



UNVEILING MYTHS : SIZEABLE ANTERIOR MEDIASTINAL MASSES

Surgery

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ABSTRACT

Background : Sizeable Anterior mediastinal masses are a rare entity and its occurrence, surgical resection and prognosis has been linked with several myths which we tried to unveil in this study.

Methods : Records were reviewed for 9 patients who had sizeable anterior mediastinal masses and who underwent proper preoperative workup and planned surgical resection. Details of the patients and operations were recorded and follow up was done.

Results: Mean age was 37 (range 19 to 55) years, and male-to-female ratio was 7:2

Computed tomography and magnetic resonance imaging (MRI) were used to evaluate the location and extent of the abnormality and to characterize the components of the mass. Besides CT and MRI, Pulmonary function testing was used to investigate pre-op pulmonary function. We selected the tumors that were large in size benign and located in the anterior mediastinum. The most frequent presenting symptom was dyspnea. The majority of cases underwent sternotomy and resection of tumor, and complete resection was possible in all patients. The mean diameter of the resected masses was 12 cm and average weight was 3000 gms (6.6 lb). Histopathologic examination revealed teratomas & lipoma mainly. Complications such as prolonged ICU stay & surgical site infection was seen in 1 patient.

Conclusion: The presurgical thoracic CT and MRI along with CT guided biopsies provided correct diagnosis along with radiological characterization and topography. Surgery must be considered the preferred treatment modality in patients with benign anterior mediastinal mass irrespective of the size and diagnosis.

KEYWORDS

Pulmonary Function Test, Mediastinum, Germ Cell Tumor, sternotomy

INTRODUCTION

Anterior mediastinal masses account for 50% of all mediastinal masses. They can represent a broad spectrum of diseases, like thymoma, thymic carcinoma, thymic cyst, thymic hyperplasia, teratoma, lipoma, germ cell tumor and lymphoma.¹ CT and MRI are non-invasive study of choice for diagnosis of mediastinal masses. It was reported that small mediastinal masses less than 3 cm in diameter remained unchanged or even regressed during follow up. There are fewer reports on prevalence and natural course of anterior mediastinal masses.

Anterior mediastinal mass was defined as any mass lesion not less than 5 mm in in short axis diameter located in anterior mediastinum, the compartment between sternum and anterior aspect of great vessels and pericardium. Its superior and inferior boundaries are the thoracic inlet and the diaphragm. The normal contents of the anterior mediastinum include the thymus, lymph nodes, adipose tissue, nerves, vessels, and retrosternal thyroid swelling. Anterior mediastinal masses generally arise from these structures.

Clinically, an anterior mediastinal mass may be silent and incidentally discovered on imaging. There may be compression effect or local invasion of nerves (causing pain, paralysis of the diaphragm or vocal cords, or arrhythmias), vascular structures (superior vena cava syndrome), airways (dyspnea, cough), esophagus (dysphagia), and bone. In addition, some tumors can produce systemic symptoms due to production of hormones or peptides. Chest radiography can show an anterior mediastinal mass or displacement of adjacent structures. CT is the most important imaging modality for showing the precise location, morphology, contrast enhancement of an anterior mediastinal mass and its relationship to other mediastinal structures. Diagnosis is made by difference in CT attenuation values, which are different for fat, water, soft tissue, calcium, or vascular structures (Table 1). The imaging findings, clinical examination and laboratory studies enable

us to provide a reasonably narrow differential diagnosis and help guide diagnostic interventions.

MRI has served as an ideal tool to evaluate tumours of the mediastinum.² It helps in assessment of pericardium, spinal cord and vascular structures. Chemical-shift MRI is useful in distinguishing normal thymus and thymic hyperplasia from thymic neoplasms and lymphoma.³ Diffusion weighted MRI (DWI) is an entity that works on principal of the metabolic and biophysical differences between tissues. According to Gumustas et al.,⁴ the mean apparent diffusion coefficient for the malignant mediastinal entities could be significantly lower than that for the benign diseases.

Percutaneous CT guided biopsy of anterior mediastinal masses are safe with high diagnostic yield of 77%. A direct mediastinal approach which enables extrapleural placement of needle is preferred method. In addition there are several other methods for histological diagnosis, like thoracoscopy, mediastinoscopy, anterior mediastinotomy, transbronchial needle biopsy and USG guided FNAB.

MATERIAL AND METHODS

We had analyzed data of 9 patients retrospectively, who had sizeable benign anterior mediastinal masses.

INCLUSION CRITERIA

1. All patient with large (>10 cm) benign anterior mediastinal masses.

EXCLUSION CRITERIA

1. Anterior mediastinal mass <10 cm in size
2. Multiple mediastinal masses (enlarged matted lymph nodes)
3. Characteristic middle and posterior masses

After proper diagnostic work up, and confirmation of its benign nature, surgical resection was done and patient were followed up for duration 6 months in the outpatient.

GENERAL FEATURES OF CASES REVIEWED : TABLE 1

CASE	AGE	SEX	COMPLAINT	SITE	SIZE	CT	PROCEDURE	HPE
Case1 (fig1 and 3)	19	M	Chest pain, Dyspnea, fever, cough.	AM	20x 15x 12 CM	heterogeneous enhancing solid mass in anterior mediastinum extending to middle mediastinum, right and left hemithorax with significant mass effect on mediastinal structures encasing neck vessels.	Sternotomy With Excision Of Mass	Teratoma

Case2	55 yrs	F	Chest pain, breathlessness, cough	AM	12X 15 x7CM	tumor in anterior mediastinum, with moderate homogeneous enhancement with central necrosis	Sternotomy with excision of mass	Fibroblastic tumor
Case3 (Fig.4)	45	M	Breathlessness	AM	12X6 x5CM	heterogeneous soft-tissue dense mass of 10x 8 cm in the anterior mediastinum extending to right hemithorax with areas of fat and calcification	Sternotomy With Excision Of Mass	Teratoma
Case4	43	M	S.O.B	AM	11X4.4x6CM	heterogeneous soft-tissue mass of 11x 4.4 cm in the anterior mediastinum extending to right hemithorax with areas of fat and calcification	Sternotomy with excision of mass	Teratoma
Case5	50	M	S.O.B	AM	10X5CM	characteristic homogeneous fat attenuation (usually -50 to -100HU), no contrast enhancement, well-defined margins.	Sternotomy With Excision Of Mass	LIPOMA
Case6	48	M	EXERTIONAL DYSPOEA	AM	10X9 x7CM	Solid and cystic components with foci of calcification eccentrically	Sternotomy And Excision Of Mass	teratoma
Case7	47	M	COUGH, S.O.B	AM	10.7X7x7	characteristic homogeneous fat attenuation (usually -50 to -100HU), no contrast enhancement, well-defined margins.	Sternotomy and excision of mass	Lipoma
Case8	37yrs	Male	Breathlessness	AM	10.1x10.4 x8cm	well defined round lesion in left parasternal area adjacent to pulmonary artery bifurcation has both cystic and solid components with few foci of fat and peripheral eccentric calcification measuring 10.1 x 10.4cm in axial section s/o benign teratoma	STERNOTOMY WITH EXCISION OF MASS	Teratoma
Case9 (fig2)	56	F	Cough, S.o.b, Restlessness, Insomnia, pemberto n's Sign Positive,	AM	13X6x4CM	A large well defined oval soft tissue mass showing continuity with thyroid high attenuation with calcific foci	Sternotomy With Near Total Thyroidectomy With Excision Of Mass.	Retrosternal goitre

RESULTS as illustrated in Table 1

- Case 1 (figure 1 and figure 3) Tumor size 20 X 15 X 12 CM & weighed 4.5 Kgs (10 lbs). Intraoperatively tumor was removed in piecemeal due to its large size and adherence to the vital structures (large airway and great vessels), blood loss was approx 2.25 litres which was replaced with colloids, blood and crystalloids. Post operatively patient was kept on mechanical ventilator for 1 day and weaned off and extubated on the 2nd day. Patient did not require any inotropic support Intra operative and post operatively. Post op recovery was uneventful.
- Case2 Tumor size 12 X 15 X 7 CM & weighed 2.5 kg (5.5 lbs). It was also removed piecemeal due to its adherence to vital structures. Blood loss was 2.5 litre. In the immediate post operative course the patient developed pulmonary edema requiring mechanical ventilator and also Inotropic and vassopresor support. The support was continued for 3 days. She was gradually weaned off and extubated on the 4th day. She developed surgical site infection at the sternotomy site which was managed with i.v antibiotics and regular dressings. Her vitals improved and surgical site became healthy.
- Case9 (figure 2) Near total thyroidectomy with excision of retro sternal extension was done through a median sternotomy incision. Intra operative blood loss was approx 200 ml. Parathyroids were removed and reimplanted in the right sternocleidomastoid muscle. Hemostasis was secured. No nerve and vascular complications were seen Post op hypocalcemia was treated with i.v calcium gluconate. Patient recovered well.
- Rest of the 6 cases had uneventful intraoperative course, they were extubated in the operating room and they had uneventful postoperative recoveries.
- Of all, benign tumours were more common than malignant ones.
- We encountered Germ cell tumors as the most common tumors instead of thymomas & lymphomas as shown in other studies.
- Male preponderance was found in the study group.
- Anterior mediastinal masses though rare in occurrence, we had encountered 9 cases in 2 years study period.
- They were sizeable masses more than 10 cm in largest dimension.
- All patient had proper pre-op work up, imaging and PFT done and symptoms clinically correlated.
- All masses were biopsied before surgery and preoperative diagnosis was made.
- The masses varied in weight from 500 gm to largest being 4500 gms.

- Proper induction and maintenance of anaesthesia led to better post-operative result.
- All patient had no intra-op complication with good post op recoveries.
- All patient did well except one patient who had delayed recovery and prolonged ICU stay.

DISCUSSION

Most of masses in our study were primary in origin, except for the 1 case that had origin in neck and extended to anterior mediastinum. Most of the patients were in the third decade of life with a median age of 40 yr and a male preponderance in our study. The demographic profile of the patients in our study was similar to other studies⁵. Most of the lesions were in the anterior compartment similar to other studies^{6,7}. In the present study, all patient had benign mass thus suggesting benign lesions were more common than malignant lesions as has been reported earlier^{6,8}.

Mediastinum is an anatomic region with wide range of benign and malignant lesions. In adults, the most common mediastinal tumour is thymoma⁹ followed by lymphoma, although some studies have reported lymphoma as the most common mediastinal tumor. But in our study we encountered higher number of germ cell tumor than thymoma and lymphoma due to small sample size of our study due to lower prevalence of primary mediastinal masses, and also the unavailability of VATS and robotic surgery at our centre led to migration of thymomas to some other place, and lymphomas referred for chemotherapy.

Primary mediastinal GCT are uncommon and represent approximately 10-15 per cent of all mediastinal tumours in adults. In adults, teratoma followed by seminoma is the most common histological type. Teratoma is the most common mediastinal GCT, typically affecting young adults. From surgical and anaesthetic point resection of mediastinal mass is very difficult though proper pre-operative workup, proper anaesthesia and meticulous surgical technique resulted in good result in our patients. Anaesthesia needed gradual induction with continuous monitoring of gas exchange and hemodynamics. Maintaining spontaneous ventilation until either the airway is definitively secured or the procedure is completed is a safe and popular strategy.

Anaesthetic induction with sevoflurane, propofol, with or without ketamine is safe strategy. Intubation of the trachea before induction is a safe approach. Intraoperative life threatening airway compression has been reported and can be avoided by either repositioning of the patient or rigid bronchoscopy and ventilation distal to the obstruction .

For patients with life-threatening cardiovascular compression after induction immediate sternotomy and surgical elevation of the mass off the great vessels is advocated. Flow-volume loops are commonly ordered as part of the preoperative assessment for patients with an anterior mediastinal mass. Specifically, an increased mid expiratory plateau when changing from the upright to the supine position is thought to be pathognomonic for a variable intrathoracic airway obstruction and an indicator of patients who are at risk for airway collapse during induction of anesthesia¹⁰. Apart from sporadic case reports, studies of flow-volume loops have shown a poor correlation with the degree of airway obstruction¹¹ and have not demonstrated usefulness in managing these patients¹².

CONCLUSION

Surgical outcome of large benign anterior mediastinum is dependent on good pre and post anaesthesia management and meticulous surgical expertise. So, surgery should be considered the mainstay of treatment.

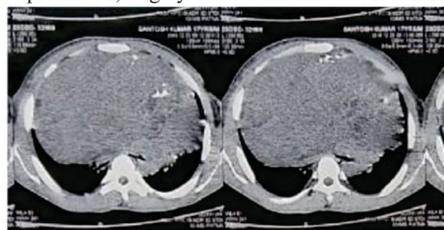


FIG 1.CECT chest s/o mediastinal mass heterogeneous enhancing solid mass in anterior mediastinum extending to middle mediastinum right andleft hemithorax with significant mass effect on mediastinal structure case 1.



FIG 2.CECT chest s/o rt sided mediastinal tumor in anterior mediastinum, with moderate homogeneous enhancement with mass effect on mediastinal structures case 9.



FIG 4.CECT chest s/o huge rt sided heterogeneous mediastinal mass with solid and cystic Components case 3 as illustrated in table 1.

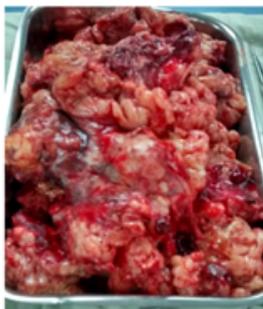


FIG 3.case 1 intra-operative tumor removed in piecemeal

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