Resection of Soft Tissue Tumors Extending Through the Obturator Ring

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Abstract

Pelvic soft tissue sarcomas are rare tumors often presenting larger than other soft tissue sarcomas and can extend into the thigh through various anatomic routes. Surgical resection is the main modality of curative treatment. En bloc tumor excision with wide, negative margins may reduce the risk of local recurrence. Soft tissue sarcomas extending through the obturator foramen create unique challenges to operative management.

This case report describes 2 cases of lipomatous lesions that extend through the obturator foramen, presenting as dumbbell-shaped lesions with large intra- and extrapelvis portions. One possible surgical approach performed in both patients is detailed with long-term follow-up. Postoperatively, 1 incidence of infection was reported. Functional outcomes were acceptable, with full restoration of ambulation without assistive devices in both cases and no hernia observed. Oncologic outcomes included locoregional recurrence in 1 patient at 24 months outside the radiation field.

The ideal primary treatment for all localized soft tissue sarcomas, including those extending through the obturator foramen, is resection. However, the unique subgroup of obturator ring soft tissue sarcomas has undefined outcomes and complications. The authors’ goal was to achieve en bloc resection with wide negative margins while preserving ipsilateral limb function. The surgical approach described in this case study offers a description of feasibility and discussion of theoretical and observed complications.

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oft tissue sarcomas account for approximately 1% of adult malignancies, and of these, only 5% are located in the pelvis. Pelvic soft tissue sarcomas are difficult to diagnose due to their location and rarity and may cause symptoms only when they become large. Compared with their extremity counterparts, the heterogeneous group of pelvic soft tissue sarcomas demonstrates a higher risk of recurrence, primary metastatic presentation, extensive size, early local invasion, and poorer prognosis.

Soft tissue sarcomas of the pelvic region can extend beyond the borders of the pelvis through a few routes, including the sciatic notch through the inguinal ligament or spemmatic cord, the femoral canal, direct extension cephalad from the iliac region, or the obturator foramen. In these cases, it may be difficult to determine whether the tumor originated in the pelvis or extended into the pelvis from a distal location. Regardless of location or orientation, surgical resection is a challenging and essential component of curative treatment. En bloc excision with wide surgical margins is associated with reduced local recurrence. The risk of local recurrence or seeding may be increased by surgical compromise (eg, bivalving) of soft tissue sarcomas extending through the obturator ring.

This tumor subset has unique operative risks. Dissection of such tumors with large adductor components may lead to avascular necrosis of the femoral head via damage to the medial femoral circumflex artery. In addition, viscera herniation may follow reconstruction of abdominal wall musculature previously anchored to the obturator ring. Pelvic soft tissue sarcomas extending through the obturator ring are exceedingly rare. Resection should avoid tumor compromise and aim to preserve ipsilateral limb function. Outcomes of surgical management in this tumor subset are unknown.

The purposes of this case report are to describe a surgical approach to tumors extending through the obturator ring with negative margin resection and report the long-term follow-up of postoperative complications, functional outcomes, and disease progression.

**CASE REPORTS**

A retrospective review of a sarcoma pathology database identified 2 patients with soft tissue tumors extending through the obturator ring. Medical records for these patients were reviewed after consent was obtained.

**Patient 1**

A 58-year-old woman presented with pain and swelling in the left thigh. Magnetic resonance imaging revealed a large fatty lesion in the pelvis extending into the medial compartment of the thigh through the obturator foramen (Figure 1). Core-needle biopsy was consistent with well-differentiated liposarcoma, and pathology verified a positive mouse double minute 2 (MDM2) gene amplification using fluorescent in situ hybridization. An MDM2 amplification can help distinguish between well-differentiated liposarcoma and some benign adipose tumors. Based on this diagnosis and the location of the tumor, the treatment plan was for surgical resection. Given the tendency of pelvic well-differentiated liposarcoma to recur at a higher grade, the recommendation was also made for postoperative radiation.

Resection was performed as described below. Surgical margins were negative. Following postoperative radiation, the patient developed moderate lymphedema in the leg, which was reasonably managed with myofascial massage and compression stockings. Ambulation without an assistive device was achieved following postoperative rehabilitation. Pain was managed initially with narcotic pain medications, but the patient was able to wean from these within 6 months. The patient was followed with imaging every 3 to 6 months over approximately 4 years and showed no recurrence at 39 months.

**Patient 2**

A 60-year-old woman presented with painless swelling of the right thigh. Magnetic resonance imaging revealed a large heterogeneous lesion in the pelvis (Figure 2). Core-needle biopsy showed a high-grade myxoid liposarcoma. The patient received preoperative radiation therapy to 50 Gy. Resection and reconstruction were performed as described below. Surgical margins were negative. Of note, this patient had a significant history of smoking, a well-established risk factor for postoperative wound infection.
Figure 3: Postoperative radiograph of patient 1 after en bloc tumor resection with modified type III hemipelvectomy and reconstruction of well-differentiated liposarcoma extending through the obturator foramen.

Figure 4: Intraoperative photograph of AlloDerm (LifeCell Corp, Bridgewater, New Jersey) reconstruction of the obturator ring in patient 1 after en bloc tumor resection and modified type III hemipelvectomy.

Surgical Technique

The excision was performed in both cases using an ilioinguinal incision with a T-shaped extension into the medial thigh. Femoral neurovascular structures were identified and isolated in both cases. Dissection in the medial thigh was done as an adductor excision without exposing the obturator ring. For patient 2, the medial hip capsule was removed as the lateral margin. Inside the pelvis, the retroperitoneal space was entered, and dissection of the tumor was performed in this plane. The obturator nerve and artery were identified and ligated in both cases. Once this was achieved, osteotomies were performed at the pubic symphysis and at the base of the acetabulum. This allowed the entire bony ring of the obturator foramen to be kept in continuity with the tumor. Soft tissue attachments to the obturator ring were then detached, and the mass was removed (Figure 3).

For reconstruction, a human acellular dermal basement membrane-prolene mesh (AlloDerm; LifeCell Corp, Bridgewater, New Jersey) patch was used to replace the obturator ring and was sutured to bony anchors at the pubis and acetabulum. The AlloDerm side faced the peritoneum to avoid adhesions, whereas the mesh side was directed toward the thigh muscle to promote scarring of musculature to the mesh (Figure 4). Soft tissues that had been removed from the obturator ring for exposure, including hamstring musculature, abdominal wall musculature, and the inguinal ligament, were reattached to the patch.

Results

Both patients underwent modified type III internal hemipelvectomy and AlloDerm-prolene mesh reconstruction. Both patients were older than 50 years, with a mean age of 59 years. Mean postoperative follow-up was 31.5 months. Postoperative outcomes were categorized as surgical, functional, or oncologic. The patient with the higher grade tumor and history of smoking experienced both a wound infection in the initial postoperative period and a tumor recurrence at 24 months postoperatively. Both patients experienced favorable functional outcomes because they were able to ambulate without the use of assistive devices after postoperative rehabilitation and reported no long-term pain or hernia in the affected region.

Discussion

The ideal primary treatment for all localized soft tissue sarcomas, including those extending through the obturator foramen, is wide resection. Effective curative treatment of soft tissue sarcomas necessitates surgical intervention.\(^2,5\)\(^-\)\(^7\) For the subset of tumors extending through the obturator ring, the optimal surgical approach is not clearly defined. The authors’ goal was to achieve en bloc resection with wide negative margins while preserving ipsilateral limb function. A modified type III internal hemipelvectomy was used to excise the tumor and obturator ring in entirety. Although the sample size is too small to draw conclusions, the cases described in this study offer a potential approach to tumors found in this rare location.

A limited body of literature exists on tumors extending through the obturator ring. To the authors’ knowledge, only 1 article has specifically discussed this subgroup.\(^1\) Therefore, the current authors’ understanding of prognostic factors and outcomes relies heavily on studies examining soft tissue sarcomas in all anatomic locations. Liposarcomas, as described in these 2 patients, are the most prevalent histological soft tissue sarcomas subtype.\(^9\) Microscopically, positive margins are the strongest prognostic factor for local recurrent disease, and wide resection is shown to lower the rate of local recurrence.\(^8\)\(^-\)\(^10\)\(^,\)\(^16\)\(^-\)\(^19\) However, the effect local soft tissue sarcoma control has on survival remains controversial.\(^8\)\(^,\)\(^16\)\(^-\)\(^19\) Local sarcoma control is important for, but cannot guarantee, long-
term survival.\textsuperscript{16,18} Large tumor size and high histologic grade are variables associated with poorer survival.\textsuperscript{2,8,16,20} In light of this, careful surgical excision remains the primary treatment of soft tissue sarcomas.

**Surgical Outcomes**

Potential surgical complications of this technique include, but are not limited to, infection, avascular necrosis, and hernia.\textsuperscript{6,20} The current authors observed infection in 1 patient that required surgical debridement and antibiotics. The patient’s significant smoking history and the high risk of infection with hemipelvectomy alone placed her at increased risk of wound infection.\textsuperscript{14} Lackman et al\textsuperscript{3} discussed complications in 30 patients with internal hemipelvectomy, of which 27% (n=8) experienced minor complications, such as infection, requiring a single incision and drainage with primary closure or drainage at the T-incision intersection. Rudert et al\textsuperscript{21} reported a deep infection incidence rate of 21% (8/38) in patients with periacetabular tumors excised via internal hemipelvectomy. Reddy and Brown\textsuperscript{15} reported 1 case of infection in 8 patients who underwent modified type III hemipelvectomy. The incidence of infection for the described resection is unlikely to be any higher than that of type III hemipelvectomy done for other tumors in this region.

Dissection and reconstruction also pose unique risks for complications following resection of obturator ring soft tissue sarcomas. Theoretically, the integrity of the medial femoral circumflex artery could be compromised during adductor dissection, leading to avascular necrosis of the femoral head. The medial femoral circumflex artery branches either directly from the femoral artery or via the profunda femoris artery and extends through the pectineus and iliopsoas muscles followed by the obturator externus and adductor brevis muscles before supplying the neck of the femur. Depending on the extent of the tumor, wide resection in this region could theoretically compromise this vessel, increasing the risk of avascular necrosis of the femoral head. In addition, compromise of the abdominal wall musculature, with insertion sites on the obturator ring, could lead to hernias through the reconstructed defect. It has been suggested that hernias tend to be underreported because they are often subclinical compared with more serious complications following internal hemipelvectomy.\textsuperscript{22} In the 2 current patients, neither avascular necrosis nor hernia were seen in long-term follow-up. However, 1 patient developed lymphedema after radiation but had no evidence of lymphedema in the 2-month period from surgery until radiation began, suggesting that the lymphedema was associated with radiation to the operative area.

**Functional Outcomes**

Rehabilitation for both patients included hamstring and iliopsoas strengthening, gait training, and eventual progression to ambulation. Physical therapy was delayed until complete wound healing in both patients. Following rehabilitation, both patients were able to ambulate without assistive devices within 6 months postoperatively. Pain was generally well managed in both patients, and both were pain free without use of narcotic medications 6 months postoperatively. Neither patient developed femoral or inguinal hernia.

**Oncologic Outcomes**

Oncologic outcomes include local recurrence or progression of the disease. The current authors followed disease progression in their patients with imaging every 3 months for 2 years and then every 6 months. Both patients had negative margins of resection. One patient remained disease free after nearly 4 years of follow-up. However, the second patient developed regional recurrence in the lumbar spine paravertebral soft tissue along the iliopsoas 24 months postoperatively. The recurrence rate for pelvic soft tissue sarcomas is high, and recurrence is not an unusual or unexpected event.\textsuperscript{2,3,12,13}

**Conclusion**

The surgical resection of soft tissue sarcomas is critical for curative treatment. En bloc resection of pelvic soft tissue sarcomas extending through the obturator ring with a modified type III hemipelvectomy is feasible and can be used to adequately treat these tumors while preserving function. Although this study has a small sample size, it is representative and provides relevant examples of surgical, functional, and oncologic outcomes following excision of this particularly challenging subset of pelvic soft tissue sarcomas.

**References**


