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Case Series

Chondrosarcoma of the anterior chest wall: surgical resection and reconstruction, our institutional experience

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ABSTRACT

Primary chest wall tumours are not very common. Chondrosarcomas is most common tumour arising from the chest wall. It occurs more often during the third and fourth decade of life. Chondrosarcomas are resistant to conventional chemotherapy and radiotherapy. Wide margin surgical excision remains the best available treatment approach. For chondrosarcomas involving the chest wall, surgical excision may result in chest wall defects that may require reconstruction to obliterate dead space, restore chest wall rigidity, preserve respiratory mechanics, maintain pulmonary function, protect intrathoracic organs, provide soft tissue coverage and minimize deformity. In this article we present a series of 3 cases of chondrosarcoma of anterior chest wall managed at government Royapettah hospital, Kilpauk medical college, Chennai. A 71-year-old male patient, a case of 22×20 cm giant chondrosarcoma arising from anterior left chest wall involving 2nd to 8th ribs. We did wide local excision and reconstruction of chest wall with a synthetic bone cement (methyl methacrylate) construct, sandwiched between two layers of polypropylene mesh. A 38-year-old male patient, a case of 8×6 cm chondrosarcoma of left anterior chest wall involving 9th rib, we did wide excision of tumor along with 8th, 9th, 10th ribs and defect reconstructed with prolene mesh. A 37-year-old male patient, a case of 5×4 cm chondrosarcoma arising from left 4th rib. We did wide excision along with 4th rib and primary closure. Patients with chondrosarcomas generally have a good prognosis when optimally diagnosed and treated. Our case series is interesting due to the different sizes of chondrosarcomas at presentation, which are managed differently. Complete resection with wide surgical margin remains the best available treatment, but post resection chest wall reconstruction is posing a great surgical challenge.

Keywords: Primary chest wall tumours, Chondrosarcomas, Surgical excision

INTRODUCTION

Chondrosarcoma is the most common primary chest wall malignancy (accounting for nearly one-third).[1] Patient with chest wall chondrosarcoma (CWC) presents with slow-growing mass, which is often painful. it arises either from the vicinity of the costochondral junction or the sternum.[2] It is more common in the sixth decade of life and has a slight male predominance.[2] past history of radiotherapy, malignant degeneration of a chondroma or osteochondroma, can be associated with CWC.[2] Surgical excision remains the major treatment for CWC since they are resistant to chemotherapy and radiotherapy.[3] The goal of surgical resection is to get a wide disease-free margins along with the maintenance of chest wall stability. The reconstruction of large chest wall defects resulting from tumor resection presents a great challenge to surgeon and plays a major role in patient treatment. The reconstruction allows the surgeon to perform the tumor resection with adequate margins that prevent a positive margin. A multidisciplinary collaboration is essential to reduce the incidence of postoperative complications, and to improve patient recovery. We (Department of surgical oncology, Royapettah government hospital, Kilpauk medical college, Chennai) report 3 cases of a CWC, where we did wide resection with negative margins and effective reconstruction.

CASES SERIES

Case 1

A 71-year-old man presented to our tertiary oncologic hospital with complaints of a chest wall mass that he first noticed 4 years earlier, which had grown rapidly in recent times and attained present size. Physical examination showed a large painless mass of the left anterolateral thoracic wall (Figure 1).

Figure 1: Large mass with significant deformity of the left chest wall: anterior and lateral views.

A computed tomography (CT) scan and a guided biopsy is performed, which is consistent with a CWC involving the second to eighth left side ribs, with a mass-effect on the mediastinal structures, collapse of the left lung lobes (Figure 2).

Figure 2: Preoperative computed tomography scan, axial planes: chondrosarcoma's characteristic findings (lobulated mass) with extensive destruction of the left ribs and compression of the mediastinum structures and left lung lobes collapse.

A careful preoperative plan was set for complete CWC resection while preserving potential regional reconstructive options and their vascular supply. The patient underwent a wide en-bloc resection of the tumor, including the adjacent left chest wall, the second to eighth left ribs. (Figure 3A and B).

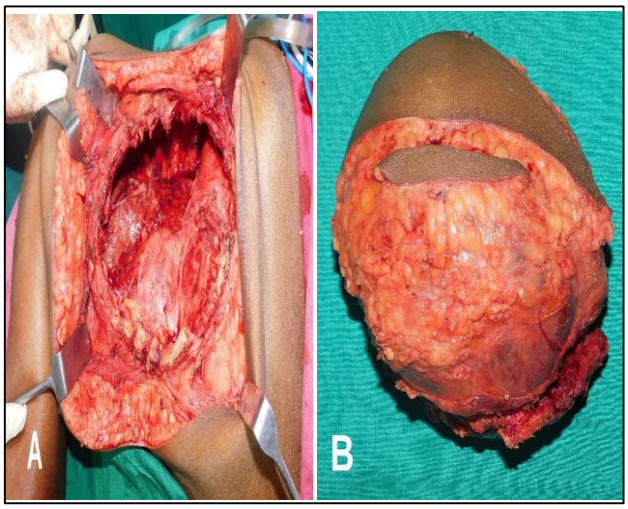

Figure 3 (A and B): Large anterolateral chest wall defect, resected tumor specimen.

The histopathologic analysis reported a grade III conventional chondrosarcoma. Complete tumor excision with negative histologic margins was obtained. Reconstruction of the full-thickness chest wall defect was achieved with a sandwich technique of methyl methacrylate (MMA) between two layers of polypropylene mesh, sutured to the remaining ribs to maintain thoracic wall stability (Figure 4).

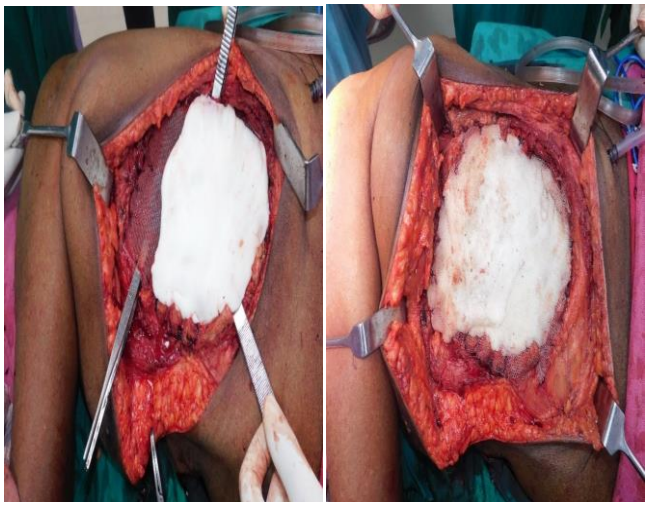

Figure 4: Reconstruction of the chest wall skeletal component with MMA-polypropylene mesh sandwich technique.

We were able to do direct skin closure without the need for grafting or a musculocutaneous flap due to the auto-expansion of non-affected thoracic skin by the tumor. In postoperative period patient had wound dehiscence with exposed mesh, which is managed with local transposition flap (Figure 5).

Figure 5: Postoperatively wound dehisence with visible mesh, managed by local transposition flap.

Again patient had wound dehisence with mesh exposed. We removed the bone cement along with mesh and defect was reconstructed with vertical rectus myocutaneous flap.

Case 2

A 38-year-old male patient, a case of chondrosarcoma of left chest wall involving 9th rib, we performed wide excision of tumor along with excision of 8th -10th ribs and defect reconstructed with prolene mesh. Patient is on regular follow-up.

Case 3

A 37-year-old male, a case of chondrosarcoma arising from left 4th rib. We did wide excision along with 4th rib excision and the defect is closed primarily without the need of mesh. Patient is on regular follow-up.

DISCUSSION

Though chondrosarcoma is rare, it is the most common malignant tumor of the chest wall, and a prompt diagnosis is required. Most patients present with an enlarging, painful mass arising from the bony costochondral junction or the sternum. A Computed tomography scan is the gold standard imaging study for diagnosis and operative planning.[4] The keys to successful treatment are early recognition and radical excision with adequate margins, as chondrosarcoma is relatively resistant to radiotherapy and chemotherapy.[2,3]

Among one of the cases reported herein presents peculiar and interesting features of CWC management and chest wall reconstruction. Besides being a rare entity, this chondrosarcoma's dimensions are markedly larger than those reported in the literature.[5] Clinical presentation with a painless mass is unusual (about 25% of cases), especially in large tumors. The typical chondrosarcoma CT findings were present in our case, consisting of a lobulated mass with destruction of multiple ribs. After the diagnosis was confirmed by core needle biopsy, a wide en bloc resection with appropriate margins, chest wall reconstruction preserving respiratory mechanics was considered the best option, according to primary CWC recommendations.[2] Reconstruction of full-thickness defects of the chest wall remains a great challenge due to its role in respiratory function and the protection of vital intrathoracic organs. For skeletal support reconstruction, synthetic materials are currently used.[6] The ideal characteristics of prosthetic materials include: rigidity which avoids paradoxical chest motion, malleability (shapable according to defect), inertness (allowing in-growth of fibrous tissue and preventing infection), and radiolucency (helps in radiographic follow-up).[7-9] many varieties of synthetic materials are available, providing reliable stability and contributing to full recovery after oncologic resection of the chest wall, with associated shorter hospital stay. Polypropylene mesh combined with MMA in a sandwich technique is used when additional rigid support was needed, which provides excellent physiologic and aesthetic outcomes.[5,7,8] Bioprosthetic meshes are also available, which can be used in places which are at risk of infection or skin dehiscence where the synthetic mesh is contraindicated.

The reconstructive choice for skeletal support should consider different aspects of the chest wall defect: (i) small defects (<5 cm) or those located posteriorly under the scapula above the fourth rib, may not require skeletal reconstruction, (ii) lateral defects more often require mesh reconstruction, (iii) for resection of <4 ribs a mesh-only reconstruction is applied (similar to our 2nd case) and (iv) for ≥4 ribs and/or a sternal resection, mesh with MMA is recommended (case 1).[5,10] MMA has been mainly used for rigid chest wall reconstruction, often sandwiched between two layers of polypropylene mesh, which is modelled to the thoracic curve. It is relatively inexpensive, and it also provides excellent stability and coverage of vital structures.[11] However, MMA was associated with higher rates of seroma (long duration) and infection requiring removal, problems with anchorage and high chance of dislocation and fracture of the MMA edges with associated chronic pain.[12]

More recently, titanium prosthetic devices have been used for chest wall reconstruction.[13] Titanium devices provide a light-weight but a strong rigid support for rib fixation. Their advantages include a high strength-to-weight ratio, precise moulding according to shape of ribcage, integration with the bone over time, resistance to infection, and low interference with the CT.[14] However, some complications like fracture or displacement of the titanium prosthesis were reported in the literatyre.[14] In complex chest wall defects, the reconstruction with titanium devices usually requires combination with synthetic or biological meshes and/or muscle flap coverage.

Soft-tissue coverage is mainly based on the defect location and its size, the availability of local and regional options,

previous surgeries or radiotherapy. The pedicled muscular or musculocutaneous flaps are usually the first choice for. The most commonly used flaps are latissimus dorsi (LD), rectus abdominis, pectoralis major.[11] Free flaps are reserved for cases where regional flaps are unavailable, insufficient, or have previously failed.

Preoperative planning is very important and requires evaluation of the anticipated defect, considering the defect's size and layers to repair (skeleton and soft tissue), and the preservation of potential reconstructive options without compromising the appropriate extension of tumor resection. In our case1, the patient underwent resection of seven ribs, which is a significant number considering the data reported in the literature (mean: three to four ribs).[15] Chest skeletal support was restored with the MMA-polypropylene mesh sandwich technique. Planning of the surgical incision placements for thoracotomy access is essential if a regional flap is to be used for reconstruction. Sparing the LD and serratus muscles during thoracotomy, or the pectoralis muscle in anterior resections-also avoiding the section of flap dominant pedicles-will preserve these options for subsequent reconstruction.

CONCLUSION

Chondrosarcomas usually have a good prognosis when compared to other chest wall malignancies, with 5-year survival rates of 85-90%. A complete tumoral excision with negative margins in addition to a successful functional and aesthetic chest wall reconstruction was accomplished in our patients. Tumoral resection must never be compromised due to concerns regarding the defect closure. Safe and reliable one-stage tumoral resection and chest wall reconstruction will have optimal oncologic outcomes and minimal patient morbidity. Mesh repair with or without bone cement seems to be inferior to more expensive alternatives like titanium plate.

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