Total Hip Replacement pseudotumoral osteolysis

A. Bourghli, T. Fabre, P. Tramond, A. Durandeau

Orthopedic Surgery Department, Pellegrin Hospital, place Amélie-Rabat Léon, 33000 Bordeaux, France
Orthopedic Surgery Department, Robert-Boulin Hospital Center, 112, rue de la Marne, 33505 Libourne, France

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Summary We report three cases of pseudotumoral lesion secondary to total hip replacement using metal on polyethylene bearings, presenting two distinct macroscopic aspects: (a) classic inflammatory granuloma and, in one case, (b) onset of hematoma associated with gluteal vessel lesions, probably affected by the pseudotumoral process. Diagnosis was radiographic, with CT-scan serving to confirm and, more importantly, to reveal extension and analyze surrounding tissue. Arteriography is needed when the lesion is liquid, and biopsy may be envisaged depending upon the clinical situation. In all three cases, histology was typically that of granulomatous lesions related to wear debris. Once diagnosis could be established, treatment was similar in both presentations, with surgical revision, which should be as early as possible in case of cortical bone involvement, to prevent pathologic fracture.

Introduction

Following total hip replacement (THR), polyethylene wear debris triggers a foreign-body reaction [1–3], leading to osteolysis and ultimately to aseptic implant loosening. With large quantities of wear debris, the foreign-body reaction may induce aggressive granulomatous lesions known as pseudotumors [4]. Very fine debris (< 10 μm) induces particularly aggressive lesions, being more easily phagocytized by macrophages [5].

We report the cases of three patients presenting with massive femoral osteolysis following THR.

Observations

Case 1

A 47-year-old man was operated on in 1980 for hip arthritis with associated right hip dysplasia. THR used a 28-mm diameter metal-polyethylene friction-couple cemented implant. After 6 years showing good clinical and X-ray results, the patient was lost to follow-up. He consulted again, 26 years after the THR, for right hip pain and limping. His Postel-Merle d’Aubigné score (PMA) [6] was 9 points. X-ray showed a large ovoid subtrochanteric lesion associated with medial femoral cortex osteolysis (Fig. 1). There was no inflammatory syndrome on biological analysis.

THR revision was undertaken in 2007. Peroperative exploration found a yellowish mass around the medial part of the joint, with liquid of abnormal aspect and necrotic tissue. No
purulent collection was found. The severe osteolysis of the medial femoral cortex was confirmed and several biopsies were performed for bacteriological and histological analysis. It was decided not to complete revision THR in the same step but to fit a polymethyl-methacrylate spacer pending biopsy results, infection being suspected.

The bacteriological cultures proved negative. Histopathology found histiocytes, giant cells and eosinophils, and foreign bodies of undetermined origin. THR revision was performed 2 months after this surgical exploration; the pseudotumor was removed and a non-cemented implant with distal locking stem was inserted. At last follow-up, at 18 months, the PMA score was 15 points.

Case 2

A 76-year-old woman was operated on in 1996 for right hip arthritis, receiving a 22.2-mm diameter metal-polyethylene friction-couple non-cemented implant. Ten years later, she began to have pain again in the right hip. Her PMA score was 8 points. AP X-ray showed very severe lysis of the trochanteric area (Fig. 2). Biological analysis revealed an inflammatory syndrome. CT-scan showed an abnormal large, rounded, clearly contoured aspect facing the medial proximal extremity of the femur, extending to the lateral edge of the ischium (Fig. 3), strongly suggestive of hematoma of unknown origin. Arteriography, performed to rule out active bleeding, found small hemorrhagic suffusions affecting the gluteal branches of the internal iliac artery. Selective microparticle embolization enabled occlusion of the culprit arteries. Immediately following embolization, THR revision was performed. Peroperative exploration found a reddish mass resembling a large hematoma, which was completely removed. Bacteriology was negative. At the last follow-up, 2 years postoperatively, the PMA score was 15 points. X-ray showed no signs of recurrence of osteolysis or of implant component loosening.

Case 3

A 73-year-old man was operated on in 2001 for right hip arthritis, receiving a 22.2-mm diameter metal-polyethylene friction-couple cemented implant. Preoperative X-ray was typical of hip arthritis, showing no other bone lesions. Postoperative course was uneventful until 2009, when the patient began to experience right inguinal pain. The PMA score was 8 points. The patient’s history was seen to include prostatectomy in 1998 for prostate carcinoma, without local recurrence or metastasis on last follow-up. X-ray showed severe acetabular osteolysis, reaching the iliopubic branch (Fig. 4). CT-scan confirmed the severe peri-acetabular osteolysis (Fig. 5). Technetium bone scan found both acetabular...
Figure 4  X-ray, right hip (Case 3), showing acetabular osteolysis (black arrows) extending towards the iliopubic branch.

Figure 5  CT-scan (Case 3) of pelvis, confirming large osteolysis extending from posterior acetabular wall to iliopubic branch (black arrows).

and iliopubic branch and medial and proximal femoral stem hyperfixation. Iliopubic branch biopsy was performed, and histology disclosed fibrous tissue, necrotic debris and histiocytes but no tumor-like cells, and bacteriology was negative. Diagnosis was of pseudotumoral granulomatous reaction to wear debris. Unipolar acetabular revision enabled resection of the granuloma and allograft associated to a support ring and cemented socket. At 3 months, the PMA score was 13 points.

Osteolysis is a commonly reported complication in THR, although tumoral aspects are rarer. Their underlying mechanism remains to be fully described [4,7–9]. The time interval between initial arthroplasty and the first clinical and X-ray signs of pseudotumor varies greatly [4,7,8,10,11]. And all types of implant, in terms of their friction couple, ball diameter or type of fixation, may be concerned [11–15]. We here report three cases of massive pseudotumoral osteolysis in THR, with two different presentations.

To the best of our knowledge, the present is the first report of a granulomatous pseudotumor peroperatively observed as a large hematoma. One case in the literature [10] reported small hemorrhagic areas in a pseudotumor, but with no suggestion of hematoma. We believe that the foreign-body reaction and osteolysis were considerable enough to enable wear debris laden synovial fluid to reach the gluteal vessels, thereby inducing macrophage and granulocyte agglomeration, causing bleeding. Willert et al. [16] confirmed histomorphologically that inflammatory processes induced by foreign-body reaction may cause vascular lesions. An alternative explanation for such a hemorrhagic process could be trauma sustained by a patient with coagulopathy; but in the present case, there was no history either of trauma or of coagulopathy or any other hematologic pathology.

In all three cases, the large osteolytic lesions were seen on X-ray views taken several years after surgery. They were so impressive that a CT-scan was taken in two of the three patients to assess the extension of bone loss and analyze the soft tissue around the joint. In case of revision, when significant polyethylene wear is found on control X-ray, Hisatome et al. [8] advocate a preoperative CT-scan to assess bone loss, which is less visible on standard X-ray, and extension around the joint. In the present Case 2, CT revealed a suspect hematoma aspect, which was confirmed on arteriography. In our view, arteriography plays an important role in preoperative assessment ahead of revision for pseudotumoral loosening, notably enabling diagnosis and possible treatment of secondary vascular lesions induced by extensive inflammation. Although aggressive, we consider arteriography to be indicated when CT-scan reveals hematoma: it prepares the surgeon to encounter an hematic collection which, whatever the revision technique, may require peroperative embolization of the vessels underlying the hemorrhage.

In all three cases, the lesion was associated with a large tumor-like mass extending into the soft tissue around the joint. The first differential diagnosis to eliminate is that of true tumor [17]. Implant infection is also to be considered. Diagnostic (anatomopathologic and bacteriologic) surgical biopsy seems indicated: in the patient with a history of prostate cancer (Case 3), possible metastasis, which would have altered the treatment strategy, could thus be eliminated.

Once the pseudotumoral lesion has been confirmed, revision should be performed promptly in case of cortical bone involvement, to avoid pathologic fracture [10,18]. Surgery may be in a single step if complementary examinations have confirmed diagnosis; in case of doubt as to diagnosis, a two-stage procedure may be adopted.
In practice, when confronted by loosening with a pseudotumoral aspect, CT-scan should be performed as well as X-ray; if it discloses a liquid-like image, arteriography is indicated to rule out the possibility of active bleeding due to vessel lesion around the joint, and possibly for preventive embolization when there is active bleeding. In all cases, preoperative surgical biopsy should be considered to rule out true tumor, especially in case of history of cancer. THR recipients should be followed up regularly to enable any pseudotumor-like loosening to be detected and thus treated in its early stages, avoiding possible pathologic fracture [7—9].

**Conflict of interest statement**

There is no conflict of interest for the clinical report entitled "THR pseudotumoral osteolysis".

**References**


