

C A S E R E P O R T

Hip joint osteochondroma treated with short stem total hip arthroplasty: A case report

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Abstract. The purpose of this report is to present the clinical and radiological findings of a young patient affected by proximal femoral and acetabular osteochondroma. This benign primary tumor of the long bones occurs in childhood and is localized in the proximal femur only with low incidence. As far as we know, there are only 30 other cases in the literature of an osteochondroma involving the entire hip joint. Out of these 30, only 17 patients were treated with lesion excision and joint replacement. However this is the first patient treated with a short stem total hip replacement. The innovative short stems allow the bone saving of the proximal femur, a necessary condition to have a good bone stock in the event of a future prosthetic revision in a highly demanding young patient. Preoperative planning and specific rehabilitation are mandatory to achieve good outcomes. (www.actabiomedica.it)

Key words: bone tumor; high demand patient; THA; hip replacement; secondary arthritis

Introduction

Osteochondromas, also known as cartilaginous exostoses, are benign primary tumors of the long bones and represent the most common benign bone tumor in the human population (1). There are no definite data on their prevalence rate as they are usually clinically silent and therefore often incidentally diagnosed (2). Osteochondroma typically arises in childhood and predominantly localizes in the metaphyses of the long bones: distal femur, proximal tibia, proximal humerus, and fibula. Often from the bone metaphysis it develops along the diaphysis (1, 2).

With a lower incidence, osteochondroma can also localize at the level of the proximal femur, with different symptomatology depending on its lateral or

medial location. Lesions growing in the lateral part of the femur usually cause pain or discomfort mainly determined by mass effect, compression of the surrounding muscles, vessels, and skin, causing impatience to palpation in the lateral region, limitation to the range of motion by impingement, bursitis, and cosmetic complaints. Lesions of the medial proximal femur and acetabulum are less common and may alter the normal anatomy of the hip, causing coxa valga, acetabular dysplasia, and subluxation or dislocation of the joint (3). These deformities can eventually lead to secondary osteoarthritis and chronically worsen the patient's social and psychological well-being and functional abilities (3, 4). Most often, osteochondromas developing in contiguity with the growth cartilage result in asymmetrical growth and subsequent limb deformity.

The most common mechanical alterations of the lower limbs include heterometry and valgus deformities of the knee, ankle, and proximal femur (4-6).

Hereby we report the case of a patient with hip osteochondroma treated with joint replacement with a short hip stem. To our knowledge, there are only 17 similar cases reported in the Literature (4-10).

Case report

A thirty-eight-year-old physiotherapist in good general health, with a BMI of 24, reports continuous pain in the right hip with functional limitation of the joint and consequently of the entire lower limb. In childhood, he had undergone surgical excision of right subtalar chondromatosis, with no further clinical or laboratory details available in his medical history. Since then, he has had a residual deformity of his right ankle and foot with a concomitantly hallux valgus (Figure 1a).

Clinical examination

At the clinical evaluation, we observed a Trendelenburg gait, 2 cm. shortening and muscular hypotrophy of the right lower limb presenting with outwardly rotated attitude.

A positive Faber Test and a positive Log Roll Test with a maximum of 70° of hip flexion were seen. The Faber Test is performed by having the tested leg flexed and the thigh abducted and externally rotated. If pain is elicited on the ipsilateral side anteriorly, it is suggestive of a hip joint disorder on the same side. The Log Roll Test is performed with the hip and knee extended on the patient in a supine position. The examiner places one hand at the mid-thigh and the other at the calf, rotating passively the entire leg and hip both internally and externally: pain, clicking or popping suggest hip pathology.

Radiological examination

Pelvic X-ray showed advanced deformity of the right hip joint with hypoplasia and deformity of the femoral head, which appears partially dislocated from

the dysplastic acetabulum. Furthermore, the imaging findings show a sessile mass in the peritrochanteric, pericervical and periacetabular regions (Figure 1b). An in-depth examination with a CT scan was carried out to better plan the surgery by understanding the three-dimensionality of the dysplasia and sessile mass. It showed a large retroacetabular osteolytic area (Figure 1 c,d).

Based on clinical and imaging evaluation, we diagnosed hip osteoarthritis secondary to osteochondroma, to be confirmed by histological examination. Considering the advanced secondary arthritis (Tönnis classification grade 3) (11) informed written consent was taken to eradicate the growing mass and to replace the hip joint with arthroplasty, to ensure pain relief, a good range of motion and improve quality of life.

All procedures were performed according to the Declaration of Helsinki and further informed consent for performing photos for scientific reporting purposes based on current legislation was also collected.

Pre-operative planning

The surgical approach and prosthetic implant options must be carefully planned in this demanding case. Indeed, the risk of further prosthetic revision is very high in young patients due to presumably highly rate of wear to due to the high functional demand (12,13).

For this reason, bone saving is mandatory to have as much bone stock as possible in case of a new future revision. Its management should be considered especially in cases with acetabular bone defects (14,15). The revision surgery of traditional femoral stems is invasive and requires a significantly sacrifice of residual bone stock, while the more recent short stems are less invasive allowing more bone to be preserved for future revisions, with clear advantages and benefits for the patient and for the surgeon (14, 16). After careful planning, a MINIMA® short stem (Lima Corporate, Udine, Italy) was chosen. It is a primary uncemented curved short stem with metaphyseal fixation and a round-of-the-corner insertion technique. For the acetabular component, the choice fell on the DELTA TT® cementless hemispherical acetabular cup manufactured in Trabecular Titanium (Lima Corporate, Udine, Italy). Its peculiar design may provide



Figure 1. *a, b, c, d:* On physical examination the patient shows an external rotation deformity and a noticeable shortening of the lower right limb with valgus knee and ankle (a). The 45° Dunn views of the pelvis show advanced secondary osteoarthritis of the right hip (b). The CT scan examination confirms coxa valga, acetabular dysplasia, and subluxation of the femoral head. Moreover, it shows broad bone resorption in the retroacetabular area which missed the diagnosis on the previous radiographic examination (c, d).

for optional bone screws to support stability in case of insufficient bone. Additional Trabecular Metal Augments were available in the operating room for to manage of the possible intraoperative bone loss of the

acetabulum, given the large retroacetabular osteolytic lesion.

Surgical procedure

A posterior approach with the patient in a lateral decubitus position was performed. After a sharp dissection of the fascia lata and gluteal muscle at the greater trochanter over the trochanteric bursa, an approximately 6 cm whitish mass was observed (Figure 2 a,b). We removed all the bone needed to reach deep planes and achieve enough range of motion to allow hip dislocation. Then, flexing the hip and internally rotating the femur the short external rotator tendinous insertions were exposed while the sciatic nerve was respected but not displayed. A blunt dissection of the tendon attachments was performed to retract the short external rotators. One suture was placed in the piriformis tendon and another in the conjoined tendons (obturator internus and gemelli) for subsequent reattachment to the great trochanter as described by Pellicci (17).

Once the hip capsule was exposed, a T-shaped capsulotomy was performed and the challenging dislocation was achieved. The femoral head appeared completely deformed and hypoplastic, with reactive osteophytes and cartilage surface irregularities. In addition, a further medial mass around the anatomical neck of the femur was appreciated. Massive excision of excess tissue was performed until recognizable anatomy was obtained to perform the femoral neck osteotomy. The acetabular fundus was occupied by osteocartilaginous exostosis which circumferentially

involved even the labrum. The periacetabular mass was removed and together with three femoral specimens was sent for histological and cytological examination.

Thus, the joint arthroplasty proceeded with no special notes of technique compared to a classic first implant. Adequate acetabular mechanical stability was achieved with 50mm. cup diameter and 36 long ceramic head (CeramTec, Bergamo, Italy) coupled with a high offset short stem. No complications related to osteolysis of the fundus were reported, therefore a Trabecular Metal Augment was not needed. The final components used were MINIMA® S stem size 8, 36mm ceramic head with acetabular spacer and DELTA TT® cup. After joint reduction, hip stability and range of motion were fully satisfactory. No drainage was used. In addition to improve intraoperatively hemostasis, 3 vials of Tranexamic Acid 1g iv (at anesthesia induction, mid-operatively, and 4 hours after the end of the procedure) plus one further local intraarticular vial after fascial suturing were used. The *Enhanced Recovery After Surgery* (ERAS) protocol was applied for pain control and relief (protocol detail in appendix).

Histological examination results

Histologic findings of both peritrochanteric fragments and acetabular fundus confirm the diagnosis of osteochondroma, characterized by extremely

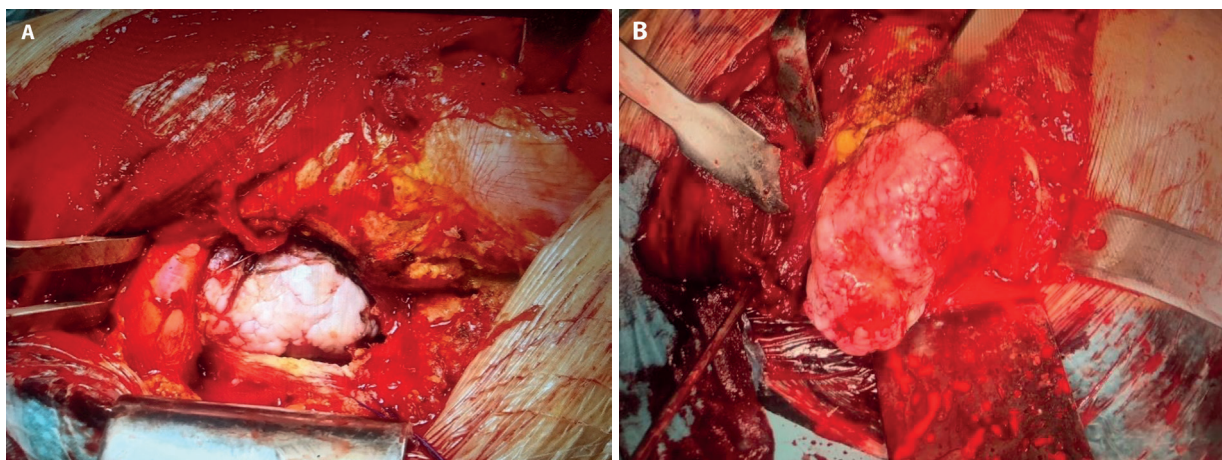


Figure 2. a, b: An approximately 6 cm translucent, whitish mass had grown lateral to the greater trochanter and was surgically removed with Luer and Bone Chisel.

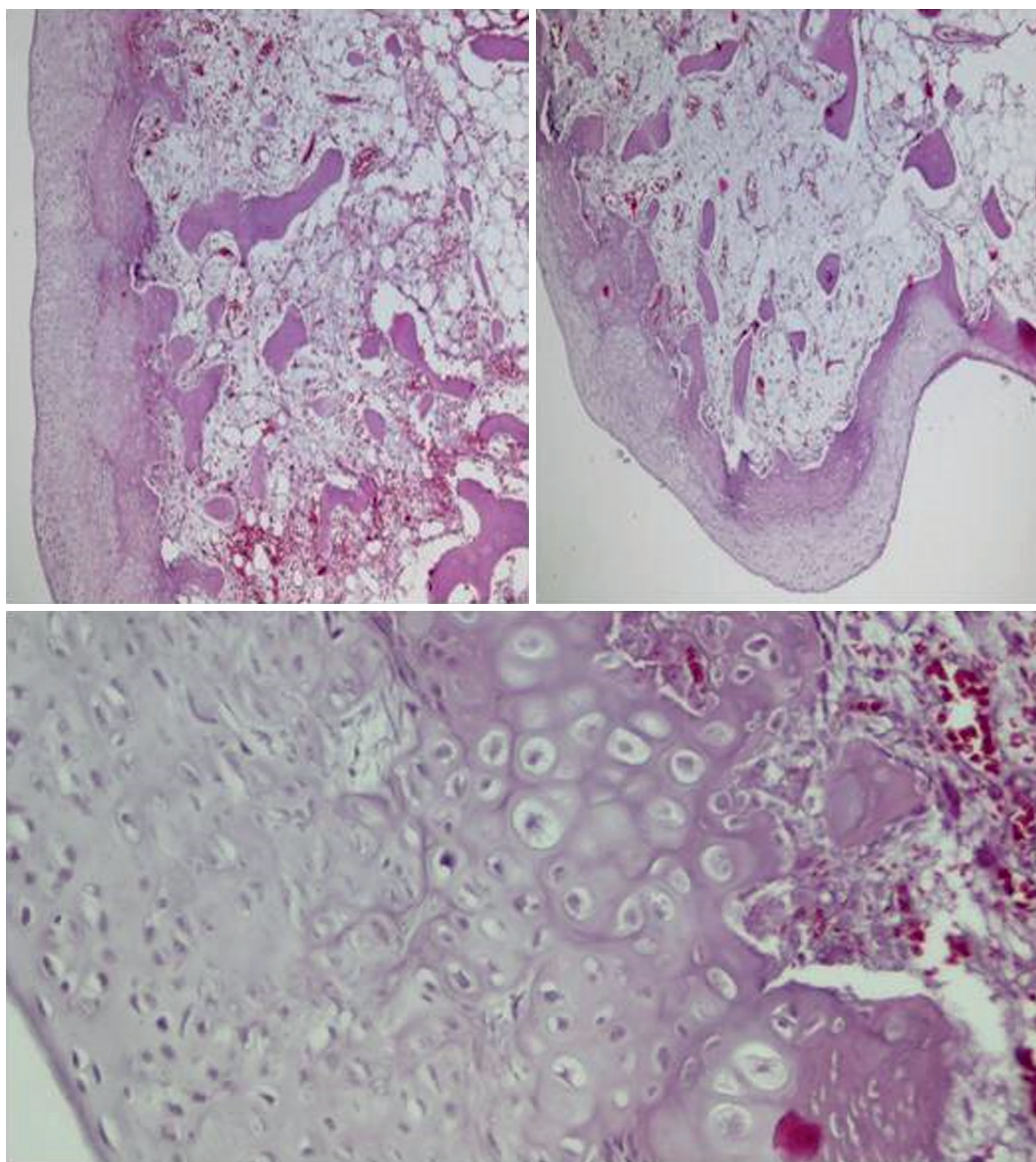


Figure 3. Laboratory findings confirm the benign form of the tumor: osteochondroma involved both the femur and the acetabulum

thinned bone spicules with adipose bone marrow and the presence of a cartilaginous cap varying in thickness between 0.5 mm and 1.5 mm. No cellular atypia nor histological differences in the different examined specimens were found (Figure 3).

Follow-up

The postoperative period was free of complications. Application of the ERAS protocol resulted in optimal postoperative pain management, with extreme patient satisfaction. The patient was discharged in good general and local clinical conditions on the 7th postoperative day with independent ambulation using two Canadian crutches and weight bearing as tolerated.



Figure 4. The radiographic examination confirmed the good positioning of the prosthetic implant, with good joint geometry and adequate osseointegration. Clinically, the recovery of the eumetry of the lower limbs allowed a gait without the limp.

Clinical and radiographic controls were performed at 3, 6 and 12 months and then annually.

At the last 2-year follow-up, the patient showed recovery of the right lower extremity length, walking without limping and a nearly full range of motion (Figure 4). In this particular case, the young age and professional background of the patient (physiotherapist) could have played an additional contribution to an optimal functional recovery.

Discussion

The main learning point of this report is that an osteochondroma resulting in secondary hip arthritis can be properly treated with a total joint replacement even in a young patient. Osteochondromas can present as solitary lesions in the proximal femur, whereas only a few studies in the literature have described the occurrence of osteochondromas in the acetabulum (3). The histological examination of the specimens confirmed our preoperative diagnosis, both for the proximal femur and for the acetabulum. Our intuition was

based on the subluxation of the hip visible on X-ray, interpreting it as due to the slow growth of a potential osteochondroma of the acetabular fundus affecting head development and resulting in coxa valga deformity and acetabular dysplasia. Serial follow-ups with X-Ray have been suggested in a previous study (3), but if surgery is a concrete option, we suggest to perform CT scan. In fact, in our experience, the execution of a CT scan of the pelvis allowed to identify a large retroacetabular osteolytic area which necessarily conditioned the choice of the implant. A thorough preoperative planning is even more useful when the natural anatomical architecture is disrupted by a neoplastic mass altering not only the anatomical landmarks but also the quality of the bone stock (18). It was therefore necessary to have an acetabular system with titanium trabecular augments available in the operating room to be used in case of necessity for insufficient acetabular seal and coverage. Furthermore, the choice of surgical access should take into account not only the familiarity of the orthopedic surgeon with a specific approach but also the geometrical tridimensional location of the neoplastic mass to grant its adequate, thorough and

safe removal. In this specific case, we considered the postero-lateral approach as the best surgical access to delimit and remove the osteochondroma (protecting the surrounding neurovascular structures) and to easily access the periacetabular space.

In a 2014 systematic review, Makhdom et al. reported cases affected by osteochondroma dividing them according to the location of the lesion (3). Out of 41 patients, only 13 (8 F, 5 M - mean age 10 yo - range 3-16 yo) had a lesion involving both the femur and the acetabulum. All patients were treated surgically with tumor excision and femur or pelvis osteotomy. All studies were case reports and retrospectives and failed to conclude a uniform treatment plan. One question that remains open from that review is whether or not early surgical excision of these lesions may prevent acetabular dysplasia. Finally, in 2020 J.Y.Yoon et al. published the first case series of 11 hips in 9 patients (mean age 53) treated with exostosis excision and arthroplasty (5). The manuscript focused on the correct choice of stem to be implanted; in their experience, long stems were always implanted. Before J.Y.Yoon only case reports had been published, for a total of 8 patients undergoing total hip replacement with standard or revision long stems, cemented or not (4,6-10).

In our case, considering the young age of the patient, we chose a short curved stem with a metaphyseal grip. The technique and the planned surgical approach ensured a radical excision of the tumor mass without the need for cementation. As far as we know this is the first case treated with a minimally invasive prosthesis, but we believe it could be a reproducible option in the future. The goals of short conservative stems include sparing of trochanteric bone stock (which could be useful in future revision surgeries) and avoiding conflict of the tip of long stems with the femoral cortex resulting in thigh pain (16). As confirmed by a systematic review and meta-analysis published by Liang HD et al. short stems show similar clinical outcomes and survival rates if compared to conventional stems in primary total hip replacement (19). Furthermore, short stems seem to promote a more physiological stress distribution, thus preserving the femoral metaphyseal bone stock (16,20-22).

In conclusion, an osteochondroma involving the femur and acetabulum if diagnosed before arthritic degeneration can be treated with various excision techniques and corrective osteotomies. However, when secondary arthritis is advanced, the therapeutic choice of a joint replacement is mandatory. Careful preoperative planning is advisable to prevent any intraoperative risk or complications and to achieve a good result. For young patients at high risk of future surgery, a short stem is the more responsible and forward-looking choice. To have good functional results, patient compliance and good rehabilitation is essential.

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