Abstract:
Though the commonest malignant tumour of the chest wall is chondrosarcoma, its occurrence in the sternum is very rare. Apart from that, the sternal reconstruction after wide excision of the tumour needs special techniques. The method we applied in this case was quite appealing in results. The knowledge of this method will be helpful when one encounters such a case.

Keyword: chondrosarcoma sternum, sternal tumours, sternal defect, sternal reconstruction

CASE STUDY: A 40 year old female patient presented with complaint of swelling over sternum since 4 months. The patient noticed rapid increase in size of the tumour. She also had vague pain over the swelling on exertion. The tumour was arising from manubrium sternum and of size 6x6cms with diffuse margins with bony hard consistency.

FNAC was reported as possibilities of 1Chondrosarcoma, 2 Plasma cell myeloma. Serum electrophoresis results were normal. HRCT lungs showed absence of involvement of lungs or underlying major vessels or heart.
Radio-isotope bone scan showed no evidence of distant metastasis.

PREOPERATIVE SURGICAL PLAN:
Since surgery is the primary modality of treatment for this tumour, wide excision was planned after discussing with surgical oncologist and plastic surgeons. The most important part of the surgery, the reconstruction of the chest wall defect after wide excision, was discussed and planned preoperatively. The coverage of the defect should fulfill the following three criteria:
1) Patient should not have respiratory insufficiency because of anterior flail chest.
2) A depression in the front of chest should be avoided for cosmetic reasons.
3) The tissue/prosthetic covering of the defect should be as good as the original chest wall in order to protect the great vessels and the heart underneath.

The plan of reconstruction was made preoperatively itself and proceeded to surgery.

SURGERY:
Skin incision was made vertically in front of sternum; another incision was made in the neckhorizontally along skin crease at the upper end of the previous incision. Skin and subcutaneous (subplatysmal in neck) flaps raised. Wide excision of the tumour was done along with the medial 1/3 rd of both clavicles, medial ends of upper three ribs on both sides and upper 2/3 rd of the sternum, en bloc along with adjacent attached soft tissues. Thymic tissue was removed. The pericardium was intact after excision. The origin of arch vessels and innominate veins were not involved by the...
Chest wall defect after wide excision of the tumor

The defect in the anterior chest wall was closed in the following way.

1) 6 metric steel wires that are routinely used in sternal closure were wired through medial cut ends of the ribs in a criss-cross manner.

2) A pad of gelfoam was placed over the pericardium.

3) A prolene mesh was placed over the gelfoam and fixed to the margins of the defect with 1-

4) Now the steel wires (that were previously nailed through the ribs) were twisted across the defect in criss-cross manner.

Steel wires and mesh placed across the defect

5) Bone cement (PMMA) was prepared and spread over the defect evenly and was allowed to fix to the shape of the defect. This obliterated the depression in the chest wall.

Gelfoam pad kept under the mesh and the wires tightened across the defect in criss-cross manner.
Bone cement spread over the defect
6) Another layer of prolene mesh was spread over the bone cement and fixed all around to the chest wall with 1-prolene.

Skin closed with subcuticular sutures
10) Patient was extubated immediately without having any evidence flail chest or respiratory insufficiency. The rationale for each component of chest wall closure is described now. The gelfoam pads placed over the pericardium prevented direct contact of mesh to it thereby avoiding any possible pericardial inflammation. This gelfoam also prevented the heat generated from bone cement from directly affecting the heart. Steel wires placed across the ribs prevent splaying of ribs on exertion. The wires also formed a scaffold for bone cement to retain it in position. Two layers of prolene mesh and the bone cement in between helped in obliterating the defect in chest wall. The bone cement hardens and protects the heart and great vessels underneath, as does the normal chest wall. Bilateral pectoralis major muscle flaps prevent direct contact of bone cement and mesh with

Second layer of prolene mesh fixed to surrounding tissues
7) Bilateral pectoralis major muscle flaps were raised and sutured together in the midline to cover the defect.

Bilateral pectoralis major muscle flaps covering the defect
8) Subcutaneous layer was approximated with 2-0 vicryl after inserting two closed suction drains(Romovac) in subcutaneous plane.

9) Skin was closed with subcuticular sutures using 3-0 monocryl.
which may cause foreign body reaction and infection. This muscle layer also gives normal consistency to the anterior chest wall avoiding irregular hard surface of bone cement directly under the skin.

The drains were removed on 4th postoperative day. The wound healing was excellent with thin scar. The chest wall didn’t have any depression and was cosmetically good.

20th postoperative day:
Patient had good respiratory mechanics. She was advised to wear a chest brace for 3 months.

Chest brace helps in better stable healing of the chest wall
Histopathological examination of the tumour was reported as Chondrosarcoma Grade I. Superior margin showed pres-

Lobular architecture of cartilagenous neoplasm

Sheets of chondrocytes with moderate atypia and nuclear pleomorphism in a chondromyxoid matrix

Patient underwent postoperative radiotherapy (50Gy) and she is under regular follow-up.

Patient completed 50 Gy of Radiotherapy

Discussion: Though Chondrosarcoma is the most common malignant tumour of the chest wall, its occurrence in sternum is very rare. Only 8% of Chondrosarcomas arise from chest wall, and, of these 8%, only 5-10% of them arise from sternum. Among sternal malignancies, secondary metastases are more common than primary malignancies. Chondrosarcoma may also arise from pre-existing

An Initiative of The Tamil Nadu Dr M.G.R. Medical University
University Journal of Surgery and Surgical Specialities
cartilagenous lesions (osteochondroma or enchondroma). Preoperative investigations should include whole-body radioisotope scan to detect any distant metastasis. Surgery is the primary modality of treatment. The tumour is poorly radiosensitive. Radiotherapy may be useful in inoperable cases and for positive margins. Chemotherapy is not useful. 5-year survival is 80% if surgical margins are negative and 50% if positive. 10-year survival rate after complete resection varies from 54-68%.

**Conclusion:**
Anterior chest wall resection with or without loss of midline continuity commonly leads to flail chest resulting in postoperative respiratory insufficiency and prolonged ventilatory support, depending upon extent of resection. The method of chest wall closure that we applied in this case resulted in excellent cosmetic and, more importantly, good functional chest wall. The knowledge of each component of this surgical procedure and their rationale may be helpful when one encounters such a case.

**References:**

