CASE REPORT

Resection And Reconstruction of Malignant Tumor Involving Sternum

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SUMMARY

We present a series of four cases of chest wall tumor, which underwent sternum resection. The methods of resection and reconstruction chest wall defect are discussed and the final outcome highlighted.

INTRODUCTION

Primary sarcomas of the chest wall are uncommon [1]. Sternum tumours or sarcomas in the lower neck or chest wall that infiltrate to the sternum pose surgical challenges for wide margin resection and reconstruction. We report 4 cases of chest wall tumors that involved the sternum, which required resection and reconstruction.

CASE REPORTS

The particulars of the four patients who underwent sternum resection are given in Table I. All patients presented with stage IIB disease with no evidence of distance metastases.

Surgical Technique

We performed upper sternum resection in three patients and anterior hemi-corpectomy of the sternum in the patient with squamous cell carcinoma. The upper sternum resection was done together with 1-3rd involved ribs and medial clavicle. The surgical technique included exploration of the subclavian artery by reflecting the pectoralis major and minor until the first ribs, which were then were protected and prepared for sternotomy. The sternal notch was freed from platysma, sternocleidomastoid and sternothyroid muscle. Single lung ventilation was employed and the subclavian vessels were protected before sternotomy was done according to surgical the margin needed. Two patients underwent upper sternal resection at the level of manubrium sternum and one patient underwent left hemi-sternum resection including the medial clavicle. Wide margin surgery was achieved by resection of the entire upper sternum, medial end of the clavicle, costal cartilage adjacent to the sternum, surrounding soft tissue and parietal pleural.

The chest wall defects were reconstructed with double layer prolene mesh and were tightened to the remaining sternum and ribs. Three patients with anterior chest soft tissue defects were covered with pedicle latissimus dorsi myocutaneous flap. One patient with rib chondrosarcoma had reconstruction with a pedicle pectoralis major myocutaneous flap.

The 76 year-old patient had post-operative complications, including pulmonary collapse and myocardiac infarction, which required prolonged ventilation, but he subsequently recovered. Wide margin resections were achieved in three patients. A rib chondrosarcoma patient had a narrow soft tissue margin of 5 mm. The patient with synovial sarcoma and squamous cell carcinoma underwent 60 K Gray of radiation treatment. All patients survived surgery and had a median follow up of 14 months. There was no local recurrence.

DISCUSSION

The aims of surgical treatment of sternal sarcoma are to achieve adequate resection margins, maintenance of chest stability for lung function and acceptable cosmesis result[2]. Restoration of chest wall stability and rigidity is important to prevent paradoxical chest motion. Furthermore a good vascularised soft tissue cover to seal the pleural space, protects visceral organs and minimizes infection [2].

Radical en-bloc resection and immediate reconstruction is the key to success in the management of malignant chest wall tumors. Wide margin surgery can be achieved by proper radiological evaluation of the tumor prior resection. The concept of resection of sternum tumor with the structure next to the part involved: - costochondral junction and the ribs, parietal pleural, medial clavicle and anterior soft tissue surrounding improves local control of the disease.

Wide margin surgery can create a massive chest wall defect. Stabilization of the chest wall is important for the patient to maintain post-operative pulmonary function and obviates the need for prolonged ventilation [1,2]. Chest wall stability can be achieved by reconstruction of defect with synthetic mesh such as prolene or poly-tetrafluroethylene (Marlex) with methyl methacrylate reinforcement. Other options includes transfer of floating ribs and stabilized with plate or rigid titanium bars and clips with methyl methacrylate (STRATOS) [2,3]. The double Prolene mesh we used was able to achieve chest wall stability and rigidity in this series. In many cases primary closure is not possible after extensive anterior soft tissue resection. Local myocutaneous flap commonly used to cover anterior chest wall defect includes; lattissimus dorsi, pectoralis major, serratus anterior and rectus abdominis[2]. Their axial blood supply permits elevation and rotation to cover anterior defect. Latissimus dorsi myocutaneous flap is the most reliable option for reconstructions. It provide large

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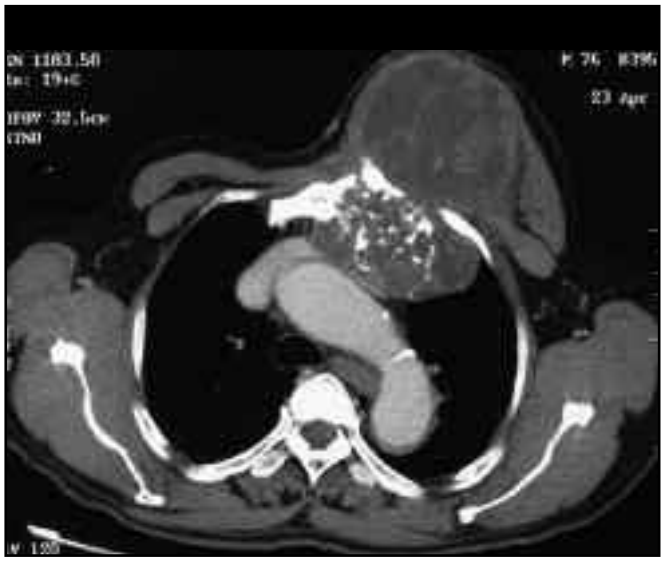

Fig. 1: Computer Tomography scans of chondrosarcoma sternum with intra-thoracic extension. There was clear plane demarcation to the adjacent lung and pericardium.

Fig. 2: Intra-operative photograph of osseous defect and reconstruction with Prolene mesh.

Cases of anterior chest wall tumor with sternal extension

No	Age	Sex	Diagnosis	Sternal extension	Bony resection	Chest wall reconstruction	Closure	Adjuvant	Outcome treatment
1	76	M	Chondrosarcoma	Entire upper to manubrium	Billateral medial clavicle 2-4th ribs and upper sernum	Prolene mesh	Latissimus dorsi	-	DFS 18 months
2	32	F	Synovial sarcoma	Upper sternum	Left medial clavicle with upper clavicle and 1st-2nd ribs	-	Latissimus dorsi	Radiotherapy	DFS 12 months
3	64	M	Squamous cell carcinoma	Anterior cortex	Right clavicle with anterior hemicorticotomy	-	Latissimus dorsi	Radiotherapy	DFS 6 months
4	38	M	Chondrosarcoma	2nd 3rd ribs and costosternal area	2-4th ribs with left hemisternal resection	Prolene mesh	Pectoralis major flap	-	DFS 6 months

amount of muscle and can be harvested with a skin paddle to allow primary closure, which is important for early adjuvant radiation treatment.

Long-term survival is closely dependent to the type of the tumor; overall 5 years survival achieved ranged from 50-65% [2,3]. Chondrosarcoma was reported to have the best survival result [2].

REFERENCES

1. Hirai S, Nobuto H, Yokota K, Matsuura Y, Uegami S, sato K, Mitsui N, Sugita T, Hamanak Y. Surgical resection and reconstruction for primary malignant sternal tumor. Ann Thorac Cardiovasc Surg 2009: 15(3); 182-5.
2. Gonfiotti A, Santini PF, Campanacci D, Innocenti M, Ferrarello S, Caldarella C, Janni A. Malignant primary chest-wall tumors: techniques of reconstruction and survival. Eur. J. Cardiothorasic Surg 2010: 38; 39-45.
3. Hamad AM, Marulli G, Bulf R, Rea F. Titanium plates support for chest wall reconstruction with Gore-Tex dua mesh after sternochondral resection. Eur J Cardio-thorasc Surg 2009: 36; 779-80.