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Abdominal cyst after early failure of polyethylene liner in total hip arthroplasty

Received: 29 January 2001
Accepted: 3 September 2001

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Abstract We report a case in which the early failure of a polyethylene liner, coupled with a 32-mm CrCo ball head, caused pelvic cyst formation simulating an abdominal mass. The presence of the mass with inguinal swelling lead us to diagnosis liner failure, as shown by radiography. An extraperitoneal cyst surrounding the iliopsoas muscle from the lesser trochanter up to the lumbosacral junction was demonstrated with pre-operative computed tomography and sonography. The cyst contained fluid and many large particles of polyethylene debris. The

liner and the head were substituted and the cyst was removed through a different abdominal approach. We hypothesize that debris falls out and concentrates along the iliopsoas muscle from the very beginning of wear, and then the muscle contraction forces pumped it along the muscle belly. From the histologic point of view, large polyethylene particles were observed in the removed tissue, and no major osteoclastic activation was found.

Key words Abdominal cyst • Total hip arthroplasty • Polyethylene wear

Introduction

Among the complications of total hip arthroplasty, cystic enlargement of iliopsoas bursa is relatively common.

Often this cyst causes vascular compression and swelling.

Polyethylene debris is frequently present resulting from liner wear and subsequent periprosthetic osteolysis is perhaps the effect of osteoclastic activation.

In the reported case neither vascular compression nor swelling were present.

The absence of osteolysis may be due to large size of debris.

Case report

A 72-year-old woman with osteoarthritis of the left hip had a total hip replacement in 1994. We utilized the posterolateral approach and obtained a perfect press-fit positioning of the

cup (ABG hemispherical titanium shell with hydroxyapatite coating, with multiple holes, two anti-rotational spikes, size 50, anti-luxation polyethylene insert), coupled with a cemented polished straight stem (EXETER, size narrow-37.5, polished), and with a 32-mm CrCo ball head, size medium.

The patient's medical history showed no significant disease, other than a sub-clinical infection with hepatitis C virus. Good functional recovery was achieved with surgery and a standard rehabilitation program. At the 3-year post-operative control, radiograms and clinical findings were excellent, with a painless hip function, complete range of motion and normal gait.

Six month later, the patient began to complain of left groin pain on walking and of abdominal discomfort, without any traumatic event. Three months later radiography showed a decreased thickness of the upper portion of the polyethylene (PE) liner. The ball head was not in line with the rotational center of the articulation due to the asymmetrical deterioration of the PE liner. Nevertheless, no osteolysis or radiolucency lines were detectable behind the metal back or around the stem (Fig. 1a,b).



Fig. 1 a Radiographic evidence of the upward shifting of the prosthetic 32-mm head, due to polyethylene wear. **b** No more bone resorption is visible around the components

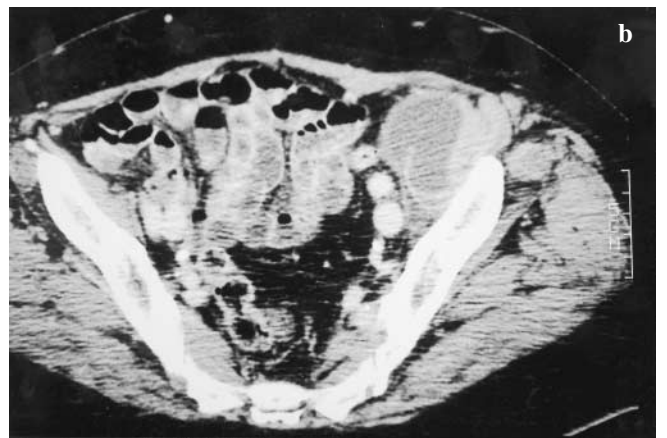
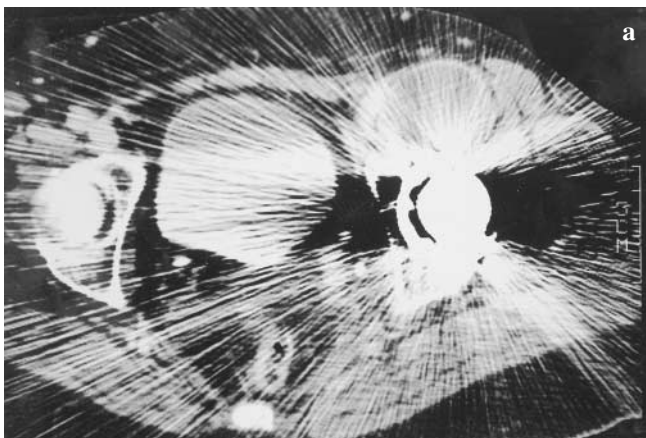


Fig. 2 CT demonstration of the cystic dilatation of the iliopsoas bursa (**a**) dissecting between muscles up to iliac crest (**b**)

The hip's passive range of motion remained complete but the patient limped due to the pain. Furthermore, clinical examination revealed a slightly painful swelling in the inguino-abdominal and inguinocrural regions. The swelling was investigated with computed tomography (CT) and with sonography. In August 1998, CT showed a wide retroperitoneal cystic body 5 cm in diameter,

enveloping the whole iliopsoas muscle along its iliac course from the lesser trochanter up to lumbosacral junction (Fig. 2a,b). With intravenously injected contrast medium, a moderate peripheral enhancement was observed.

The ultrasound examination (September 1998) confirmed the presence of an extraperitoneal cyst with mixed echoic structure; intravenously injected contrast medium

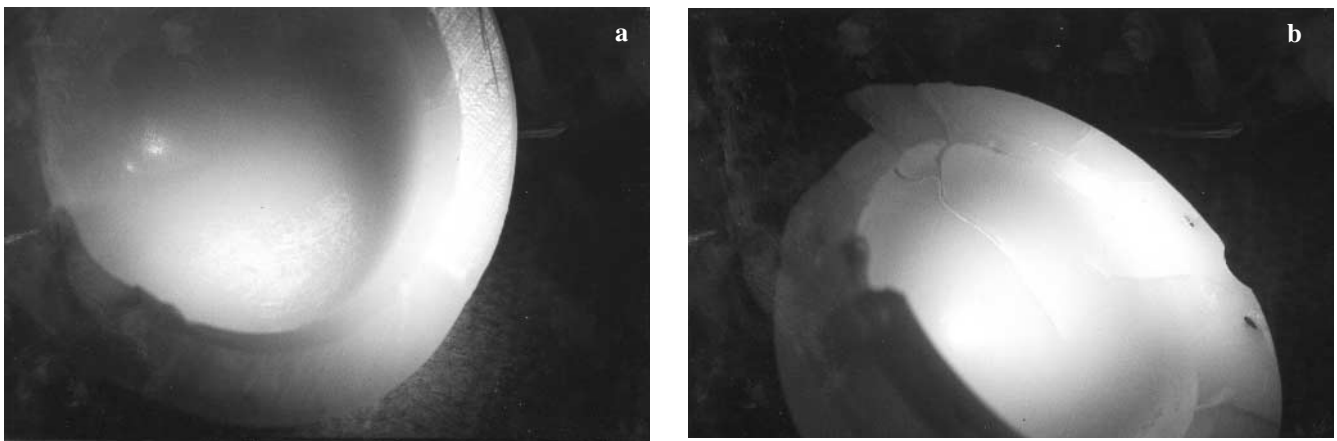


Fig. 3 **a** The huge wear of the liner is evident. **b** Cracks and fissures at the upper rim can be considered signs of a rupture of the liner

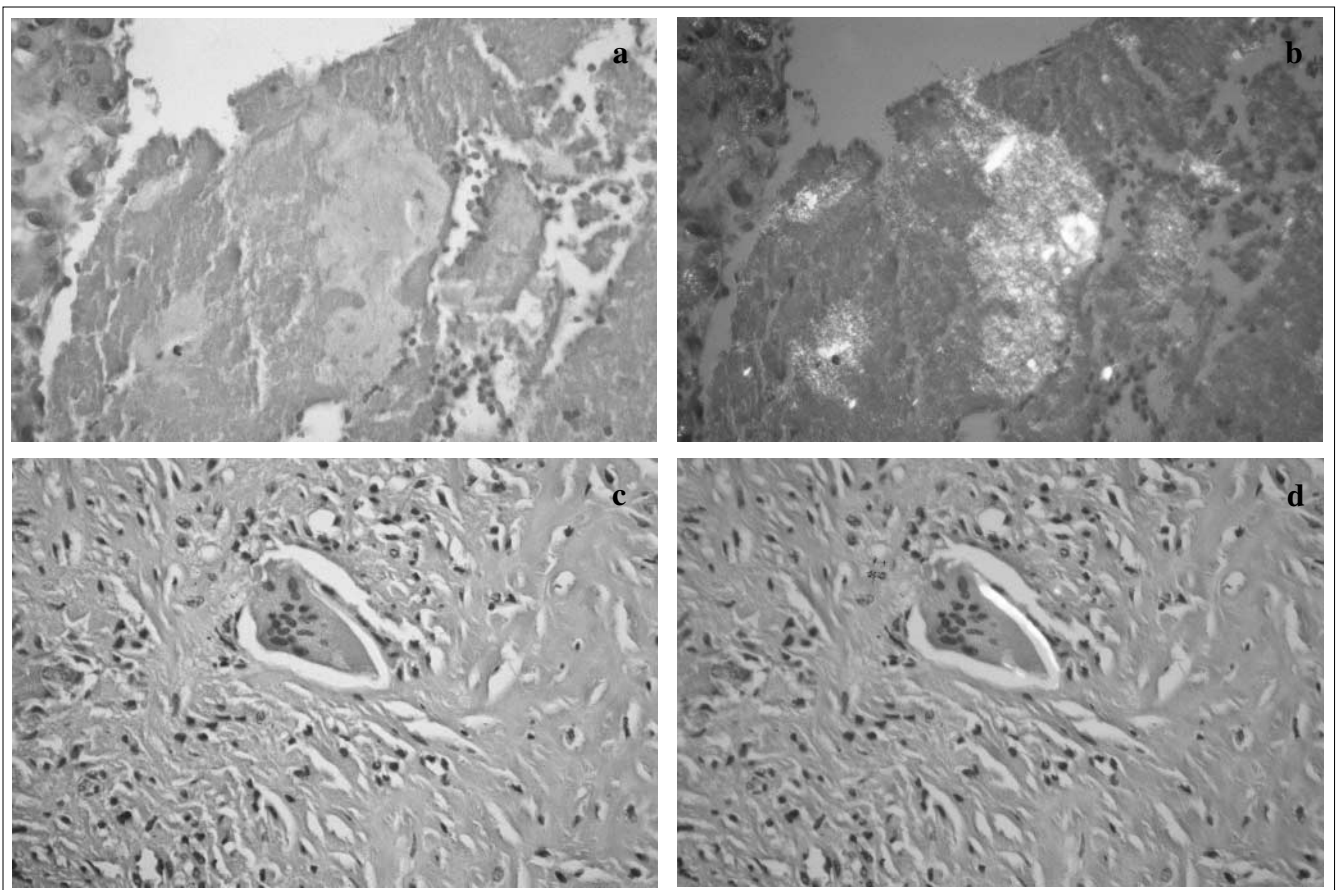


Fig. 4 Polarized light microscopy showed the presence of huge biriffringent debris (**a**, **b**), with the typical needle-like appearance within a macrophage (**c**, **d**)

(Levovist) also showed moderate peripheral vascularization. Under sonographic guidance, the cyst was punctured and 30 ml colloidal, dense material was evacuated. The culture was negative while microscopic observation under polarized light of the fresh unfixed material showed the presence of large birefringent debris.

In October 1998, a two-step surgical revision was performed. In the first phase, with the same posterolateral approach of primary surgery, the hip was dislocated after complete removal of periprosthetic fibroid tissue; the head and the liner were removed. The insert was eccentrically worn out and fractured, and the inner surface was scratched (Fig. 3a,b). The metal back was firmly integrated, and the acetabular bone was inspected with a probe through the holes of the cup once the fibrous membrane filling them was removed; no abnormal softening was detected. The greater trochanter and the calcar showed no absorption around the cement mantle. In the lesser trochanter region, the "cul-de sac" of the cyst was emerging aside the iliopsoas tendon, but care was taken not to damage it, in order to avoid fluid spreading into the wound. A thicker liner and a 28 head were placed, the hip relocated, two drains placed and the wound closed.

In the second phase of the operation, the patient was turned face up, and a retroperitoneal approach with a parainguinal incision at the iliac fossa was performed. Once the abdominal wall was opened, the cyst was exposed, incised and drained, and then smoothly detached and completely excised. Drains were removed 24 hours after surgery and rehabilitation started immediately with full weight-bearing after 48 hours. The cultures of the fluid were also negative this time.

Tissue specimens were fixed in buffered formalin and embedded in paraffin, and sections were stained with hematoxylin-eosin. Histological analyses revealed a synovial-like lining of the cyst wall and large villi with a central blood supply.

Polarized light showed sparse, huge polyethylene debris surrounded by foreign-body granuloma and giant cell formation, and lack of inflammatory cells (Fig. 4). No evidence of metal debris or cement particles was found.

Macroscopic analysis of the liner, performed also with magnifying lenses, confirmed excessive and asymmetrical wear of the PE liner, causing fractures and scratches on the loaded surface. No corresponding macroscopic alteration or scratches on the head were identified.

Two months after surgery, the patient was symptom free and satisfied, with full range of motion, but the glutei muscles were still weak with a slightly positive Trendelenburg's sign. In fact, a few days later the patient was back to the hospital with the left hip dislocated; the luxation occurred during a forced flexion and internal rotation movement (the patient was cutting her toe nails). The hip was relocated, and

a rehabilitation program based on muscular strength improvement was started.

At the 3-year follow-up, the patient is fully satisfied, and no radiographic signs of further wear of the liner are detectable.

Discussion

The formation of a cyst as a complication of total hip arthroplasty (THA) is not uncommon. Yang and Bronson [1] reported the case of a patient who received of THA 4.5 years before presenting with a cystic dilatation of the bursa of the iliopsoas muscle and complaining of swelling and pain of the left lower extremity. The arthrogram showed the cystic cavity in communication with the hip pseudo-capsule, while magnetic resonance imaging (MRI) and phlebography demonstrated the endopelvic mass compressing the external iliac vein. Resolution of the cystic enlargement and edema was obtained with two aspirations of the bursa. De Frang et al. [2] reported the case of a patient presenting 3 years after THA with a painful swelling of the leg caused by compression of the right common femoral vein due to a synovial cyst arising from the hip joint. Aspiration revealed fluid containing polyethylene debris; the inguinal mass was surgically removed. However, one year later the uncemented cup was revised because of liner wear. Van Mourik et al. [3] described an 82-year-old patient with an inguinal synovial cyst causing deep venous thrombosis; the cyst was excised through an inguinal approach and polyethylene debris was demonstrated in the fluid. These findings were significant for secondary hyperplastic reactive synovitis with vascularization typical of inflammatory tissues.

The case presented in this paper is similar to the previously described reports for the inguinal mass with an abdominal expansion consisting of the enlargement of the iliopsoas bursa containing fluid rich in polyethylene debris. However, some peculiarities must be underlined. The iliopsoas bursitis with inguinal and abdominal expansion did not cause vascular compression or swelling. From the radiographic point of view, the polar wear of the liner was clearly evident, with upward shifting of the prosthetic head. There was neither radiographic nor surgical evidence of periprosthetic osteolysis. The problem was solved with a double surgical approach (abdominal and posterolateral of the hip). The liner was thus substituted and the abdominal mass was removed.

A communication between the iliopsoas bursa and the hip joint is present in 15% of normal hips and in about 40% of the osteoarthritic hips [4-6]. The iliopsoas bursa can thus enlarge due to an abnormal synovial fluid pro-

duction or to increased intra-articular pressure. In fact, recent papers showed that the first step of prosthetic mobilization is an increased intra-articular pressure causing osteoblastic necrosis and secondary osteoclastic [4, 5]. The antero-inferior migration of polyethylene debris along the iliopsoas tendon and its penetration in the preexisting or in the newly formed bursa can be caused or favored by a local increase in fluid pressure. This increased pressure may cause the formation of a reactive cystic enlargement; the enlarged bursa can thus penetrate in the pelvis through the inguinal canal due to the high pressure inside the bursa and to the muscular pumping action of the thigh.

The patient we treated showed neither acetabular nor femoral osteolysis. When the liner was changed, the acetabular bone was tested with a probe through every hole of the metal back and no bone softening was found.

The absence of periprosthetic osteolysis may be ascribed to the large size of the polyethylene debris caused by insert cracking and/or rupture. These large particles of

debris promoted a reactive macrophage response with giant cell formation. This is a typical histological pattern in which there is no macrophage cytokine secretion, a key factor in osteoclastic activation. Macrophage and osteoclast activation is observed in presence of PE debris of small size (<4 µm) [6].

On the other hand, according to Aspenberg [8], the high fluid pressure may promote the sudden penetration of a large mass of polyethylene debris in the iliopsoas bursa while it can not enter the bone cement interface due to the good quality of cementation and bone-cement interlocking. In this case the polyethylene wear was clearly evident at the beginning of leg pain with the appearance of inguinal mass: the liner revision was mandatory.

Considering the case reported here and the literature data, when the iliopsoas bursa is enlarged by fluid containing polyethylene debris we suggest changing the liner as soon as possible before bone resorption and loosening of the prosthesis occur.

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