Pseudotumour Complicated by Implant Loosening One Year After revision Ceramic on Metal Total Hip Arthroplasty: A Case Report

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Abstract

Introduction: Pseudotumor is not an uncommon complication after total hip arthroplasty (THA). This can occur in relationship to different bearing surfaces of head and liner ranging from soft to hard articulation. There is wide spectrum of presentation from asymptomatic to implant failure.

Case Report: We report a case of pseudotumor formation with acetabular cup aseptic loosening after revision ceramic on metal hip arthroplasty. The patient underwent pseudotumor excision and re-revision complex arthroplasty procedure using trabecular metal shell and buttress with ceramic on polyethylene THA.

Conclusion: The surgeon should aware of this complication during a presentation in revision cases to prevent rapid progression of cup loosening, and to intervene early to avoid complex arthroplasty procedures.

Keywords: Arthroplasty, ceramics, metals, polyethylene.

Introduction

Pseudotumor is abnormal periprosthetic soft tissue reaction [1] developed in relation to both metal-on-polyethylene total hip arthroplasty (THA) due to polyethylene debris [2] and metal-on-metal (MoM) THA due to metal debris [3,4]. These lesions are non-neoplastic lesions believe to worsen progressively and resulted in both bone and soft tissue extensive destruction [1]. Pseudotumor is increasingly associated to THA with recent studies incidence ranging from 0.27% to 5% [5, 6]. To overcome the adverse issue of metal ion release of MoM, other hard bearings with improved quality were introduced such as ceramic-on-ceramic (CoC) and ceramic-on-metal (CoM) couples to minimize bearing surface wear. CoM have had limited clinical data with short duration of follow-up with high variation in the wear performance [7, 8, 9].

We report a case of pseudotumor formation one year after revision CoM THA. At the time of initial presentation, the patient has mild discomfort with well-fixed implants. The patient underwent pseudotumor formation and rapid aseptic loosening, and managed with complex re-revision arthroplasty with pseudotumor excision. On the basis of clinical findings,
imaging studies, increase serum metal ions, intraoperative findings of metallosis and histopathology, we believed pseudotumor formation in this case of revision CoM THA.

The patient informed consent was taken for the purpose of publication of the case.

**Case Report**

A 50-year-old female, department store salesperson by profession, with idiopathic bilateral avascular necrosis, underwent primary left hip THA in 2003 at an outside institution 3 years before evaluation at our hospital presented with worsening right hip pain. Radiographs demonstrated secondary osteoarthritis right hip for which cementless ceramic on polyethylene (CoP) THA was done. On the left side, there was well functioning THA without evidence of any loosening. Review of operative record identified components as cementless metal-on-polyethylene (MoP) THA on left side. The posterolateral incision at left hip was well healed with no evidence of any infection.

In 2011, the patient started gradual onset of pain in the left hip. Radiographs and computed tomography (CT) scan demonstrated polyethylene wearing with aseptic loosening of both acetabular and femoral components. The patient underwent revision cementless CoM THA left side in 2011 using 54 mm pinnacle acetabular shell, cobalt chromium metal liner, 36 mm Biolox delta ceramic head, S-ROM titanium alloy femoral stem with titanium sintered proximal sleeve (Depuy, Jhonson and Jhonson co., Warsaw, IN). On the acetabular side allo chip bone graft was used for osteolytic lesions, encirclage wiring done for greater trochanter. Intraoperative findings were loosening of femoral stem and acetabular cup along with mild metallosis on acetabulum and femoral side. Postoperative period was eventless with substantial improvement in function. Acetabular cup inclination and anteversion angle were 45° and 20° respectively estimated from plain radiograph. Femoral anteverision was 15° with normal stem alignment. At 6-week follow-up, the patient was made partial weight bearing increasing to full weight bearing with an assistive device and active abduction over a 6-week period.

After 1 year of follow-up in 2012, patient complaint of mild discomfort in the groin in the left inguinal region. On examination soft swelling, non-tender, 2 cm × 3 cm size with no signs of inflammation was present in inguinal region. Radiographs showed normal alignment and position of hip prosthesis with no signs of loosening (Fig. 1a). Ultrasonography suggestive of cystic lesion in iliopsoas area in the left anterior hip (3.76 cm × 3.12 cm × 2.95 cm) suspected to be iliopsoas bursitis. Serum inflammatory markers and complete blood counts were within normal limits. Clinical examination showed a painless normal range of motion at left hip. The patient was kept under observation after refusal for ultrasonography-guided aspiration.

After one month, she complains left groin and thigh pain, limping followed by impaired ambulation in few days. The patient showed an increase in size of iliopsoas cystic lesion. Follow-up radiographs showed signs of acetabular cup superior and lateral migration, increased inclination angle with evidence of loosening and well-fixed femoral stem (Fig. 1b). CT scan showed well circumscribed cystic lesion around the left hip with an expansion of iliopsoas region (Fig. 2). CT scan also showed the superior segmental defect in the acetabulum along with loosening of acetabular cup. Positive radioisotope bone scan indicates acetabular loosening. Serum C-reactive protein was 0.6 mg/Dl, and erythrocyte sedimentation rate was 28 mm/h. Her complete blood count was normal. Serum cobalt and chromium was significantly raised (serum Co = 2.4 µg/L, serum Cr = 22.5 µg/L).

Given the clinical and imaging findings, combined with a history of CoM THA, it was felt that patients symptoms were likely aseptic loosening of acetabular cup with local soft tissue response due to elevated serum metal ions. Surgical exploration with revision THA for loosened implant was discussed with patient. The patient underwent revision surgery using posterolateral approach. The pseudotumor and surrounding inflamed synovitis sac was excised. The cystic soft tissue extended to hip joint was stained with features suggestive of metallosis (Fig. 3). Hip was dislocated and loosened acetabular cup along with cobalt-chromium liner was removed. There is corrosive wear at the metal liner with large “black stripe” across the top of retrieved ceramic femoral head (Fig. 4). The proximal femoral sleeve and the femoral taper showed no corrosion.

![Figure 1](https://example.com/figure1.jpg) (a and b) Anteroposterior radiograph of left hip. (a) 1 year after revision cementless ceramic-on-metal hip arthroplasty demonstrating with well aligned and fixed implants. (b) 1 month after the initial presentation of mild discomfort, radiograph showed acetabular cup superior and lateral migration with well-fixed femoral stem.

![Figure 2](https://example.com/figure2.jpg) The axial computed tomography scan of both hips shows space occupying lesion in iliopsoas region in communication with left hip joint (arrow).
or wear. The femoral stem with proximal sleeve was well fixed with no evidence of corrosion.

The intraoperative frozen section of mass showed less than 5 polymorphonuclear leukocytes per high-power field in all the three specimens. Intraoperative dark gray colored fluid analysis was done with 58% polymorphonuclear, 39% lymphocytic, and 3% mononuclear cells. After aggressive debridement of metallic and necrotic tissue, acetabular cavitary defects were filled with mixed autogenous bone graft and allograft bone chips. On the acetabular side, the patient was revised with 52 mm trabecular metal shell (52 mm) with metal buttress (Fig. 5) to address the superior bone defect (zimmer, warsaw, Indiana, USA). Highly cross-linked polyethylene liner was applied with 32 mm biolox delta ceramic femoral head (Depuy, Jhonson and Jhonson co., Warsaw, IN).

Operative cultures for soft tissue and fluid were both negative for infection. Histopathology was consistent with metallosis. For each tissue fragment, sections were routinely stained with hematoxylin and eosin and examined with light microscopy. On microscopic examination, the inner surface covered with eosinophilic fibrinoid material with local fibrotic tissue. The histopathology analysis supports morphology consistent with the metallosis as an inflammatory response to metal particles. It revealed abundant lymphocytes, histiocytes, occasional plasma cells, foreign body type giant cells, and black metal particles (Fig. 6a-d).

After 6 weeks of partial weight bearing, the patient was fully mobilized with full weight bearing over 6-week period. At 6 month repeat serum metal ion analysis showed decrease level with cobalt and chromium levels of 1.3, 2.54 µg/L, respectively. The recent cobalt and chromium measurements were 0.66 and 0.42 µg/L, respectively. The patient with continued improvements in function with full weight bearing walking at last follow-up with Harris hip score of 87 compared with 58 preoperatively.

Discussion

The use of MoM bearing is associated with elevated levels of serum metal ions [3, 10] with local effects (metallosis and local soft tissue reaction) [6] and systemic effects [11]. The use of MoM articulations has decreased, and other hard on hard bearings such as CoC and CoM have been increasingly used. Although CoC is associated with low wear rates but breakage and squeaking are still a concern. The in vitro studies showed reduce in wear in CoM bearing surface [12, 13]. At the same time, there is difference in literature between wear and metal ion release in CoM with limited clinical
data [8, 9, 14]. Few reports showed relation between head-neck, modular neck, and stem-sleeve corrosion with the increased incidence of metal hypersensitivity reactions [15, 16]. Patient-related factors like female [17] and surgeon-related factors like suboptimal component positioning [18] more often involved in the pseudotumor. However, all the three hard bearing (CoC, CoM, MoM) showed increased wear with edge loading. CoM bearings demonstrated lower wear compared with MoM [12].

Two case reports describe the pseudotumor formation around the CoM bearing after primary arthroplasty with abnormal acetabular cup positioning [19, 20]. To best of our knowledge, our case report is first to describe pseudotumor formation with rapid loosening, after well aligned and positioned revision CoM THA; and managed with complex re-revision arthroplasty. Initial presentation of symptoms in our case occurred one year after the revision surgery. This duration is short in comparison to soft tissue reaction in MoP bearing ranging from 3 to 26 years [21]. However, we observed excessive acetabular inclination, superior and lateral migration of cup, and loosening correlated with the increase symptoms of pain and increase of soft tissue swelling in inguinal region. We observed superior acetabular segmental defect in CT scan. The initiating factor in our case would be pseudotumor followed by rapid loosening. After loosening there was an increase in edge loading. The symptoms increase rapidly followed by increased in size of pseudotumor indicating vicious cycle of rapid loosening and metallosis.

In the management of pseudotumor, non-metal bearing is indicated during revision surgery [5] and we revised our case with CoP. But still, the presence of modular titanium alloy stem with sleeve, porous trabecular metal shell and metal buttress [22], patient with the serum metal ions need close follow-up. This CoM bearing needs to be studied more thoroughly and testing with emphasis on design and material of the bearing surface. The clinical data with component position and serum metals level in the long-term follow-up are necessary.

Conclusion

Pseudotumor is not an uncommon complication after THA. This can occur in relationship to different bearing surfaces of head and liner. Treating physician should be aware of this condition so that prompt diagnosis and treatment can be carried out. Patients with index revision surgery due to aseptic loosening may require subsequent re-revision due to loosening. Loosening in such cases will increase edge loading, hence more severe metallosis and rapid loosening requiring complex arthroplasty procedure.

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