

Malignant Sternal Tumors: Report of Two Cases.

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Abstract

Primary malignant sternal tumors are rare clinical entities. We came across two such patients with primary sternal tumors. One was a chondroblastic osteosarcoma while the other was a chondrosarcoma. One patient received neoadjuvant chemotherapy followed by surgery. The second patient underwent upfront surgery. Both cases received wide excision of the tumor (sternum along with part of medial ends of bilateral clavicles and upper ribs). Reconstruction was done using autologous bone graft with prolene mesh in one case and titanium reconstruction plates in the other case. Both cases received coverage with pectoralis major muscle flaps.

Key words: *sternum, osteosarcoma, chondrosarcoma, resection.*

Introduction:

Primary sternal tumors are an uncommon clinical entity. Most of these tumors are malignant, usually sarcomas arising from the bone or soft tissues of the sternum. Chondrosarcoma and osteosarcoma form the bulk of the histology of these tumors.¹ They mostly present with a palpable sternal mass and CT scans usually give the diagnosis. Surgical resection is the most effective treatment option in most cases. The goal of surgery is en bloc removal of tumor along with stable reconstruction of the chest wall. Various techniques for reconstruction have been tried including Marlex sandwich with methyl methacrylate, autologous bone, prolene mesh, titanium plates and mesh and various other techniques. Here we report two cases of sternal tumors which were managed with resection and reconstruction using two different techniques.

Case Reports:

Case 1:

A 54 year old male presented with complaints of chest pain of four months duration along with a slowly growing mass over the anterior chest wall. He underwent a core-cut biopsy of the lesion, with histopathology (HPE) and Immunohistochemistry (IHC) favoring chondroblastic osteosarcoma. CT scans (fig. 1) revealed a moderately enhancing expansile soft tissue mass of size 9.7cm*11cm*12cm with extensive intralesional calcifications in mid anterior chest wall involving sternal manubrium and bilateral first chostochondral junction, extending to anterior mediastinal space. Vital structures were not involved and no metastases were noted. He received three cycles of neoadjuvant chemotherapy (cyclophosphamide, doxorubicin and dacarbazine). Post

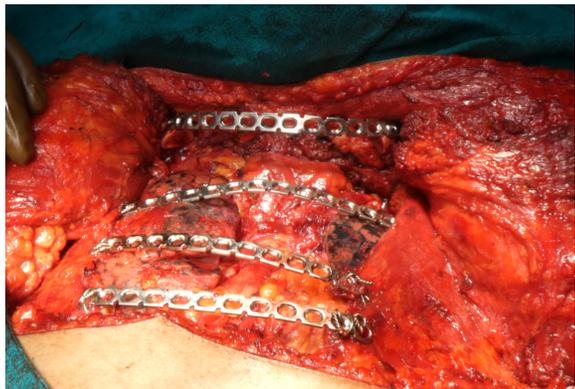
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Fig 1: CT scan of case 1.



chemotherapy CT scans revealed no change in tumor characteristics. He underwent surgery with

Fig 2: Reconstruction of sternal defect using titanium recon plates. B/L pectoralis muscle flaps have been raised.



wide local excision of the tumor (hemi sternectomy) with three cm of healthy sternal margins along with bilateral clavicular heads and first to fourth ribs sections. No invasion of deeper structures were noted. Chest wall reconstruction was done with titanium recon plates which were fixed to bilateral ribs with steel wires (fig. 2). Bilateral pectoralis major muscle flaps were mobilized for anterior coverage and skin was approximated. Post-operatively he required supplemental oxygen for 8 days and paradoxical

chest movement was noted initially, which subsided after a week. Bilateral chest drains were removed in fourth post-operative day. He developed superficial surgical site infection which was managed with opening the wound and daily dressings. Wound swab cultures were negative and skin was re-approximated with polypropylene suture following resolution of discharge. He is doing well 2 months after surgery and is receiving adjuvant chemotherapy.

Case 2:

A 65 year old man presented with a slow growing lump in the anterior chest wall of 7 months duration. Physical examination revealed a 4*4cm mass arising from the sternum. There was no skin involvement. Fine needle aspiration of the lesion done in another center was suggestive of chondrosarcoma. CT scan of the chest revealed an expansile lytic and sclerotic lesion of size 4.3cm*4.4cm within manubrium sterni with chondroid matrix and associated soft tissue

Fig 3: CT scan of case 2.



component with few foci of calcification (fig. 3). He underwent upfront surgery with wide excision

of tumor including the manubrium sterni and bilateral clavicular heads along with first and second rib sections. There was no invasion of deeper structures. In this case reconstruction was done with rib autograft which was harvested from the sixth rib. The harvested rib was divided in half and one part was attached to bilateral cut clavicular ends while the other rib section was attached from the center of the previously attached rib graft to the remaining inferior sternal margin such that the grafts made a T-shape. This was reinforced with a large prolene mesh which was sutured taut to all exposed ribs, sternal and clavicular margins (fig 4). Right pectoralis major muscle flap was finally mobilized and used to cover the reconstruction and skin was approximated. Post operatively patient required supplemental oxygen for 5 days. Paradoxical chest movement, present initially, subsided within a week and all drains were removed on 4th post-operative day. He is doing well after 3 months of surgery.

Discussion:

Sternal tumors are a rare diagnosis. Most commonly they present as a metastatic nodule from primaries such as breast cancer, thyroid cancer or lymphoma.² Primary malignant sternal tumors (PMST) are even rarer. A review of cases of PMSTs at a large cancer center in USA over a 64 year period reported only 58 cases.¹

Most of the patients in this series had chondrosarcoma (48%), followed by osteosarcoma (19%). Other histologies included plasmacytoma (15%), lymphoma (10%), angiosarcoma (1.8%), Ewing's sarcoma (1.8%)

and others. These patients generally present with a palpable mass appearing over the anterior chest wall, but occasionally present incidentally with asymptomatic radiological findings. Diagnosis can be done using a core needle sampling. CT imaging helps in characterizing the lesion. It provides information regarding direct extent of tumor and presence of pulmonary metastases. MRI is useful if vascular or cardiac invasion is suspected.³

Surgery is the mainstay therapy for local control of sternal tumors unless Ewing's sarcoma, plasmacytoma or lymphoma are suspected. These cases are primarily treated with chemotherapy and/ or radiation but surgery may be needed in residual disease or in doubtful diagnosis. Surgery entails en bloc resection of tumor with 3-4cm of tumor free margin.⁴ This may require total or subtotal sternectomy along with resection of large part of multiple ribs and both clavicles. Following resection, sternal reconstruction is necessary in order to achieve protection to the exposed thoracic viscera and to provide a rigid chest wall necessary for respiration. Plenty of options are available for this which includes Marlex sandwich with methyl methacrylate, autologous bone graft, prolene mesh, titanium mesh and reconstruction plates.⁵⁻⁹ Newer reconstruction techniques include use of 3D printed materials adapted to patient's defect.¹⁰ In our case we used non vascularized rib graft which was shaped in a T form and attached to the bone edges. Stability was reinforced with prolene mesh. In the other case titanium recon plates were used along with prolene mesh for reconstruction. In both cases flap coverage was provided by pectoralis major muscle flap. These

Fig 4: Reconstruction of sternal defect using sternal autograft (4a). Graft has been covered with prolene mesh (4b).



techniques used in reconstruction of post-excisional anterior chest wall defects are technically reproducible, and cost effective. Adjuvant chemotherapy and radiotherapy can be given following reconstruction using these techniques. Our experience suggests en bloc resection is a good modality for multidisciplinary management of sternal tumors. Reconstruction can be done using standard principles and with use of locally available materials.

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