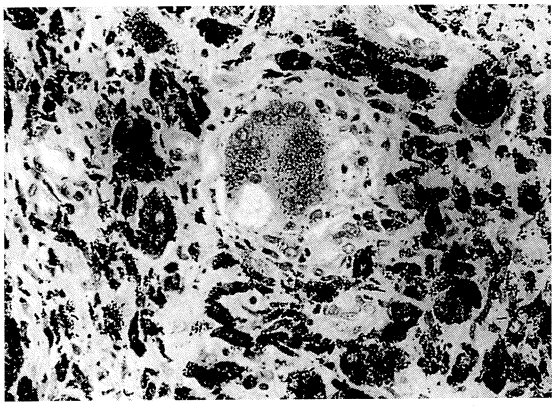

Fig 2 – Photomicrograph (H&E stain) showing synovial hypertrophy with abundant dark granular material (Mag. x 40)

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Post-operatively the patient was started on partial weight bearing for 12 weeks. One year following his revision, he was pain free. The left hip flexed from 0° to 90°. The internal and external rotation were 10° and 30° respectively. The range of abduction and adduction was limited to 30°.

Histology (Fig 2) showed marked proliferation of synovial lining cells covered with fibrin and necrotic debris containing abundant dark granular material. There was no evidence of sepsis or malignancy. The retrieved femoral component was stained black due to the debris. The metallic head clearly revealed the site of abrasive wear.

DISCUSSION

The aetiology of hip pain, following a total joint replacement, in the absence of sepsis or definite loosening is unclear[5]. Metal-on-metal hip designs have caused metallic debris due to the high frictional forces generated in the articulation. The metallic debris has been postulated to accelerate the aseptic loosening process[2]. This has led to new designs of implants incorporating mainly metal on polyethylene components.

The isoelastic hip prosthesis consists of an outer shell of polyacetate that is reinforced by a flexible internal stainless steel core. A modular designed head-neck unit attaches to the neck of the femoral stem via a snap fit. It is unlikely that this design will result in the production of metallic wear debris. Two cancellous screws are used to anchor the proximal lateral portion of the femoral component to the greater trochanter. These screws resist rotation and also serve to buttress the lateral portion of the prosthesis from excessive tension in a fashion analogous to that of a tension band[4].

In our patient, the toggling effect of the loose femoral component caused one of the cancellous screws to sustain a fatigue fracture. This resulted in the screw head abutting against the femoral head causing the progressive release of metallic wear debris. The metallic wear debris could have hastened the process of aseptic loosening by being trapped in the implant-bone interface. Based on our observation of metallic debris in the femoral canal, we postulate that the aseptic loosening process could have been, at least partially, hastened by the broken screw.

This case highlights the problem of proximal anchoring screw in implants designed to be used without bone cement. In such a clinical situation, we recommend that the broken screw be removed as early as possible to prevent severe metallosis with its complications.

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