CASE REPORT

Periprosthetic metastasis: a rare cause for prosthetic loosening

Mathias Thomas Nagy,¹ Andrew Fred Young,¹ Neshteman Gorgees,² Richard Lawrence Barrington¹

¹Department of Trauma and Orthopaedic Surgery, Kettering General Hospital, Kettering, UK

²Department of Pathology, Kettering General Hospital, Kettering, UK

Correspondence to
Dr Mathias Thomas Nagy,
dr.nagy@gmx.net

SUMMARY

Malignant periprosthetic metastasis is a very rare yet important cause of painful joint arthroplasty. This study presents a case in which periprosthetic osteolysis following total hip replacement (THR) occurred as a result of metastatic mesothelioma. After a THR and revision THR, histopathology confirmed the diagnosis of metastatic mesothelioma. Primary lesion was identified using CT scan of the chest. Patient is receiving palliative chemotherapy.

BACKGROUND

Periprosthetic osteolysis is a common complication in patients who undergo total hip replacement (THR). In a great majority of cases, aseptic or septic loosening is responsible for periprosthetic osteolysis and the subsequent THR failure. Malignant causes of prosthetic loosening are far less common and can frequently be misinterpreted as non-malignant.^{1–3} This study presents a case in which loosening happened as a result of periprosthetic metastatic infiltration.

CASE PRESENTATION

A 71-year-old gentleman presented in December 2011 with increasing pain in his left thigh of 12 months duration. The previously healthy and independent patient was living an active lifestyle and underwent a very successful primary cemented C-STEM THR (DePuy, Warsaw, USA) in 2003 for primary osteoarthritis, being completely asymptomatic for 7 years till this presentation. He had worked in a steel factory and a printing company for about 40 years. He never smoked, but was exposed to passive smoking as child.

At the time of presentation, the patient was able to bear weight, but initial loading of his leg was more painful. He complained of pain at night time. On examination, passive movement of the hip joint caused no pain, but there was tenderness in the upper shaft of his femur. x-Rays taken were suggestive of aseptic loosening with evident thin lucency at the cement bone interface around the femoral component. There was also lucency on the medial aspect of the stem of the femoral component which was consistent with loosening (figure 1).

Patient underwent revision THR using C-STEM AMT implant (DePuy) in March 2012. During the procedure, no free fluid was seen in the joint and there was no evidence of any degradation synovitis. Femoral component was very solid and was removed with great difficulty. There was some

granulation tissue between the cement bone interface, but in general the cement was firmly bound to the femoral component. The two areas of lucency which has been identified on x-rays were explored and tissue samples were sent for microbiology. No specimen was sent for histopathology as at that time the investigators did not judge that as necessary. During the removal of cement, a slight breach in the cortex was caused. There was no intraoperative evidence of any infection and the patient had an uneventful recovery following this procedure.

Patient was seen in two follow-up visits post-operatively; he was progressing well without any significant problems. However, 3 months after revision THR, the patient complained of severe pain radiating down his left thigh. x-Rays showed a large area with significant amount of bone lysis (figure 2).

Patient underwent further surgery in July 2012 when a revision of the standard femoral component was carried out and replaced with a 200 mm

Figure 1 Left cemented total hip replacement (C-STEM, DePuy), 8 years postoperative. Arrows show lucency on the medial aspect of the stem.

To cite: Nagy MT, Young AF, Gorgees N, et al. *BMJ Case Rep* Published online: [please include Day Month Year] doi:10.1136/bcr-2013-008707

Figure 2 Three months after revision total hip replacement (C-STEM, DePuy). Arrows show large area with significant amount of bone lysis on anteroposterior radiograph.

stem (figure 3). Surgical incision was extended more distally to explore the femoral shaft. Femoral component was found to be solid and difficult to remove. The appearance of the soft tissue in and around the femur was concerning as it did not make the impression of normal granulation tissue. Postoperative recovery was uneventful; the patient was able to mobilise independently and was pain free.

INVESTIGATIONS

Tissue samples taken during the last revision THR from the femoral canal were submitted for histology and in view of the pleomorphic sarcomatoid appearances were forwarded for a specialist opinion to the Royal National Orthopaedic Hospital.

This confirmed a high-grade spindle-cell tumour and suggested that the morphological and immunohistochemical features indicated a metastatic sarcomatoid carcinoma.

In particular, there was expression of cytokeratins with a profile that was cytokeratin 7 (CK7) positive and cytokeratin 20 (CK20) negative.

As part of the workup to determine the primary site a chest CT scan was performed.

This showed a large anterior mediastinal mass with multiple enhancing nodular pleural deposits while further deposits were observed in several ribs and in the pericardial fat (figure 4). These significant pathological findings were not detectable on previous routine chest radiographs taken prior to the first revision surgery (figure 5).

Further immunophenotyping of tissue samples from the femoral canal was then carried out (figure 6). Mesothelioma was part of the differential diagnosis in any mass which may be

Figure 3 Patient underwent further revision surgery; the standard femoral component was replaced with a 200 mm stem. Arrow shows large area of bone lysis.

pleural based and differentiation between mesothelioma and pulmonary adenocarcinoma was often reliant on a panel of immunocytochemical tests.

The cardinal findings were the expression of cytokeratins 5/6 (CK5/6) plus strong marking with antisera to calretinin (calretinin is a calcium-binding protein expressed in often

Figure 4 CT scan of chest showing a large anterior mediastinal mass with multiple enhancing nodular pleural deposits (arrows).

Figure 5 Routine x-ray of chest taken prior to first revision total hip replacement did not reveal any significant pathology.

mesothelioma but much less so in adenocarcinoma). There was no expression of thyroid transcription factor 1, carcinoembryonic antigen or the epithelial marker Ber-Ep4; all these are more common in lung carcinomas compared with mesothelioma.

Overall, these findings indicated a diagnosis of metastatic biphasic malignant mesothelioma.

Based on the findings, the consensus among the multidisciplinary team in charge of the patient's care was that the femoral tumour was a metastasis from a primary thoracic mesothelioma. Tissue samples from the mediastinal or pleural mass were not obtained as this did not influence the palliative management plan of the patient.

OUTCOME AND FOLLOW-UP

Patient was referred to oncology and received palliative chemotherapy. Subsequent CT scans showed further progression of the disease. As of January 2013, the patient is still undergoing palliative chemotherapy, but his mobility has further deteriorated.

Figure 6 Histology of tissue samples from femoral canal confirmed a high-grade spindle cell tumour. Further immunophenotyping showed the expression of cytokeratins 5/6 and 7 (CK5/6 and CK7) plus strong marking with antisera to calretinin.

DISCUSSION

While periprosthetic osteolysis is a common complication in patients who undergo a total joint replacement procedure, it is rarely caused as a result of a malignant infiltration. If seen, periprosthetic malignancies are more likely to be the manifestation of a primary tumour (mostly sarcomas) rather than a metastatic disease.^{1–4} There have been several reports of cases in which THR failure happened as a result of periprosthetic malignant metastasis. These include metastatic disease from the following primary malignancies: five cases of bronchogenic carcinoma, three cases of renal cell carcinoma, two cases of ovarian carcinoma and one case of breast cancer, gastric adenocarcinoma, malignant immunoblastic lymphoma, non-Hodgkin's lymphoma, hepatocellular carcinoma and prostate cancer.^{1–10} To our knowledge, there has been no published report of loosening after THR as a result of metastatic mesothelioma and this case is the first to report on that.

Metastatic periprosthetic infiltrations can be easily misinterpreted as aseptic loosening. To avoid missed diagnosis, a higher index of suspicion for malignant causes is recommended when dealing with loosening after THR especially in patients whose medical history, symptoms, physical exam or findings during revision THR are atypical for benign causes. In these patients, histopathological evaluation of the lesions should be performed.

Learning points

- ▶ Although uncommon, malignant causes should be considered when dealing with loosening of prosthetic implants.
- ▶ There should be a high index of suspicion for malignant causes of loosening especially in patients with atypical history, those who are at higher risk for primary malignancies and in cases where atypical findings are observed during repeat procedures.
- ▶ Routine histopathological examination of the removed tissue should be considered.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 O'Shea K, Kearns SR, Blaney A, *et al.* Periprosthetic malignancy as a mode of failure in total hip arthroplasty. *J Arthroplasty* 2006;21:926–30.
- 2 Schmidt AH, Walker G, Kyle RE, *et al.* Periprosthetic metastatic carcinoma: pitfalls in the management of two cases initially diagnosed as osteolysis. *J Arthroplasty* 1996;11:613–19.
- 3 Dramis A, Desai AS, Board TN, *et al.* Periprosthetic osteolysis due to metastatic renal cell carcinoma. *Cases J* 2008;1:297.
- 4 Pereira A, Massada M, Sousa R, *et al.* Metastatic carcinoma as an unusual cause of failure in total hip arthroplasty. *J Surg Case Rep* 2012;3:9.
- 5 Allain J, Le Mouel S, Voiccin M, *et al.* The importance of systematic histological examination after loosening of an implant. *J Bone Joint Surg* 1998;80:591–4.
- 6 Kim Y, Yun Y. Metastasis of lung carcinoma to proximal femur after hip implant. *Orthop Rev* 1986;15:534–9.
- 7 Simon JP, Bellemans J, Samson I. Metastasis from renal cell carcinoma presenting as osteolysis in total hip arthroplasty: a case report. *Acta Orthop Belg* 2008;74:122–4.
- 8 Bonneville P, Bouchet A, Sans N, *et al.* Metastasis on previous hip arthroplasty: three cases. *Chir Orthop Reparatrice Appar Mot* 2005;91:558–63.

- 9 Bali K, Prabhakar S, Krishnan V, *et al*. Hip hemiarthroplasty periprosthetic loosening caused by papillary ovarian carcinoma metastasis in a 78-year-old woman: a rare presentation and a literature review. *Am J Orthop (Belle Mead NJ)* 2012;41:33–6.
- 10 Donohoe KJ, Patton DD. Metastatic non-Hodgkin's lymphoma on bone scintigraphy mimicking loosening or infection of hip prosthesis. *Clin Nucl Med* 1987;12:888–9.

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