



# Adolescent pelvic chondrosarcoma, surgical treatment, and unusual reconstruction with pedestal conic cup (LUMiC®): A case report

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Chondrosarcoma is a malignant primary bone tumor originating from chondrocytes that produce cartilage.<sup>[1,2]</sup> The prognosis and behavior of chondrosarcoma can range from slowly growing and non-metastatic tumor to very aggressive pattern and metastasis.<sup>[3]</sup> Clinical behavior is generally consistent with the histological structure of the lesion. Histologically, three subgroups are distinguished by their characteristics such as cell atypia and cellularity (grades 1, 2, and 3).<sup>[4-6]</sup> Some subtypes are also described (secondary, dedifferentiated, clear cell, mesenchymal, periosteal). It is more common in male sex aged over 40 years and it mostly occurs in the scapula, proximal humerus, femur, pelvic girdle, knee, and spine.<sup>[5]</sup> The most common complaints of patients are pain and mass. Because of the resistance to chemotherapy and radiotherapy, it is frequently treated by surgery.<sup>[7,8]</sup>

## ABSTRACT

An 18-year-old male patient was diagnosed pelvic chondrosarcoma histopathologically. Hip joint involvement was detected. No metastasis or neurovascular invasion was seen. Type I-II pelvic resection and hip reconstruction were planned with pedestal cup (LUMiC®) and proximal femur tumor prosthesis. Surgery was performed in lateral decubitus position with extensive triradiate incision. Pelvic wide resection was performed. At the second year of follow-up, implant failure was detected and patient was revised with same pedestal cup. Axial stability was supported by a L5 screw and connector from L5 vertebrae to LUMiC® prosthesis. Except the implant failure, no oncological complication or infection was observed during the final 36<sup>th</sup> month follow-up.

**Keywords:** Adolescent, chondrosarcoma, hemipelvectomy.

The aim of this study is to show that a rare case of chondrosarcoma seen in adolescent pelvis can reach a satisfactory functional outcome by reconstruction with LUMiC® prosthesis and spinopelvic fixation with polyaxial screws as a new surgical technique when there is no sufficient bone stock after pelvic resections.<sup>[9]</sup>

## CASE REPORT

An 18-year-old male patient was admitted to our clinic with pain and limping on the right hip, and a mass was detected at the right iliac wing on physical examination. The patient underwent pelvic radiography, pelvic computed tomography, and pelvic magnetic resonance imaging (MRI). On MRI, tumoral tissues originating from destroyed cortex of the right iliac wing was extending to the right sacroiliac junction adjacent to the iliac crest accompanied by the soft tissue component. Moreover, hip joint involvement was also detected (Figure 1a-c). No metastasis or neurovascular

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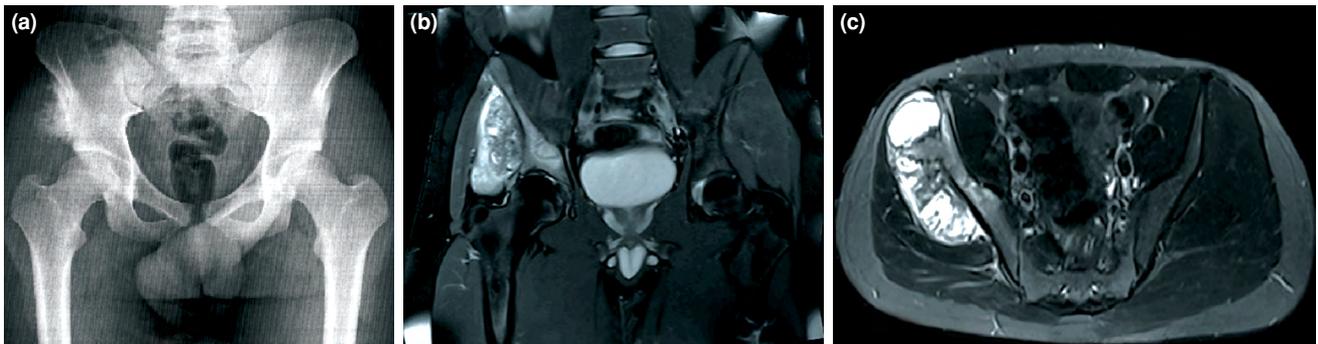
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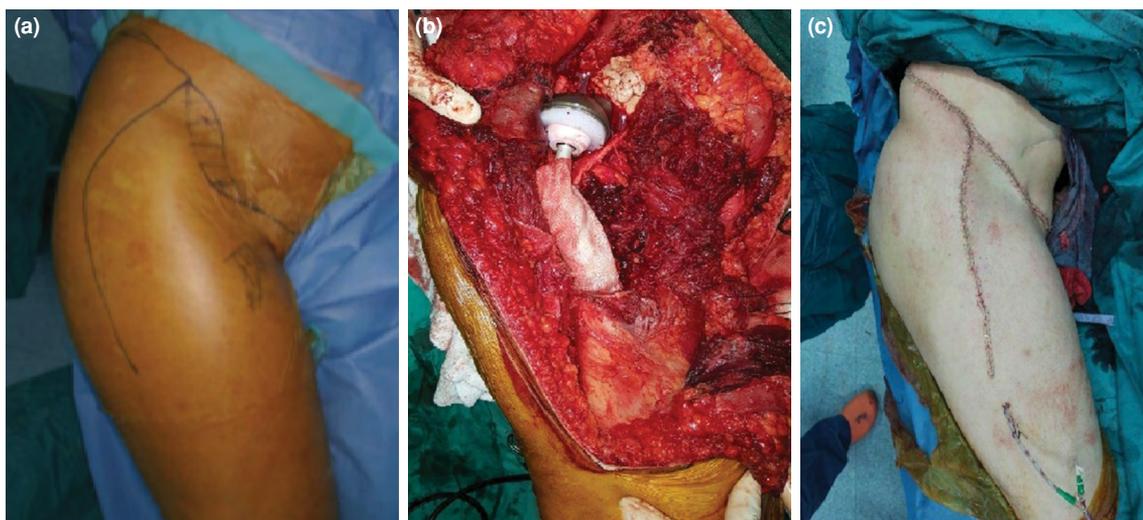
**FIGURE 1.** (a) In anteroposterior pelvic X-ray, there is an exophytic lesion containing a chondrogenic matrix that grows from right iliac wing. (b) In coronal T2 fat-suppressed sequences, an exophytic growing soft tissue mass from right iliac bone is invading lateral capsule of hip joint. (c) In axial T2 fat-suppressed sequences, T2 increased signal intensity in right iliac bone extends through bone marrow and subchondral area of sacroiliac joint while sacroiliac joint involvement is absent.

invasion was seen. Tru-cut biopsy was performed and chondrosarcoma (grade 2) was diagnosed histopathologically. Proximal femur modular tumor prosthesis and pedestal conic cup (MUTARS® LUMiC® acetabular implantcast, Buxtehude, Germany) were planned for joint and bone reconstruction after type I+II resection which was described by Enneking.<sup>[10-15]</sup> A written informed consent was obtained from the patient.

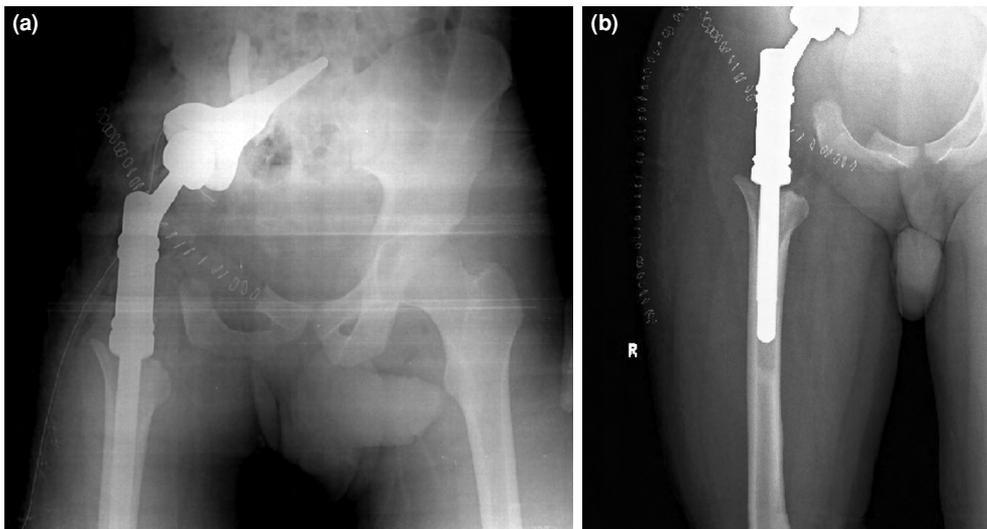
Surgery was performed in the lateral decubitus position under general anesthesia. "T" (extensive triradiate) incision was used to facilitate access to the posterior and anterior anatomical structures, which could also exclude the biopsy tract (Figure 2a). Wide resection was achieved by

performing type I+II internal hemipelvectomy. For reconstruction, cemented pedestal conic cup (LUMiC®) was used through ala of sacrum and L5 spine. To avoid any length discrepancy at the lower extremity, the joint level was raised and the joint was reconstructed with a proximal femur modular tumor resection prosthesis (Figure 2b, c). No intraoperative complication was encountered.

No complications were seen clinically and radiologically in early postoperative period (Figure 3a, b). Non-weight-bearing mobilization was allowed at the end of first week and patient was discharged on postoperative 21<sup>st</sup> day. Partial weight bearing was allowed at postoperative second month. Musculoskeletal tumor society (MSTS) scores were



**FIGURE 2.** (a) Preoperative wound planning. (b) Intraoperative tumor resection and reconstruction with prosthesis. (c) Postoperative wound closure.



**FIGURE 3.** (a, b) Early postoperative anteroposterior X-rays (placement of pedestal cup, LUMiC®, through sacrum and L5 vertebra). Balanced lower extremity length after reconstruction.

23 (66%) at sixth and 29 (83%) at 12<sup>th</sup> months of control visit.<sup>[16]</sup>

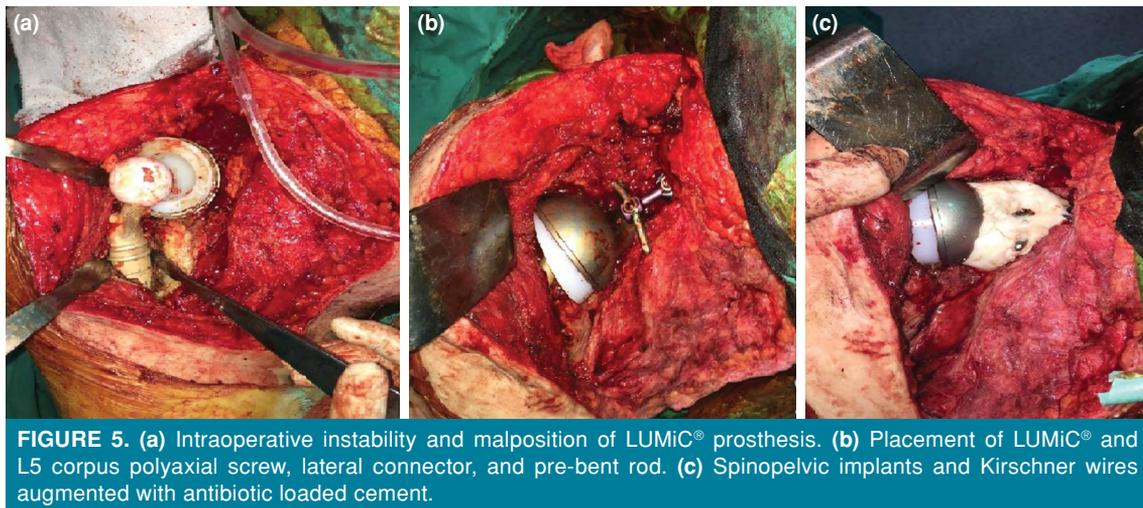
At the postoperative 23<sup>rd</sup> month, the patient applied to our clinic with acute onset of increased limping and hip pain after a motorcycle accident. Implant failure on the LUMiC® and limb discrepancy were detected and the decision was established for revision (Figure 4a). In the second operation, previous incision was used and extended proximally for anterior instrumentation of L5 corpus. Hip joint instability and pathological movement of LUMiC® stem were detected (Figure 5a). LUMiC® and cements were removed and signs of infection were not detected. Then, sacrum and L5 vertebrae corpus were reamirized together and LUMiC® stem

was placed with cement into the ala of sacrum and L5 spine as the previous operation. Additionally, axial stability of LUMiC® prosthesis was supported by a L5 polyaxial corpus screw and lateral connector rod from L5 vertebrae to LUMiC® prosthesis (Figures 4b and 5b). Then, two Kirschner wires were placed to ala of sacrum and all implants were augmented by antibiotic loaded cement to support the stability of our reconstruction (Figure 5c).

Wounds were closed properly and suction drains were placed. No complication was seen in the early postoperative period. Non-weight-bearing mobilization was allowed on postoperative second day and patient was discharged at the end of the first week. MSTS score was 23 (66%) at the 12<sup>th</sup> month after the second operation.



**FIGURE 4.** (a) Postoperative 23<sup>rd</sup> month anteroposterior X-ray shows failure of LUMiC® after motorcycle accident. (b) After final operation, early anteroposterior pelvic X-ray (placement of LUMiC® and L5 corpus screw and rods). (c) Control anteroposterior pelvic X-ray at postoperative 36<sup>th</sup> month.



**FIGURE 5.** (a) Intraoperative instability and malposition of LUMiC<sup>®</sup> prosthesis. (b) Placement of LUMiC<sup>®</sup> and L5 corpus polyaxial screw, lateral connector, and pre-bent rod. (c) Spinopelvic implants and Kirschner wires augmented with antibiotic loaded cement.

Except the implant failure due to the motorcycle accident at the postoperative 23<sup>rd</sup> month, no oncological (metastasis, recurrence) or local complications (infectious, mechanical) were observed till the final 36<sup>th</sup> month follow-up (Figure 4c).

## DISCUSSION

Chondrosarcoma is a malignant cartilaginous tumor seen primarily at adulthood. Chondrosarcomas in children and adolescents constitute <5% of all cases. Secondary chondrosarcomas are nearly half of these cases in this age group.<sup>[17,18]</sup> Thus this case is remarkable because it was seen in the adolescent pelvic bone.

Surgical treatment of pelvic sarcomas is difficult due to its proximity to deep vascular and neurological structures. The type, grade, and extensivity of sarcoma are other difficulties in treatment. Moreover, the need for reconstruction of anatomical structures after surgery is a secondary problem to be solved. Various methods can be used for reconstruction after internal hemipelvectomy for limb-salvage surgery.<sup>[15]</sup> These are massive allografts, autografts (recycling bone), arthrodeses, flail hip, saddle prostheses, acetabular cages, and LUMiC<sup>®</sup> etc. that can be used with proximal femur tumor prosthesis.

LUMiC<sup>®</sup> prosthesis was mostly used by implanting the remaining part of the iliac wing after Enneking type II periacetabular resection. At short-term follow-up, the LUMiC<sup>®</sup> prosthesis demonstrated low frequency of mechanical complications and failure. Therefore, this is a useful reconstruction for periacetabular resections for tumor or failed prior reconstructions.<sup>[15]</sup> Infection and dislocation are relatively common complications

in not only reconstruction by LUMiC<sup>®</sup> but also after other complex reconstructions (allografts, autografts, arthrodeses, saddle prostheses, acetabular cages etc.).<sup>[12-15]</sup>

In our case, despite the lack of adequate iliac bone stock after surgery, we used the LUMiC<sup>®</sup> prosthesis because of the young age and high bone quality of patient. There was no complication due to implant failure in postoperative follow-up until the motorcycle accident. According to this, LUMiC<sup>®</sup> can be used as a different technique in young patients with high bone quality, not only after type II resection, but also in type I+II resections in which the iliac wing is totally removed.

Furthermore, the MSTS scores of our case at the postoperative 6<sup>th</sup> and 12<sup>th</sup> months were 23 (66%) and 29 (83%), respectively. This suggests that LUMiC<sup>®</sup> has satisfactory functional results in patients whose extremity length is preserved when used with proximal femur tumor prosthesis.

In the case of implant failure as in our patient, there were options to strengthen the existing reconstruction or to perform flail hip which would result in shortness and not satisfy the patient functionally. We showed that LUMiC<sup>®</sup> stability can be improved with screws and rods by using L5 vertebral corpus in patients who have insufficient bone stocks that develop implant failure due to trauma.

Similar cases can only be encountered in the form of case reports in the literature although not using the same technique.<sup>[17,19]</sup> Therefore, this case is rare and unique for the literature in terms of an initial reconstruction technique as well as implant failure management strategy.

Although no other complications were seen in our case, conducting multicenter studies that may increase the number of similar cases and comparisons with other techniques may contribute to the literature to obtain valid results in terms of possible complications and the success of this surgical technique.

#### Declaration of conflicting interests

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