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Laparoscopic assisted resection of a ilio-sacral chondrosarcoma: A single case report

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ABSTRACT

INTRODUCTION: Sacral tumor often involves en bloc surgical resection with tumor-free margins and functional reconstruction challenges. Such a management is challenging because of difficulties in accessing the lesion, risks for damages of neighboring organs, and risks for massive blood loss. In posterior approach, because first elevation of the sacrum allows dissection of presacral structures, such risks for damages intrapelvic structures and hemorrhage are especially high.
PRESENTATION OF CASE: We report here about a laparoscopic assisted posterior resection of a ilio-sacral chondrosarcoma in a women, 6 weeks after vaginal delivery. Primary laparoscopic approach consisted in dissection of the ureter and of the colon with control to the pelvic vessels and nerves and determination of limits of the resection. The iliac osteotomy was performed from posterior approach with saw and osteotomes at the predetermined extralesional level. The defect was replaced with a structural fresh frozen femoral allograft and stabilization performed by lumbo-ischial screw/rod fixation.
DISCUSSION: Surgical time was about 360 min. No intra-postoperative complications occurred. Blood loss was estimated to about 1000 cm^3. Histologic examination of the specimen showed tumor-free margins. At 8 months follow-up, the patient appears to be without recurrence. Because of the denervation of the nerve root L5 and below, she mostly uses two canes, but she has a functioning quadriceps. Continence and voiding functions for urine and stool have fully recovered.
CONCLUSION: Primary laparoscopic approach appeared to be a good way for preparation orthopedics sacroiliac resection to reduce postoperative morbidity, intraoperative blood loss and better assure macroscopic tumor-free margins.

1. Introduction

Primary therapy for sacral tumor often involves surgical resection and functional reconstruction challenges. Such a management is challenging because of difficulties in accessing the lesion, risks for damages of neighboring organs, and risks for massive blood loss due to an extensive vascularity. Preoperative angiography should be performed to characterize the vascular anatomy.[1] Preoperative tumor embolization has been proposed, exposed however the patients for ischemic neuropathy that can result in motor and sensory deficits in the pelvis and lower extremities.[2] We present a new surgical concept for management of ilio-sacral tumors based on a combined anterior laparoscopic approach and posterior open resection of the tumor.

2. Presentation of case

A 33-year-old woman, 6 weeks after vaginal delivery, complained of lumbosacral dysesthesia, which led her gynecologist to have a lumbo-pelvic CT performed. This revealed an intensive vascularized mass of the sacrum reaching from the foramina L5 to S3, crossing the sacro-iliac joint and extending into the iliac bone. MRI and angiography were suggestive of a chondromatous process (Figs. 1 and 2). CT guided biopsies confirmed a cartilaginous process, which in synopsis with the images was graded as GI chondrosarcoma. Neuropelveological assessment diagnosed a S2-4 radiculopathy right with vulvodynia, coccygodynia, low back pain and bladder hypersensitivity, and a L5-S2 irritative sciatica without signs for neurogenic damages. Urodynamic testing showed bladder hypersensitivity with postvoid residual urine at 60 mL. Orthopedic examination was unremarkable with normal gait.

As there is no effective adjuvant treatment for low grade chondromatous lesions, the patient after extensive repeated discussion opted for resection of the tumor and reconstruction realizing that mutilation was unavoidable due to the involvement of sacral nerve

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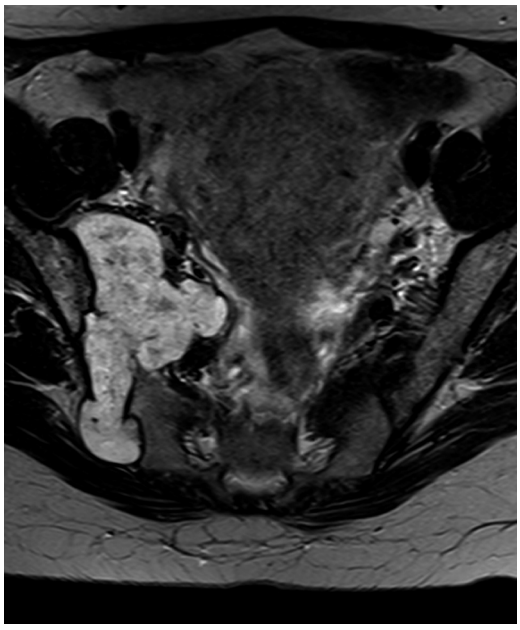

Fig. 1. Imaging shows the osteo-chondromatous lesion involving the sacrum and the sacro-iliac joint reaching from the neuroforamina L5 down to S4.

roots. Massive pelvic congestion due to postpartum situation was considered as an additional risk factor for hemorrhage. The patient signed informed consent forms for the procedure and authorization for communication as a case report (Figs. 3–5).

For the procedure, the patient was placed in unstable lateral decubitus to allow free access anteriorly for laparoscopy as well as the back by rotating the patient without need for new sterile preparation. For the laparoscopy, one 10 mm trocar was placed in the navel to introduce a 10 mm/0° HDTV optic and three further 5 mm-trocars were placed in the lower abdomen. For identification of the different sacral nerves roots (SNR), intraoperative electrical stimulation using a laparoscopic probe with a current fixed by 250 μs/35 Hz/4 V was applied to the nerves.[3]

The procedure was started with the full exposure of the os sacrum and the right pelvic sidewall by dissection of the right pararectal space. The medial sacral vessels were coagulated. After transection of the sacral hypogastric fascia, the medial and caudal limits of the tumor and as well as the SNR were identified. While the SNR L#5, S#1 and S#2 were attached on the tumor, the SNR S#3 and S#4 did not show any contact with the tumor and were exposed in order to avoid their damages during the rest of the procedure.

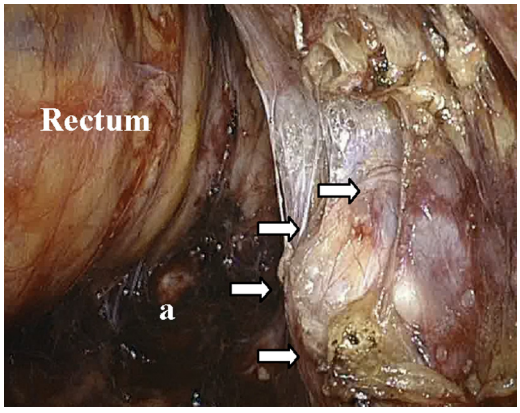

Fig. 2. Dissection of the right pararectal fossa (a) with exposure the medial limits of the tumor.

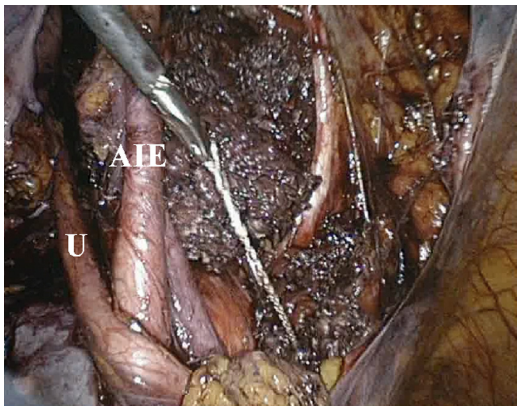

Fig. 3. Passage of the Gigli saw through the foramen L5–S1 (U: ureter; AIE: arteria iliaca externa).

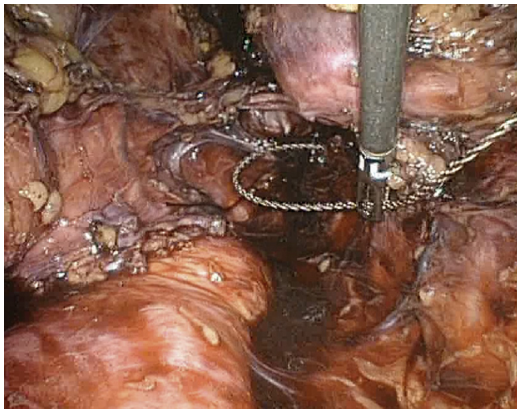

Fig. 4. Gigli saw passed through the foraminas L5–S1 and S1–S3 for transection of the sacrum medial to the tumor.

The next step consisted in the full exposure of the pelvic ureter followed by the coagulation/transection of the internal iliac and the lateral sacral vessels. All cardinal vessels below the tumor were also transected including the pudendal and inferior gluteal vessels. The sciatic nerves were identified just before its entry through the great sciatic foramen. To reduce risk for bleeding during the gluteal dissection, the superior gluteal vessels were dissected at the level of the suprapiriform level of the great sciatic foramen, separated from the superior gluteal nerve, and coagulated selectively. After dissection of the right femoral nerve, the major psoas muscle was transected twice proximally and distally to the tumor to permit en

Fig. 5. End situ – defect replaced with a structural fresh frozen femoral allograft and stabilization performed by lumbo-ischial screw/rod fixation.

bloc resection. Also the nerves roots L5, S1 and S2 were kept in contact to the tumor. After complete anterior exposure of the tumor, two Gigli saws were passed from anterior to posterior by passing with laparoscopic forceps through the foraminas L5–S1 and S1–S3 for transection of the sacrum medial to the tumor. The transection of the sacrum was performed under endoscopic vision to control eventual bleeding. The entire laparoscopic part of the procedure was based on the principle of "non-touching en-bloc resection of the tumor".

For posterior resection of the ilium, the incision for the open posterior approach included the exit points of the 2 inserted Gigli saw as extended cranially for the later insertion of the pedicle screws and caudally below the sciatic notch for the iliac osteotomy in analogy to a Juder approach. A soft tissue margin was left on the specimen to be resected. The iliac osteotomy was performed with saw and osteotomes at the predetermined extralesional level. The defect was replaced with a structural fresh frozen femoral allograft and stabilization performed by lumbo-ischial screw/rod fixation.

Laparoscopic control excluded any residual bleeding and permit closure of the peritoneum after introduction of a Robinson drainage. To avoid risk for postoperative bladder overdilatation, a suprapubic catheter was placed inside the urinary bladder.

Surgical time was about 360 min. No intra- or postoperative complications occurred. Blood loss was estimated to <1000 cm^3; the patient received a total of 2 Units Erythrocytes. Bowel motion recovered at 4th postoperative day, urinary function after three months. Rehabilitation was started four weeks after the procedure. Histologic examination of the specimen showed an osteochondrosarcoma with tumor-free margins. At 17 months follow-up, the patient appears to be without recurrence. Because of the denervation of the nerve root L5 and below, she mostly uses two canes, but she has a functioning quadriceps. Continence and voiding functions for urine and stool have fully recovered.

3. Discussion

Operative treatment of tumors in the sacroiliac area is among the most challenging musculoskeletal tumor surgeries. Because almost all the deaths from chondromas result from local recurrence, greater effort to obtain adequate surgical excision has been made over the last decades. Most common surgical approach used are the posterior, posterolateral, anterior and posterior, anterior and lateral combined approach.[4,5] In tumor of the sacrum, exposition is mostly obtained by a posterior midline incision; lateral osteotomies are usually performed through the sacral foramina using a threadwire saw and Kerrison rongeurs. Although various reports analyzed "en-bloc" excision of sacral tumors, there are still technical problems to improve protection of nerve roots and pelvic organs and reduce intraoperative bleeding. In posterior approach, because first elevation of the sacrum allows dissection of presacral structures, risk for damages intrapelvic structures is high. Wound infections, neurologic deficits, pelvic instability, and cerebrospinal fluid leakage are the main complications of sacrectomy.[6,7] Extensive hemorrhage is the most serious complication since it may threaten the life of the patient and jeopardize the outcome of surgery. Angelini reported about sacral resection with a mean blood loss by 2961 mL (1000–8000 mL).[8] In a further retrospective study on 173 patients, 39.88% of the patients had blood loss greater than 3000 mL.[9] In one study of nine patients with total sacrectomies,[10] the blood loss ranged between 4.5 and 17 L (mean, 6.3 L). In another report[11] three sacral tumor resections were performed with blood losses of 9250, 7500, and 9600 mL. In one larger-scale study of 29 patients who underwent partial or total sacrectomies[12] the median blood loss was 3.9 L and the maximum blood loss was 37 L.

It is obvious that primary control on blood supply of the sacrum and parameters may reduce intraoperative blood loss. The results of several studies suggest preoperative arterial embolization and aortic balloon occlusion,[13,14] but indications remain uncertain. Because of numerous pelvic anastomoses, single closure of the internal iliac artery does not protect from hemorrhage. We opted for a primary closure of all parametric vessels including the internal iliac artery, the gluteal and the sacral vessels by laparoscopic before starting with bone resection, that vascular control do not present major difficulties for pelvic surgeons trained in laparoscopic retroperitoneal surgery. In our patient, this first step decrease considerably blood loss despite the massive postgravid pelvic varicosis.

Laparoscopic dissection of the pelvic organs not only had protect the patient from visceral lesions, but had also permitted in same time to exclude abdominal metastases, and to resect the bones according to the limits of the tumor with in turn macroscopic tumor-free margins. The introduction of the Gigly saw through the different sacral foramens had also contributed to a tumor-adapted and precise transaction of the bone under laparoscopic control. High amputation of the sacrum inevitably results in damages of the sacral nerve roots, the pudendal nerve and the coccygeal plexus.[15] However, it is well-known that simultaneous abdominosacral resection circumvents many of problems for such advanced procedures since it provides good exposure of the intra-abdominal structures, and avoids damage to the sacral nerve roots.[16] Similarly, laparoscopic approach had permitted an optimal exploration of the entire lumbosacral plexus before resection: the nerve roots L5, S1 and S2 were resected en bloc with the tumor, while the roots S3 and S4 (bladder functions) below the tumor, as well as the femoral nerve (extension and stabilization of the knee during locomotion) above the tumor, were respected for a maximum reduction of postoperative functional morbidity.

4. Conclusion

The neuropelveology is a new field of medicine that deals with pathologies of the pelvic nerves. Neuropelveologists are trained in laparoscopic neurosurgery to the pelvic nerves.[17,18] In the presented patient, because of particular high risk for intraoperative hemorrhage few weeks after delivery, primary laparoscopic approach appeared to be a good way for a optimal preparation of orthopedics sacroiliac resection with macroscopic tumor-free margin, by a maximal reduction of risks for intraoperative hemorrhage and pelvic organs damages.

Conflict of interest

No conflict of interest.

Funding

No sources of funding.

Ethical approval

We report about a single case that do not require ethical approval. The manuscript is not a clinical study.

Author contribution

Marc Possover did the project development, data collection and management, data analysis, manuscript writing/editing and surgery.

Key learning point

- Reduction of morbidity during surgery for iliosacral tumors.

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