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MID-TERM CLINICAL OUTCOMES OF SURGICALLY TREATED MALIGNANT SACRUM TUMORS

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ABSTRACT

Objective: There are limited studies in the literature reporting clinical outcomes of malignant sacrum tumors due to their rarity. The aim of this study was to evaluate mid-term clinical outcomes of malignant sacrum lesions surgically treated by a single surgeon.

Materials and Methods: Patients who were surgically treated with the diagnosis of sacrum tumor were retrospectively analyzed. Patients who underwent surgical resection of malignant sacrum tumors were included. Exclusion criteria were incomplete medical records and follow-ups. Patients' demographics, type of the tumor, histopathological diagnosis, presence of neurologic deficit, type of approach, type of resection, presence of lumbopelvic fixation, postoperative complications, and recurrence rates were noted from our medical records.

Results: A total of 15 patients (7 females, 8 males) with a mean age of 43.3 years participated in the study. The most common histopathological diagnosis of the malignant sacrum tumor was chordoma that was seen in 10 of 15 patients (67%). Soft-tissue tumors (leiomyosarcoma and malignant mesenchymal tumor) were seen in 2 patients (13%), metastatic tumors (renal cell carcinoma and malignant melanoma) in 2 patients (13%), and primary osteogenic tumor (chondrosarcoma) in 1 patient (7%). Perioperative and postoperative complications were encountered in 7 of 15 patients (47%).

Conclusion: Chordoma was the most encountered malignant tumor of the sacrum according to our findings. Recurrence of the malignant sacrum tumor was so common that half of our patients had a history of previous treatment. It was remarkable that perioperative and postoperative complications were also common.

Keywords: Sacrum, malignant, tumor, surgery, spine

INTRODUCTION

Malignant tumors of the sacrum are a rare clinical entity. Most malignant sacrum tumors are low-grade malignancies, such as chondrosarcomas and chordomas, and a few are high-grade, such as sarcomas and osteosarcomas[1-3]. Treatment of these tumors requires a multidisciplinary approach. Oncologists, radiologists, radiotherapists, and spine surgeons must collaborate in diagnosis and treatment. After clinical, morphologic, functional, and laboratory examinations, it is essential to perform a biopsy for diagnosis[4,5]. After histological diagnosis, the team decides on personalized treatment.

Treatment protocols may constantly be changing. While the first treatment approach for Ewing's sarcoma was the surgery about ten years ago, it has become the next option after chemotherapy with new chemotherapeutic agents. For chordoma and chondrosarcoma, the surgical approach is still the first choice. While in some cases, en-bloc surgery is sufficient, in others, wide resection is required for long-term survival. The reason for the high number of local recurrences in the complex anatomy of the region, which makes it difficult to surgically reach the entire tumor[1-7].

There are limited studies in the literature reporting clinical outcomes of malignant sacrum tumors due to their rarity. It is important to share information about this rare clinical entity in order to guide orthopedic surgeons. Therefore, the aim of this study was to evaluate mid-term clinical outcomes of malignant sacrum lesions surgically treated by a single surgeon.

MATERIALS AND METHODS

This retrospective case-series study was performed under the approval of İstanbul Atlas University Ethical Review Board (ID: E-22686390-050.01.04-9540) and conducted in accordance with the Declaration of Helsinki. Informed consent was

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obtained for each patient. Patients who were surgically treated with the diagnosis of sacrum tumors between 2011 and 2019 were retrospectively analyzed. Patients who underwent surgical resection of malignant sacrum tumors were included in the study. Exclusion criteria were incomplete medical records and follow-ups.

Patients' demographics (age, gender), type of the tumor (congenital tumor, primary neurogenic tumor, primary bone tumor, primary soft-tissue tumor, metastatic tumor), histopathological diagnosis, presence of neurologic deficit, type of approach (anterior, posterior, lateral), type of sacrum resection (total, hemicorporectomy, partial, hemisacrectomy), presence of lumbopelvic fixation, postoperative complications and recurrence rates were noted from our medical records.

Statistical Analysis

Descriptive statistical analysis was performed by using SPSS 25.0 software (SPSS Inc., IBM, NY, USA). Numerical variables were given as means and standard deviations, and categorical variables were given as frequencies and percentages.

RESULTS

A total of 15 patients (7 females, 8 males) were participated in the current study. The mean age of the patients was 43.3±16.6 years old (ranges, 20 to 69 years old). The mean follow-up time was 5.2±2.9 years (ranges, 3 to 11 years). The most common histopathological diagnosis of the malignant sacrum tumor was chordoma.

Chordoma, was seen in 10 of 15 patients (67%). Soft-tissue tumors (leiomyosarcoma and malignant mesenchymal tumor) were seen in 2 patients (13%), metastatic tumors (renal cell carcinoma and malignant melanoma) were seen in 2 patients (13%), and primary osteogenic tumor (chondrosarcoma) was seen in 1 patient (7%).

Eight of 15 patients (53%) had a history of previous treatment for the diagnosis of malignant sacrum tumor that revealed these patients underwent resection of the recurrent malignant sacrum tumor. The neurogenic deficit was present in 5 of 15 patients (33%) preoperatively. Operative data of the patients were demonstrated in Table 1.

Perioperative and postoperative complications were encountered in 7 of 15 patients (47%). The most common perioperative complication was rectum perforation which occurred in 2 of 15 patients. These two patients underwent primary repair by the general surgeon. One patient had a dura mater tear during surgery and it was primarily repaired. The most common of postoperative complication was prolonged drainage and closure defect of the wound that occurred in 3 patients. These patients underwent wound debridement and vacuum-assisted closure treatment. Postoperatively one patient had a neurologic deficit and this patient underwent revision of the screw fixation. During follow-ups, 3 patients had recurrence of the tumor (2 chordoma and 1 malignant mesenchymal tumor).

Table 1. Operative data of the patients

Patient	Gender	Age	Histopathologic diagnosis	Approach	Sacrectomy level	Resection type	Nerve sacrification	Lumbo-pelvic fixation
1	Male	44	Chondrosarcoma	Lateral	Upper	Hemisacrectomy	None	Yes
2	Male	40	Leiomyosarcoma	Lateral	Middle	Hemicorporectomy	None	Yes
3	Female	47	Chordoma	Posterior		No resection	None	No
4	Female	67	Chordoma	Posterior	Upper	Partial	None	No
5	Female	62	Chordoma	Posterior		No resection	None	No
6	Female	41	Malignant melanoma	Ant. + Post.	Upper	Partial	None	Yes
7	Female	35	Chordoma	Posterior		No resection	None	No
8	Male	38	Malignant mesenchimal tumor	Posterior	Upper	Partial	None	Yes
9	Female	53	Chordoma	Posterior	Middle	Partial	None	No
10	Female	20	Chordoma	Posterior	Middle	Partial	None	No
11	Female	62	Renal cell carcinoma	Ant. + Post.	Upper and middle	Partial	None	Yes
12	Male	20	Chordoma	Posterior		No resection	None	No
13	Male	69	Chordoma	Lateral	Middle	Partial	None	No
14	Male	21	Chordoma	Ant. + Post.		Total	L5	Yes
15	Male	31	Chordoma	Lateral		No resection	None	No

Ant.: Anterior, Post.: Posterior

DISCUSSION

Chordomas are the most common histopathological form in sacral tumors. They constitute approximately 40% of all malignant sacral tumors. Less frequently, sarcomas and other metastatic tumors. In our series, 10 of 15 cases were chordomas (67%). This tumor originates from the notochord and is aggressive. Although it is considered a tumor, grows slowly[5]. The most prominent symptom is hip and leg pain. Pain occurs when the tumoral tissue compresses the surrounding tissues. Neurological symptoms are independent of pain[7,8].

Combined techniques are generally used in the treatment. The tumor size, localization, borders, and character of the tumor play a role in the selection of treatment. Chordomas and chondrosarcomas are tumors that are resistant to radiotherapy and chemotherapy, but radiotherapy and chemotherapy are applied as adjuvant treatment after resection surgery. Especially after partial and subtotal resections, the success of the treatment, and longer survival without long-term recurrence, adjuvant therapy is necessary[1,7,8]. In our series, all our patients received adjuvant radiotherapy and chemotherapy. New chemotherapeutic agents are effective both in increasing the effectiveness of surgery and in obtaining more successful results in cases where surgery cannot be performed[3,9,10].

Surgical approaches are classically anterior, posterior, lateral, and combined approaches. Combined approaches are preferred for more successful results and long-term survival. An anterior approach is required if the tumor has invaded the pelvic organs. If spinopelvic fixation is required, posterior and combined approaches are recommended. In our series, a posterior approach was required in 8 cases, a lateral approach in 4 cases, and a combined approach in 3 cases. Depending on the location of the tumor, sacrectomy levels vary, and nerve root sacrification may sometimes be inevitable in more proximal tumors. Stabilization may be necessary in cases where lumbosacral instability develops[11,12]. Lumbosacral fixation also provides an advantage in terms of postoperative quality of life for the patient[12]. We performed lumbosacral stabilization in a case where the tumor borders exceeded the lumbosacral junction and we had to sacrifice the L5 nerve root. If more than 50% of the sacroiliac joint is removed and lumbosacral instability occurs, stabilization is required[11-14].

In cases where the resection is large, a rectus abdominis myocutaneous flap is used to close the defect area. We used the rectus flap for defect closure in two of our cases where we performed high sacrectomy with the anterior-posterior combined approach, and we achieved successful results. Early postoperative surgical site infection is one of the most common complications. Being close to the perineum facilitates infection. Wide resection and cavity formation also pave the way for infection. The early infection rate in the literature is between 25% and 50%. In our series, early infection was found to be 36%, similar to the literature. The infection rate in intralesional resections is significantly lower. In addition, lumbopelvic fixation can prevent instability and reduce infection formation[15-17].

For postoperative rehabilitation and ambulation, the preservation of the L5-S1 nerve root and the preservation of the S2 nerve root are necessary and important for sphincter function. While the preservation of the nerve roots is necessary for the functions, on the other hand, sacrificing the nerve root and performing wider resection is important in preventing local recurrences[16,17]. In our series, the L5 nerve root was sacrificed in only 1 case. Our view is to preserve the L5 nerve root as much as possible for functional results. We tried to resection from the widest possible border while trying to preserve the nerve root as much as possible.

Study Limitations

The main limitations of our study were its the limited number of cases and retrospective design. However, we reported outcomes of a rare clinical entity, the surgical treatment of malignant sacrum tumor, in which outcomes of treatments as well as giving information about potential complications are very important for spine surgeons. Further studies with larger cohorts are needed in order to better assess outcomes, complications, and recurrence rates.

CONCLUSION

Chordoma is the most encountered malignant tumor of the sacrum according to our findings. Recurrence of the malignant sacrum tumor was so common that half of our patients had a history of previous treatment. It is remarkable that perioperative and postoperative complications were also common in our series, even if surgical treatment had been performed by an experienced spine surgeon.

Ethics

Ethics Committee Approval: Ethics committee approval was obtained from İstanbul Atlas University Ethical Review Board (ID: E-22686390-050.01.04-9540).

Informed Consent: Informed consent was obtained for each patient.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: U.A., Concept: K.T., U.A., Design: K.T., U.A., Data Collection or Processing: Y.U., Y.O.K., M.K., Analysis or Interpretation: K.T., Y.U., Y.O.K., M.K., A.T., Literature Search: A.T., Writing: K.T.

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