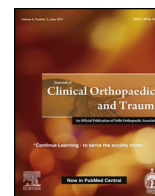




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Full length article

Surgical management of pelvic bone sarcoma with internal hemipelvectomy: Oncologic and Functional outcomes

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ABSTRACT

Introduction: The management of pelvic sarcoma is challenging and goals of surgery are adequate oncologic local control, maintenance of optimum function with good quality of life.

Methods: We have evaluated the results of internal hemipelvectomy including age, type of resection, reconstruction, radiotherapy or chemotherapy. From 2010 to 2016, 23 patients with pelvic bone tumors (13 with Ewing's sarcoma, 9 with Osteosarcoma, 1 with chondrosarcoma) were treated by surgical resection.

Results: The mean follow-up was 18 months (0.5–5) years. In 12 patients reconstruction was performed and 11 were without reconstruction. A total of 3 patients (13%) had an infection develop at a mean follow up of 1 month. Surgical debridement's and antibiotics in three patients led to complete recovery. One patient had sciatic nerve injury. One patient had injury to femoral vein; was treated with femoral vein reconstruction. Two patients (9%) developed a local recurrence and were treated with best supportive treatment. Distal pulmonary metastases were seen in four patients and treated with supportive treatment. Five-year disease-specific survival rates of all patients were 83%. The mean functional MSTs score was 18(14–24).

Conclusions: Proper selection of patients, preoperative planning and wide surgical margins with reconstruction provides good functional outcomes following internal hemipelvectomy. The surgical site infection and flap necrosis tend to be minor complication and can be managed leading to optimal outcomes and justifies the need for this complex surgery. The oncological and functional outcome after internal hemipelvectomy suggests that it's an effective method for treatment of patients with pelvic sarcomas.

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1. Introduction

Malignant tumors of pelvis include osteosarcoma, Ewing's sarcoma and chondrosarcoma¹. The management of pelvic sarcoma is challenging and goals of surgery are adequate oncologic local control, maintenance of optimum function with good quality of life. The overall results of the patients are governed by multiple factors including the extent of tumor, resection type and reconstruction method and response to chemotherapy. The limb salvage surgery for pelvic sarcoma performed with internal

hemipelvectomy. There are four types of pelvic resections i.e. Iliac (type I), Periacetabular (type II), Pubic bone (type III), Sacrum (type IV) and combined resections^{1–3}.

Due to uncommon location and delay in diagnoses pelvic tumors are often large in size and proximity to major neurovascular structures, bowel and bladder poses a herculean task to oncosurgeons.² Recent advances in diagnoses, chemotherapy regimens, and multidisciplinary approach have led to limb salvage in these complex tumors around pelvis region.^{1–4} Resection of pelvic sarcomas involves removal of affected bone, adjoining muscles and leads to instability and loss of pelvic ring architecture.^{1,2,5–7} Following the resection of pelvic sarcomas reconstruction method plays important role to prevent functional impairment.^{5–8} Polypropylene mesh graft can be used for soft-

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tissue reconstruction in internal hemipelvectomy.⁷ Biological reconstruction after internal hemipelvectomy provides good functional outcomes.^{5,8} Endoprosthetic replacement and hip transposition are alternative methods for reconstruction following hemipelvectomy surgery. The overall infection rate described in literature after internal hemipelvectomy is from 10% to 50%.^{1–5,10,11} Other complications can include local recurrence, hematoma, delayed healing skin problems and nerve injuries, bowel and bladder injuries.^{1–5,8}

The objective of this study was to evaluate the oncological and functional outcome after Internal hemipelvectomy surgery.

2. Methods

The study included 23 patients with a malignant pelvic bone tumor surgically treated between 2010 and 2016. 23 patients with pelvic bone tumors (13 with Ewing's sarcoma, 9 with Osteosarcoma, 1 with chondrosarcoma) were treated by surgical resection. We have evaluated the results of internal hemipelvectomy including demographic data, type of resection, reconstruction, radiotherapy or chemotherapy. The medical records, imaging, oncologic and functional status were reviewed for these patients.

The diagnoses was established with radiograph imaging, magnetic resonance imaging followed by needle biopsy under image guidance or computed tomography. Histopathological diagnosis was established by trained musculoskeletal pathologist. Staging investigation included bone scan and computed tomography of chest. Patients with Ewing's sarcoma and osteosarcoma were administered neoadjuvant chemotherapy as per hospital protocol.

The surgical planning for internal hemipelvectomy was performed with plain radiograph of pelvis, magnetic resonance imaging and 3 D computed tomography. Trained radiologist opinion was obtained preoperatively for defining the bony cuts with safe oncologic margins. The patient and relatives were properly counseled about treatment plan and a written informed consent about surgery was obtained.

The surgical planning consisted of oral plegic for bowel preparation and low molecular heparin 0.6 units on preoperative evening. Whole blood and blood products were preserved in blood bank as per the patient's hemoglobin levels. The patient was administered general anesthesia followed by epidural spinal anesthesia for hemipelvectomy surgery. The Enneking classification was used and is having four types of pelvic resections i.e. Iliac (type I), Periacetabular (type II), Pubic bone (type III), Sacrum (type IV) and combined resections.^{1–3} Combinations of these resections were also performed. The incision was made according to the type of intended pelvic resection. The previous biopsy scar was eclipsed out from the incision. The major neurovascular vessels, femoral and sciatic nerves were preserved and mobilized from the tumor. Osteotomies were made through the pelvic bone using giggly saw and osteotome. Frozen section study was done for evaluating the status of bony and soft tissue margin. The reconstruction method used was polypropylene mesh in selected cases as per the instability of hip joint. The mesh was used as an anchoring structure from greater trochanter to remaining pelvic bone. The joint capsule was reconstructed use of a polyethylene mesh to form a tube like structure and was fixed to the pelvis with transosseous sutures and formed a pouch for the femoral greater trochanter. All remaining muscles were sutured along with mesh by prolene no. 0. The incision was closed after achieving proper homeostasis with two drains. Postoperative ankle pump and static quadriceps exercises were started from next post operative day. The resected tumor specimens were examined for surgical margins (free of tumor or involved of tumor) and histological response to chemotherapy. The patients were on regular follow-up every 1

month for the first 3 months, 3 monthly for 1 year and 6 months for next 3 years. The patients were assessed clinically for local recurrence and plain radiograph bone scan and computed tomography of chest was performed. Musculoskeletal Tumor Society (MSTS) scoring system was used to assess the functional status of the patients. Kaplan-Meier method was used to assess the oncologic outcomes and survival rate outcomes. The physiotherapy protocol included Type 1 hemipelvectomy: Non weight bearing walking for 2 weeks followed by partial weight bearing for 6 weeks and full weight bearing 8 weeks after surgery. Type 2: Non weight bearing walking for 4 weeks followed by partial weight bearing for 12 weeks and full weight bearing 16 weeks after surgery. Type 1 + 2: Non weight bearing walking for 4 weeks followed by partial weight bearing for 12 weeks and full weight bearing 16 weeks after surgery. Type 2 + 3: Non weight bearing walking for 4 weeks followed by partial weight bearing for 12 weeks and full weight bearing 16 weeks after surgery. Type 3 + 2: Non weight bearing walking for 4 weeks followed by partial weight bearing for 12 weeks and full weight bearing 16 weeks after surgery. Type 3: Non weight bearing walking for 2 weeks followed by partial weight bearing for 6 weeks and full weight bearing 8 weeks after surgery.

The mean follow-up was 18 months (0.5–5) years. In 12 patients reconstruction was performed and 11 were without reconstruction. A total of 3 patients (13%) had an infection develop at a mean follow up of 1 month. Surgical debridement's and antibiotics in three patients led to complete recovery. One patient had sciatic nerve injury and one patient had injury to femoral nerve; was treated with femoral vein reconstruction. Two patients (9%) developed a local recurrence and were treated with best supportive treatment. Distal pulmonary metastases were seen in four patients and treated with best supportive treatment. Two- and five-year disease-specific survival rates of all patients were 80.1% and 60%, respectively. The mean functional MSTS score was 18 (16–22).

3. Results

There were 9 female and 14 male patients with an average age of 25 years (range 11–40 years). The mean follow-up was 18 months (range, 0.5–5 years). Type 1 resection was done in 7, Type 2 was done in 2, Type 1 + 2 resection was done in 4, Type 2 + 3 resection in 1, Type 3 + 2 resection in 4, Type 3 resection in 5 (Figs. 1–3). After resection, various methods of reconstruction were adopted [Table 1]. In 12 patients reconstruction was performed; in 11 were without reconstruction. Screw fixation was performed in 5 patients to achieve stability around the pelvis. Prolene mesh was



Fig. 1. Preoperative radiograph of osteosarcoma pelvis with iliac bone involvement (Arrow towards tumor).

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