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Osteoarticular Repair with Bone Cement for Advanced Pigmented Villonodular Synovitis of the Hip; A Temporizing and Yet Durable Reconstruction

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Abstract

Hip joint involvement by Pigmented villonodular synovitis (PVNS) is uncommon, and it usually presents as diffuse articular involvement with extensive joint destruction. Total hip arthroplasty (THA) reconstruction have risk including dislocation, loosening, infection and difficult surveillance of local recurrent with MRI and CT. We report herein the case of a patient who underwent osteoarticular repair of the hip joint with bone cement for advanced PVNS.

The osteoarticular repair with bone cement is a reasonable reconstructive option and temporizing management before THA in the advanced PVNS of the hip joint.

Keywords

osteoarticular repair; bone cement; bone tumor; pigmented villonodular synovitis; hip joint

Introduction

Pigmented villonodular synovitis (PVNS) is a proliferative pathology of the synovial membrane with a locally aggressive pattern that mainly affects the knee joint [1]. Hip joint involvement by PVNS is uncommon, and it usually presents as diffuse articular involvement with extensive joint destruction [2-4]. Total hip arthroplasty (THA) has been the treatment of choice over curettage and bone graft after total synovectomy that has caused osteoarthritis in the hip joint [2-4]. However, THA may have a poorer outcome in young patients with high functional demands, risk of joint dislocation and destiny of revision surgery by aseptic loosening. High local recurrence rates have been reported [5-7], but the surveillance of recurrence may be impossible by magnetic resonance imaging (MRI) or computed tomography (CT) in THA. There was a case of PVNS associated with bony erosion in the adjustment knee joint which was treated by the use of polymethylmetacrylate (PMMA) [8]. Bone cement filling for giant cell tumor and metastatic cancer in the femoral head and neck is also introduced [9-10]. We report herein the case of a patient who underwent osteoarticular repair of the hip joint with bone cement for advanced PVNS.

Case Presentation

A 57-year-old woman was referred with a six month history of dull pain and a palpable mass in the left proximal thigh and inguinal area. There were intermittent neurologic symptoms including radiating pain to the calf at while standing or walking for a long time, but there were no systemic symptoms such as

fever or weight loss. X-ray revealed osteolytic lesions at the left femoral head and neck, and acetabulum on the plain radiographs (Fig. 1). A CT scan revealed multiple osteolytic lesions at the acetabulum, femoral head and femoral neck (Fig. 2). MRI showed that a large encapsulated lobular soft tissue mass surrounding the hip joint and encroaching upon the femoral vessel anteriorly and the sciatic nerve posteriorly. This mass interdigitated with the adductor muscles and invaded osteoarticular bone, even beyond the medial acetabular wall (Fig. 3). Multiple focal low-signal intensity areas in the soft tissue mass and intraosseous lesions were seen on both T1 and T2-weighted spin echo images.

We performed a percutaneous gun-biopsy and confirmed the diagnosis of PVNS. The imaging studies indicated that it would be difficult to save the joint due to extensive joint destruction. Furthermore, the acetabular osteolytic area was large and would require a large quantity of bone graft even if total hip arthroplasty were to be employed.

There was concern that the risk of local recurrence, either with or without total hip arthroplasty, would be quite high, given the extent of disease. Monitoring for recurrence of disease with MRI would best be accomplished if there were no metal in the joint that would induce metallic artifact on MRI and CT scans. Therefore, we decided to perform the joint salvage surgery instead of THA with acetabular bone graft as a meaning of temporary reconstruction.

After making an ilio-femoral incision, the hip joint was exposed by detaching the quadriceps and gluteus muscles from the iliac bone and removed the intramuscular soft tissue mass. The joint was dislocated after making a T-shaped joint capsular incision. The main osteolysis was detected at the acetabular fossa and femoral head for the round ligament (Fig. 3). Extensive synovectomy with partial capsulectomy was performed. The curettage and burring of osteolytic sites were performed under fluoroscopic guidance. Because the integrity of the cortical bone of the femur neck may have been compromised and weakened by multiple focal bony erosions, it was fixed with two 6.5-mm cannulated screws. The main osteochondral defects were filled with PMMA bone cement (Depuy International ltd, Blackpool, UK). A round rubber irrigater bulb was cut transversely midway through its height, and the hemisphere was used to make the cement mantle with concave and convex surfaces for the acetabular and femoral head to reproduce the curvature of their articular surface (Fig. 4). Multiple femoral neck osteolytic foci were also filled with bone cement and irrigated with cold water at the time of cement hardening to reduce thermal damage to cartilage. After capsular repair, the tendons and gluteus muscles were sutured to the ilium after making several bone holes.

Wheel chair ambulation was possible 1 week postoperatively, and two-crutch ambulation was started 1 month with non weight bearing. Partial weight bearing was started 6 weeks, and use of 1-crutch ambulation was started 3 months postoperatively. She began swimming 3 months after operation and could walk unaided at 6 months follow-up. At every year's follow-up, the patient showed no evidence of recurrence and gained a complete range of hip joint motion. Follow-up radiographs demonstrated well seated bone cement (Figs. 5 and 6). Although there was a slight joint space narrowing at 8-years follow-up, she was symptom-free, could walk without limp and had no restriction in her daily life activities.

Discussion

Although the pathogenesis of the bony lesions of PVNS has not yet been established, one theory is that it is the result of increased intra-articular pressure on the cartilage and underlying bone due to

effusion and synovial hypertrophy. This may explain why bony lesions are seen earlier and more frequently in the hip joint which has a tight capsule and ligaments without any synovial recesses [11,12]. Namazi has reported that bony erosion are induced by multinucleated giant cells in PVNS which express all the phenotypical features of osteoclasts [13]. Consequently, bisphosphonates might be considered as an adjuvant therapy for advanced PVNS.

In our case, the major osteolysis of the femoral head occurred at the attachment site of round ligament which was covered with synovial membrane. The acetabular fossa which was also covered with synovial membrane was another major osteolytic area. In our patient and other reported cases, the most prominent regions of bone resorption related to contact areas of synovial membrane on bone rather than articular cartilage.

For the treatment of PVNS associated with bone erosion, numerous joint-preserving methods have been proposed: radiotherapy [14], synoviorthesis with intra-articular radioactive materials [15], curettage [16], bone graft [17] and PMMA repair [18].

However, PVNS in the hip joint usually presents with diffuse articular involvement and extensive joint destruction. Thus, the most common treatment of late-stage disease has been total hip arthroplasty[2-4,11]. Moreover, even if complete synovectomy is successful in preventing recurrence, it may not prevent the development of secondary osteoarthritis. In the current case, the attempt of joint conservative surgery was able to perform without much worry of replacing the joint cartilage with bone cement because osteolytic lesons usually occurred at the non-weight bearing articular surface where synovial membrane was.

The previously published experience with THA for PVNS has not been uniformly favorable. Gonzalez Della Valle et al. [2] reported that 2 of the 3 patients who underwent cemented THA for the treatment of PVNS subsequently required revision surgery because of aseptic loosening. Yoo et al. [4] observed osteolysis in 4 of 8 patients undergoing cementless THA, and revision surgeries were performed in 2 of these patients. When osteolytic lesions are detected during the follow-up period after THA, it is difficult to distinguish between recurrent disease and aseptic loosening. Moreover, MRI or CT is frequently not helpful in patients with prosthesis insertion because of metallic artifacts. Bone cement does not interfere with MRI or CT, so it facilitates surveillance of local recurrence in patients at high risk for recurrence. Ares-Rodriquez et al. [8] reported 1 case of PVNS which was treated with PMMA for an osteolytic lesion of the medial condyle of the distal femur. These authors demonstrated good seating of bone cement and normal knee joint function without any complication. Kaneko et al. [18] demonstrated the potential for percutaneous repair of the femoral head and neck with bone cement in a cadaveric model. Recently, Kang et al. [10] introduced a new surgical treatment modality, percutaneous fixation of hollow perforated screws and bone cement injection for metastatic femoral head and neck diseases.

There have been some reports of long-term follow-up cases without joint replacement surgery after subchondral cementation for giant cell tumors [19]. Based on the results, we felt that PMMA might be also applicable to the articular surface and potentially useful as temporary reconstruction. Such a strategy might be particularly applicable to young patients who would benefit from delayed total hip replacement. Preserved articular cartilage and cortex can be good barriers against diffuse scattering of recurrent locally aggressive tumors. Furthermore, preservation of the native joint can provide better

joint stability in terms of dislocation compared to arthroplasty. Finally, conversion to THA can be easily accomplished at any time in the future if necessary. Although it is unclear how long this reconstruction may last without symptomatic osteoarthritis, our long-term results are encouraging and provide some clinically useful observations. While our patient may require THA in the future, it will be reassuring to know that the risk of recurrence will be low at that time, and perhaps this may improve the longevity of the implant. Therefore, we believe that osteoarticular repair with bone cement is a reasonable reconstructive option and temporizing measure in the management of advanced PVNS of the hip joint.

Figures

Figure 1: Anteroposterior radiograph of a left hip demonstrates multiple osteolytic lesions in the femoral head and acetabulum

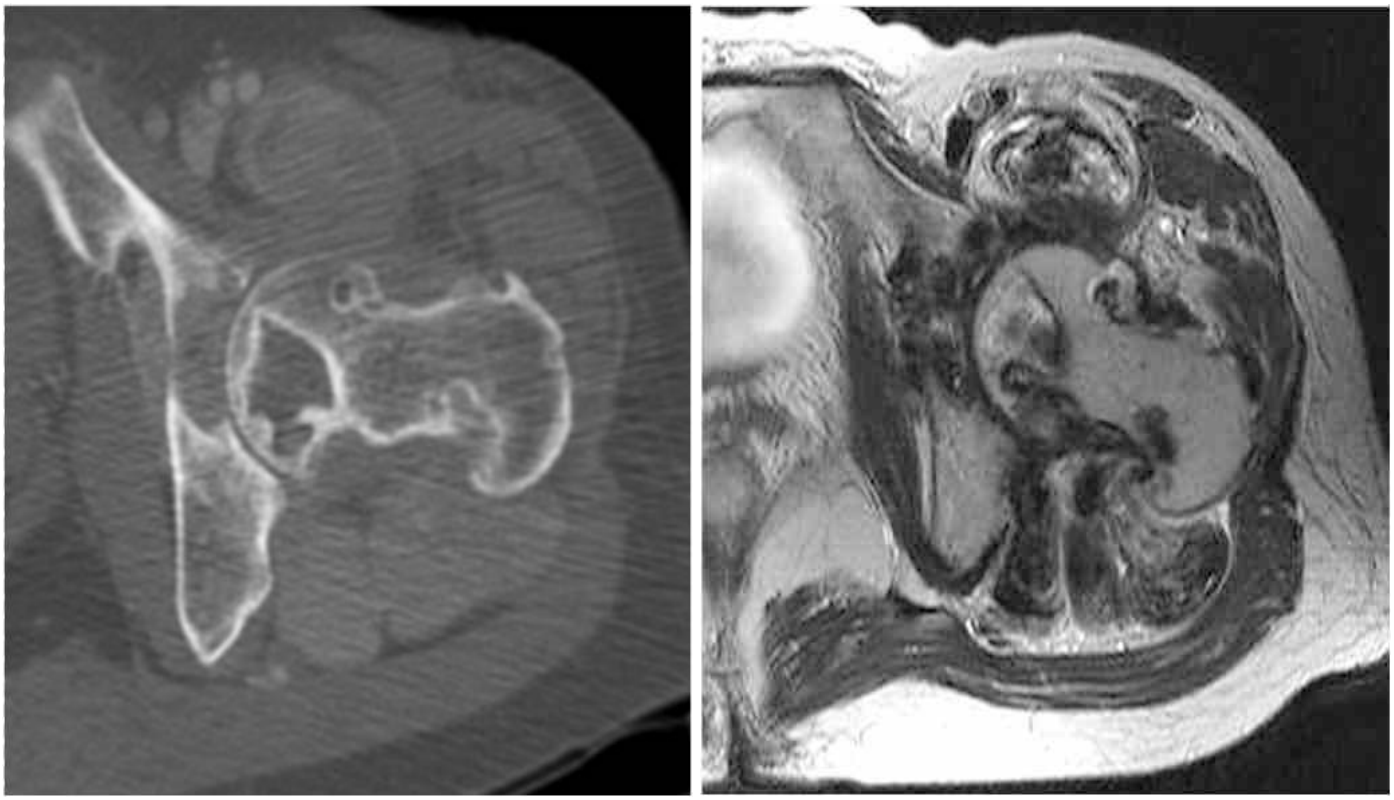

Figure 2: (a) Computed tomography shows a massive destructive bony lesion of the hip joint. (b) Axial T2-weighted magnetic resonance image demonstrates a lobular mass encroaching on the major neurovascular structures and invading beyond the medial wall of the acetabulum

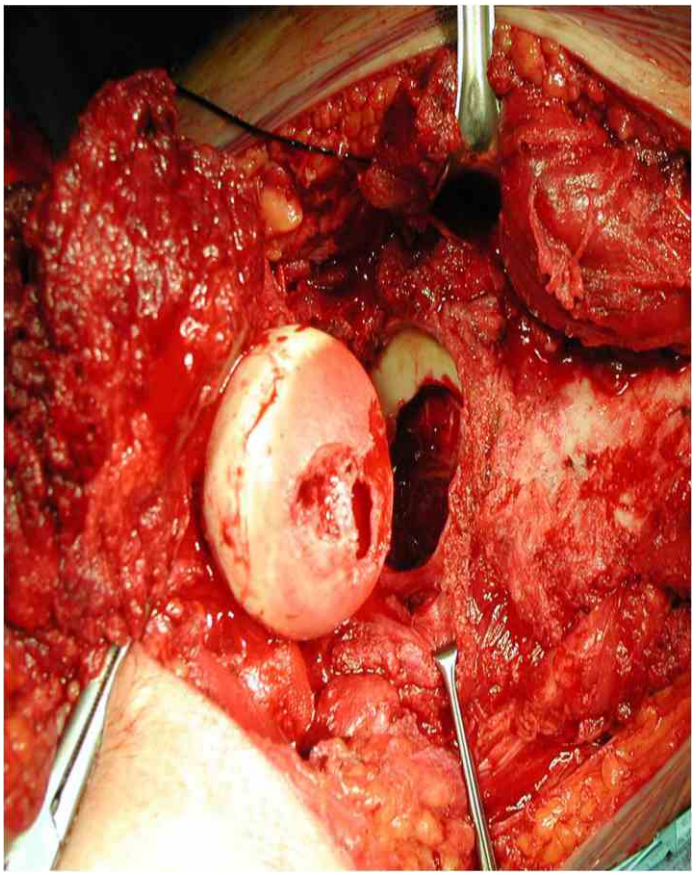

Figure 3: Photograph taken intraoperatively shows a large osteochondral defect at the femoral head and acetabulum

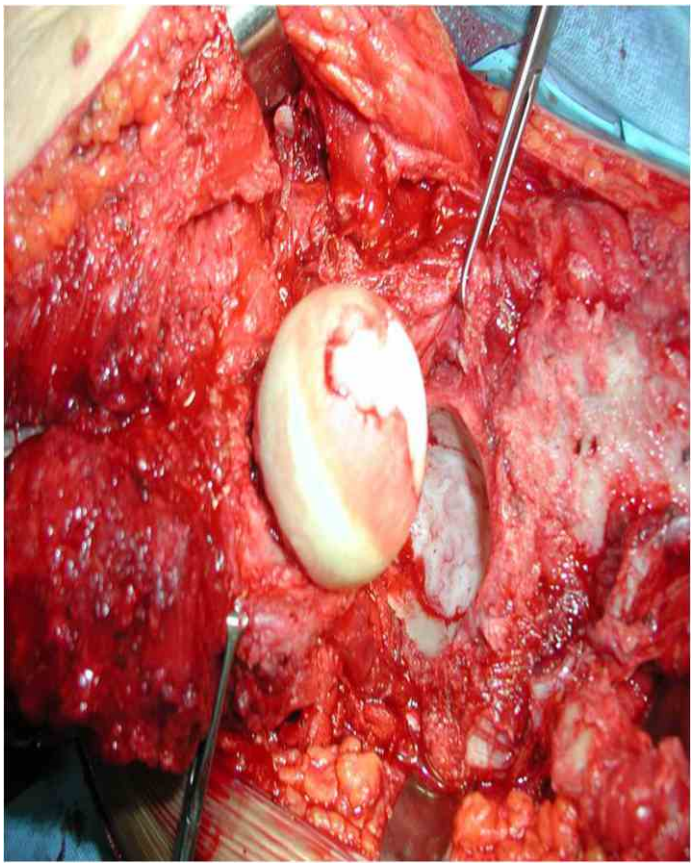

Figure 4: Intraoperative photograph shows well-contoured cement mantles

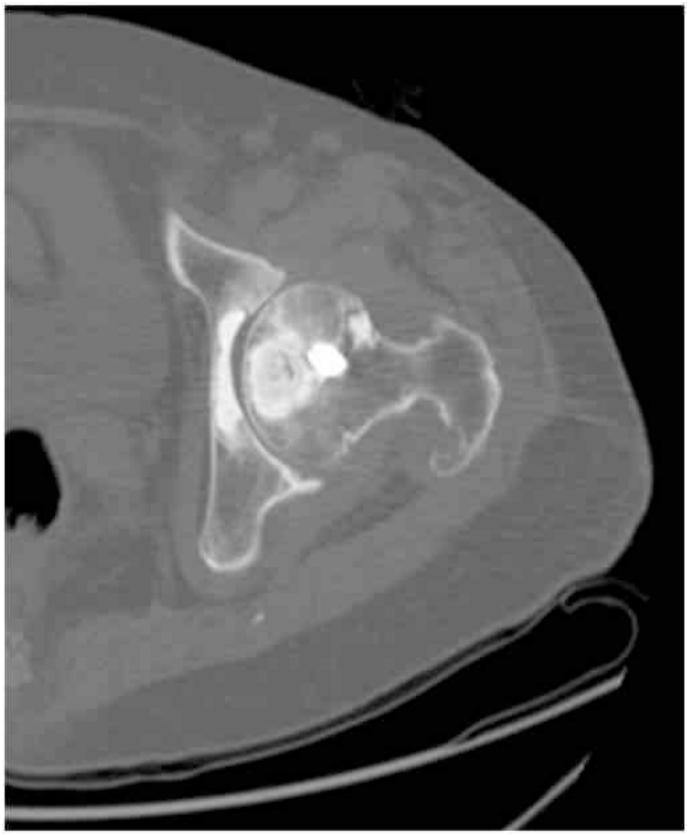

Figure 5: Post operative hip radiograph (a) and computed tomogram (b) shows filling of bone cement in the bony destructive area

Figure 6: Standing hip radiograph taken 5 years after operation reveals a slight narrowing of the joint space

Figure 7: Anterior-posterior standing hip radiograph (a) and anterior-posterior frog leg hip radiograph (b) taken 8 years after operation shows good maintenance of the cement mantles without further joint space narrowing

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