



Case Report

Reconstruction with iliac pedestal cup and proximal femur tumor prosthesis after wide resection of chondrosarcoma – 10-year follow-up results[☆]



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ABSTRACT

Chondrosarcoma is a malignant cartilage-forming neoplasm. It is difficult to treat because of resistance to both chemotherapy and radiation, making wide local excision the only treatment. This report presents an active, 43 year-old man who was diagnosed with recurrent clear cell chondrosarcoma of the proximal left femur, previously reconstructed with a total hip prosthesis, extending to the weight-bearing dome of the acetabulum. Cancer staging study revealed no signs of tumor dissemination at distance. Given the excellent functional status of the patient, the authors performed an Enneking–Dunham type periacetabular pelvic resection and resected en bloc, with the total hip prosthesis including 22 cm of the femur and a portion of the hip abductor apparatus. Acetabular reconstruction was performed with a non-cemented pedestal cup prosthesis fixed at the iliac, and in-femur reconstruction utilized a cemented silver-coated proximal femur modular prosthesis. Today, after a 10-year follow-up, the patient is walking without crutches, he practices recreational cycling without assistance, and he is asymptomatic and free of tumoral disease. At present, no signs of relevant loosening, instability, infection, heterotopic ossification, or any other complications have been observed. Pelvic reconstructions are challenging and risky surgeries; however, the appearance of more functional implants, like the pedestal cup prosthesis, and its correct application and indication, may allow promising clinical and functional results with low complications rate.

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Reconstrução com prótese de pedestal no íliaco e prótese de tumor proximal do fêmur após ressecção ampla de condrossarcoma – resultados de acompanhamento de 10 anos

R E S U M O

Palavras-chave:

Neoplasias ósseas

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Reconstrução

O condrossarcoma é uma neoplasia maligna formadora de cartilagem. O tratamento é difícil, devido à resistência tanto à quimioterapia como à radiação; a excisão local ampla é o único tratamento. O presente estudo relata o caso de um homem ativo de 43 anos diagnosticado com condrossarcoma de células claras do fêmur esquerdo proximal recorrente, previamente reconstruído com prótese total de quadril, estendendo-se à abóbada do acetábulo, que sustenta peso. O estudo de estadiamento de câncer não revelou sinais de disseminação tumoral à distância. Considerando o excelente estado funcional do paciente, os autores realizaram uma ressecção pélvica periacetabular do tipo Enneking-Dunham com ressecção em bloco, com a prótese total do quadril, incluindo 22 cm do fêmur e uma porção do aparelho abductor do quadril. A reconstrução acetabular foi realizada com uma prótese de pedestal não cimentada fixada no íliaco e a reconstrução no fêmur utilizou uma prótese modular cimentada para o fêmur proximal com revestimento em prata. Hoje, após um seguimento de dez anos, o paciente anda sem muletas, pratica ciclismo recreativo sem assistência e está assintomático e livre de doença tumoral. Não foram observados sinais de afrouxamento relevante, instabilidade, infecção, ossificação heterotópica ou quaisquer outras complicações. As reconstruções pélvicas são cirurgias difíceis e arriscadas; entretanto, o surgimento de implantes mais funcionais, como a prótese de pedestal, e sua correta aplicação e indicação podem permitir resultados clínicos e funcionais promissores, com baixa taxa de complicações.

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Introduction

Chondrosarcoma is a cartilage forming malign neoplasm. It is the second most common primary malignancy of bone and is more frequent in males above 40 years old. It can be primary or secondary, frequently originating from benign tumors' malignization. Most frequent locations include pelvis, proximal femur and scapula. Chondrosarcoma is difficult to treat because it is resistant to both chemotherapy and radiation, making wide local excision the only effective treatment.^{1,2} The extent of the resection margins depends on the tumor grade and location.^{3,4} Local recurrence is frequently seen after intralesional excision, thus wide local excision is sometimes employed despite significant morbidity, even in low-grade lesions. The surgeon must weigh the risk of significant morbidity with the ability to minimize the chance of local recurrence and maximize the likelihood of long-term survival.² The most important predictors of poor prognostic for patients with chondrosarcoma are a high histological grade and age over 50 years old.^{5,6}

Chondrosarcoma, Ewing sarcoma and osteosarcoma are the most frequent primitive malignant bone tumor affecting the iliac bone.⁷ As opposed to iliac and obturator ring resections, iliac wing and acetabular resections require reconstruction. This is due to the pelvic ring disruption that affects weight bearing, demanding reconstruction to allow ambulation and an acceptable functional result.⁷ Reconstruction of periacetabular defects after pelvic tumor resection

ranks among the most challenging procedures in orthopedic surgery.^{7,8} Current solutions include total hip replacement and reconstruction with saddle or modular tumor prosthesis, pedestal cup prosthesis, massive allograft with or without prosthesis and femoro-ilac arthrodesis.^{7,9} The choice is made balancing the following items: remaining acetabular bone stock quality for prosthesis fixation; general health status and functional level of the patient.⁹

Case description

We present the case of a 43 year-old active man that was diagnosed with a recurrent clear cell chondrosarcoma of the proximal left femur, extending to the weight-bearing dome of the acetabulum. Cancer staging study revealed no signs of tumor dissemination to distance. The patient was previously submitted in other healthcare institution to two curettage resections of benign local chondrogenic tumors (17 and 16 years ago respectively) and one proximal femur resection followed by reconstruction with a modular revision total hip arthroplasty S-ROM[®] (12 years ago). The latter surgery was performed already with the diagnosis of chondrosarcoma (Fig. 1).

Given the excellent functional status of the patient and the localized tumor disease, we decided to perform a wide resection and reconstruction. Using ilioinguinal and lateral thigh approaches (Fig. 2), we performed a periacetabular pelvic



Fig. 1 – Proximal left femur resection followed by reconstruction with a modular revision total hip arthroplasty S-ROM®.

resection Enneking-Dunham type II (Fig. 3).¹⁰ In order to achieve clear margins the tumor was resected in bloc with the total hip prosthesis, 22 cm of femur and a portion of the abductor hip apparatus. The tumor was surrounding the hip prosthesis and its macroscopic appearance is presented in Fig. 4. Acetabular reconstruction was performed with non-cemented pedestal cup prosthesis fixed at the iliac (Pedestal Cup Zimmer®) (Fig. 5). In femur reconstruction we used a cemented silver coated femur proximal modular MUTARS® prosthesis (Fig. 6). After polyethylene insert application, prosthesis reduction and stability tests, a trevira tube was applied to ensure reconstruction of soft tissue and muscular reinsertions (Fig. 7). In order to achieve adequate acetabular pedestal

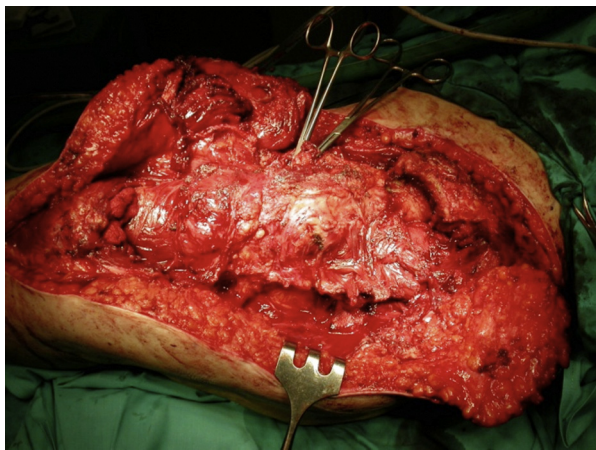


Fig. 2 – Macroscopic aspect of the recurrent clear cell chondrosarcoma of the proximal left femur – ilioinguinal and a lateral thigh approaches.

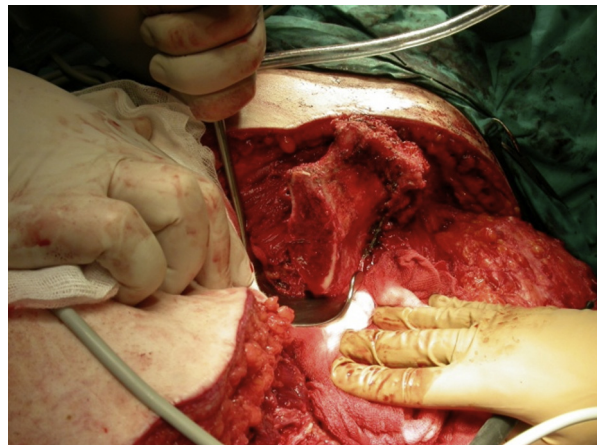


Fig. 3 – Periacetabular pelvic resection Enneking-Dunham type II.

fixation and stability, surgery resulted in a 2 cm shortening of the inferior limb, corrected with a compensatory shoe.

Results

Postoperative period was unremarkable (Fig. 8). Progressive weight bearing was started according to pain tolerance. The patient was walking without crutches at 3 months follow-up. After 10 years the patient is walking without crutches, only with a slight Trendelenburg sign. He is a recreational cyclist and he is asymptomatic and tumoral disease free. Until

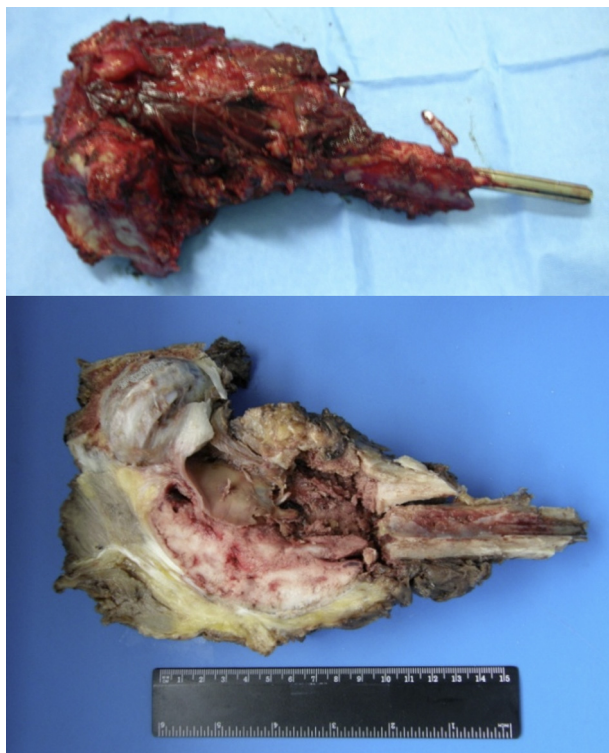


Fig. 4 – Macroscopic aspect of the resected clear cell chondrosarcoma, including the total hip prosthesis.

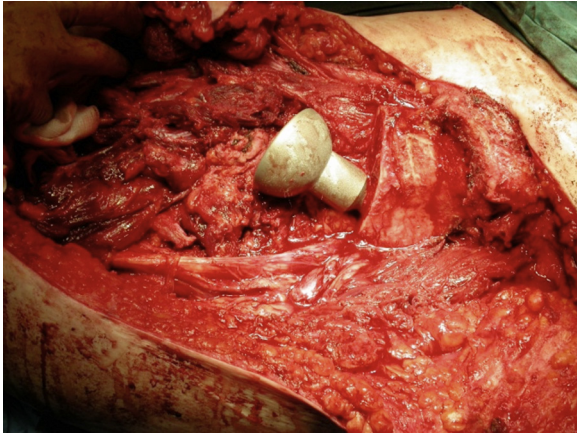


Fig. 5 – Acetabular reconstruction with a non-cemented pedestal cup prosthesis fixed at the iliac (Pedestal Cup Zimmer®).

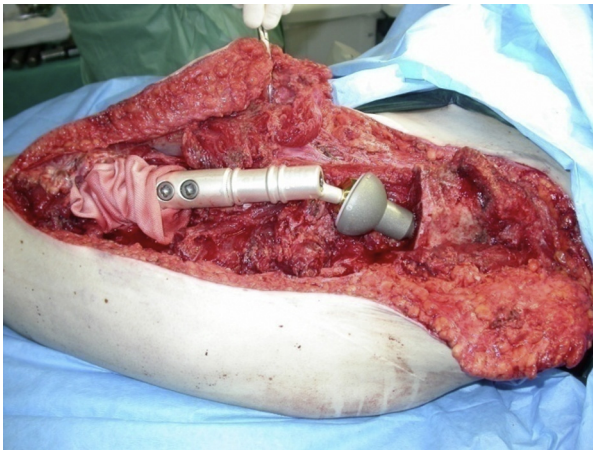


Fig. 6 – Femur reconstruction with a cemented silver coated femur proximal modular MUTARS® prosthesis and acetabular and femur reconstruction final aspect.

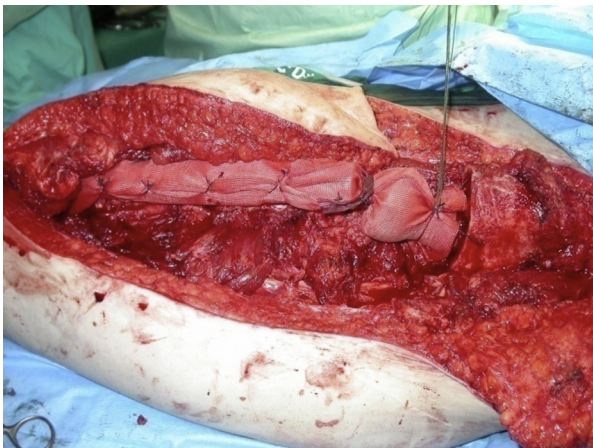


Fig. 7 – Trevira tube application to assure reconstruction of soft tissue and muscular reinsertions.

now we have not identified any signs of relevant loosening (Fig. 9), instability, infection, heterotopic ossification or any other complications.

Discussion

Except for clear cell carcinomas that metastasize to bone, with renal cell carcinoma being the principal representative of that group, clear cell osseous neoplasms are rare. The only distinct nosologic entity in this category that is primary in the bone is the clear cell chondrosarcoma, representing less than 2% of all chondrosarcomas. It is most often seen in the proximal femur or humerus, affects males more often than females and has a peak incidence during the third and fourth decades of life.¹¹ Clear cell chondrosarcoma is an epiphyseal tumor that can be confounded with low grade chondrosarcoma. However it has a relatively indolent malignancy: it can be locally aggressive and roughly 25% of patients experience local recurrences of their tumors or develop metastasis. However tumor-related death is uncommon, particularly when the lesion has been completely resected “en bloc”.¹¹

In the present case, either due to recurrence or tumor cells persistence after previous resections, the patient was diagnosed with a sizable chondrosarcoma (8 cm length and 5 cm thickness) of a rare and aggressive type, in a femur that had a previous total hip prosthesis. Treatment option had to be wide tumor resection with clear margins, involving both acetabulum and femur resections due to the tumor extension. Given the excellent general condition, absence of signs of disseminated disease and the high functional level (in a young patient), acetabular e femur reconstruction were necessary.

Periacetabular reconstruction remains a high technical demanding challenge. Reconstructive techniques are generally associated with unsatisfactory mechanical and non-mechanical complication rates.⁸ Enneking–Dunham type II pelvic resections are associated with more mechanical complications than isolated type I and type III resections.^{12–14} There are two main options for periacetabular reconstructions that require some remaining iliac bone stock: saddle prosthesis, with a proximal saddle component that articulates with the remaining iliac bone; ball-socket type prosthesis with a pedestal or stem component fixed at the remaining iliac.⁹ Saddle prosthesis were previously the gold-standard for periacetabular reconstructions, however some studies found they were associated with high rates of major complications, such as infection, prosthesis migration and dislocation.^{9,13,15–17} Instead, despite of pedestal cup prosthesis are recent implants, their more advantageous biomechanics in terms of axial stress distribution across bone–implant interface, allows them to be achieving good outcome reports in literature. This reconstruction is also currently considered an easier surgical technique, taking less surgical time and having lower complications rate at short term comparing to other pelvic reconstructions.^{8,18}

Our center current choice in periacetabular reconstructions is the pedestal cup prosthesis fixed at the iliac and a modular silver coated prosthesis for the proximal femur. Silver is known to have antimicrobial activity and silver-coated tumor prostheses in high risk patients are being associated with a



Fig. 8 – Postoperative pelvic and femur radiographs.

lower rate of early periprosthetic infection.¹⁹⁻²¹ Acknowledging the high risk of infection of patients submitted to major invasive resections of bone tumors and reconstructed with big dimension tumor prosthesis, we currently choose silver coated prosthesis for this type of surgery.

As the majority of patients in which these reconstructions are performed have short life expectancy, current scientific evidence about survival of these implants at medium and long term is absent. We present the rare case of a patient submitted to acetabular and proximal femoral arthroplastic reconstruction and the functional, mechanical and radiographic results at 10 year follow-up period. Patient is asymptomatic,

independently ambulating and even practices cycling. Our team does not recommend sports practice (mainly those associated with impact activities or an important risk of falls) following pelvic and femur reconstructions. However the patient assumed total responsibility for his decision and continues sports activity without any adverse event until today. The only limitation referred by the patient is a slight Trendelenburg claudication, probably due to partial resection of the abductor hip apparatus. The excellent results of this patient may be explained by the wide and clear margins of tumor resection, the respect for anatomical structures and its adequate reconstruction. These factors are essential in the



Fig. 9 – Full-limb radiograph at 10 years follow-up.

therapy of malignant bone tumors in order to minimize the risk of local recurrence and ensure long-term survival.¹

The treatment of a malignant bone tumor includes wide resection to obtain clear margins. When acetabulum is involved its resection affects weight bearing. Therefore reconstruction is needed to allow ambulation and an acceptable functional result. Reconstruction of periacetabular defects after pelvic tumor resection ranks among the most challenging procedures in orthopedic surgery. Usually, patients who undergo such reconstructions have short-life expectancy, hence the lack of current scientific evidence about survival of these implants at medium and long term. We present a successful case of acetabulum and proximal femur resection followed by reconstruction with pedestal cup and modular proximal femur prosthesis that had excellent clinical and functional outcomes at 10 years follow-up, without any complication until now. Pelvic reconstructions are challenging and risky surgeries. The development of more functional implants, such as the pedestal cup prosthesis, its correct application and indications, may allow promising clinical and functional results, with a low rate of complications.

Conflicts of interest

The authors declare no conflicts of interest.

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