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ORIGINAL ARTICLE

VATS Excision of Posterior Mediastinal Neurogenic Tumor in Prone Position

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ABSTRACT

Tumors arising from structures located in paravertebral[1] (region between the pericardium & vertebrae) sulcus are considered posterior mediastinal tumors. Spindle cell tumours originating in the mediastinum are extremely rare. Due to profusion of structures & organs located in the mediastinum, a wide variety of these neoplastic processes develop here (neural, vascular, epithelial). Schwannomas are the most common type of nerve sheath (neurogenic) tumors in adults.

Most of the mediastinal neurogenic tumours are benign & slow growing most frequently originate posteriorly & they require surgical resection as treatment.[1] Clinical symptoms occur when the tumour reaches a large size or begins to compress on surrounding structures. So with increasing technical advances these mediastinal tumours can be approached for resection thoracoscopically to reduce the morbidity of the patient.

Video-assisted thoracoscopic surgery (VATS) has an evolving role in the management of mediastinal pathology being less invasive.

Through this case report we are trying to show the potential thoracoscopic part of the procedure in prone position with better ergonomics is technically feasible with an enlarged & optimal visualisation of the intra-thoracic structures for the surgeon, less operative time & better respiratory results with low incidence of respiratory

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complications for the patient that ease the difficulties faced in conventional surgery[1] (limiting the burden of injury to ribs & underlying structures due to rib retraction & muscle destruction), less intraoperative blood loss, less chest tube drainage, & shorter hospital stays than open procedures.

KEYWORDS

• Schwannoma • Video assisted thoracoscopic surgery (VATS) • Posterior mediastinal neurogenic tumor • Prone position

INTRODUCTION

The mediastinum is a complex compartment in the centre of the chest bounded by the thoracic inlet superiorly, the diaphragm inferiorly, the sternum anteriorly, the spine posteriorly and the mediastinal pleura bordering each lung laterally. The mediastinum is divided into anterior, middle and posterior compartments to categorise tumors and the diseases according to their site of origin and location.

The anterior mediastinum - region posterior to the sternum and anterior to the heart and brachiocephalic vessels.

The middle mediastinum - space containing heart and pericardium including ascending and transverse aorta, the venacavae, main pulmonary arteries and veins, trachea, bronchi and lymph nodes.

The posterior mediastinum - bordered anteriorly by the heart and trachea, posteriorly thoracic vertebral margins containing descending aorta, oesophagus, azygous veins, thoracic duct, autonomic ganglia, lymph nodes and fat. Posterior mediastinal schwannomas typically arise from intercostal nerves, about 9% of all schwannomas[2].

However when these posterior mediastinal tumours present for a long period of time can produce symptoms by local compression of adjacent tissue, bone erosion, and spinal canal involvement. Neurologic deficit may also occur.[1]

Here is our case report presenting the surgical strategy attempted for access and resection of posterior mediastinal neurogenic tumour in prone[2] position through VATS in TMH, Durgapur.

CASE REPORT

We report a case of a 66 years old male, known case of diabetes mellitus and hypertension who was admitted with the complaints of throat irritation, intermittent fever and non-productive cough since last 1 month.

- After initial resuscitation patient was shifted to the general ward for conducting relevant investigations.
- On Bronchoscopy + BAL = Trunat (MTB) PCR with Rifampicin resistance reported as negative (-).

Tests with BAL Fluid:

- AFB /Fungal stain = report (-)
- BAL fluid C/S = shown no growth after 48 hrs.
- Gram stain = Moderate epithelial cells, occasional gram positive cocci in pairs and tetrads seen.
- BAL fluid for malignant cells = No dysplastic cells seen (-). He was managed conservatively and treated with IV antibiotics nebulisation and other supportive medications awaiting further reports and management.

***HRCT Thorax (plain and contrast):**

Shown - soft tissue heterogeneous enhancing mass of size 5.06 x 4.10 cms in right paratracheal region. S/O? Malignant nodal mass. Rest of both lung parenchyma normal in morphology and attenuation.

Pleura - pleural calcification in left lower zone of lungs.

On oncosurgery review - CT guided mediastinal mass biopsy was advised.

Biopsy Confirmed - Benign spindle cell neoplasm, morphology favouring Schwannoma.

Plan - Exploratory Thoracotomy / VATS.

***CECT Thorax** (plain and IV contrast enhanced -128 slice):

A well marginated vertically oval mass is seen in the posterior mediastinum measuring 5 cm

*5.5cm x 7cm (Fig. 1) and extending from root of neck to 4th thoracic vertebral end plate; lying anterolateral to the vertebral bodies on the right side. On the left side, the mass abuts the trachea and oesophagus Fig. 1.

Anteriorly, it abuts the superior venacava Fig. 2.

Inferiorly, the mass is related to the azygous vein Fig. 3, which is compressed by the mass. The mass is of soft tissue attenuation with some areas of low attenuation in the centre consistent with necrosis. There is peripheral enhancement. No extension of the lesion is noted into the spinal canal.

No bony changes are noted.

Both the lung fields are normal in parenchymal attenuation and bronchovascular distribution. Thick chunky old costal pleural calcifications are noted in left CP angle.

No significant mediastinal lymphadenopathy seen.

Impression: Posterior mediastinal well circumscribed mass extending from the root of neck to the level of inferior endplate of D4 vertebra in right paravertebral region Fig. 4.



Fig. 1: A 66 years old male patient has a soft tissue density of approx 5 x 5.5 x 7cms abuting the trachea and oesophagus on the left side

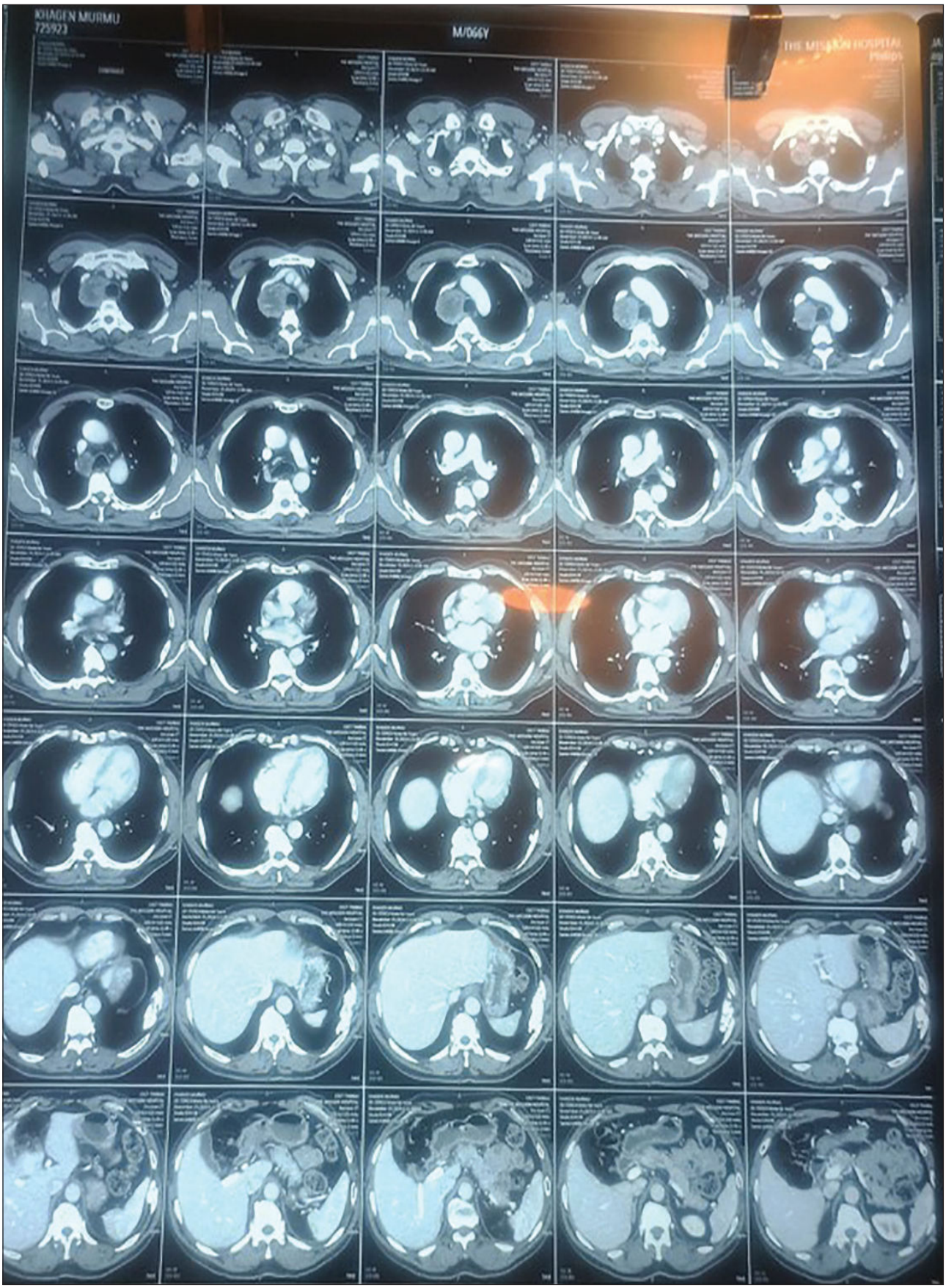


Fig. 2: Mass anteriorly abuting the superior venacavae

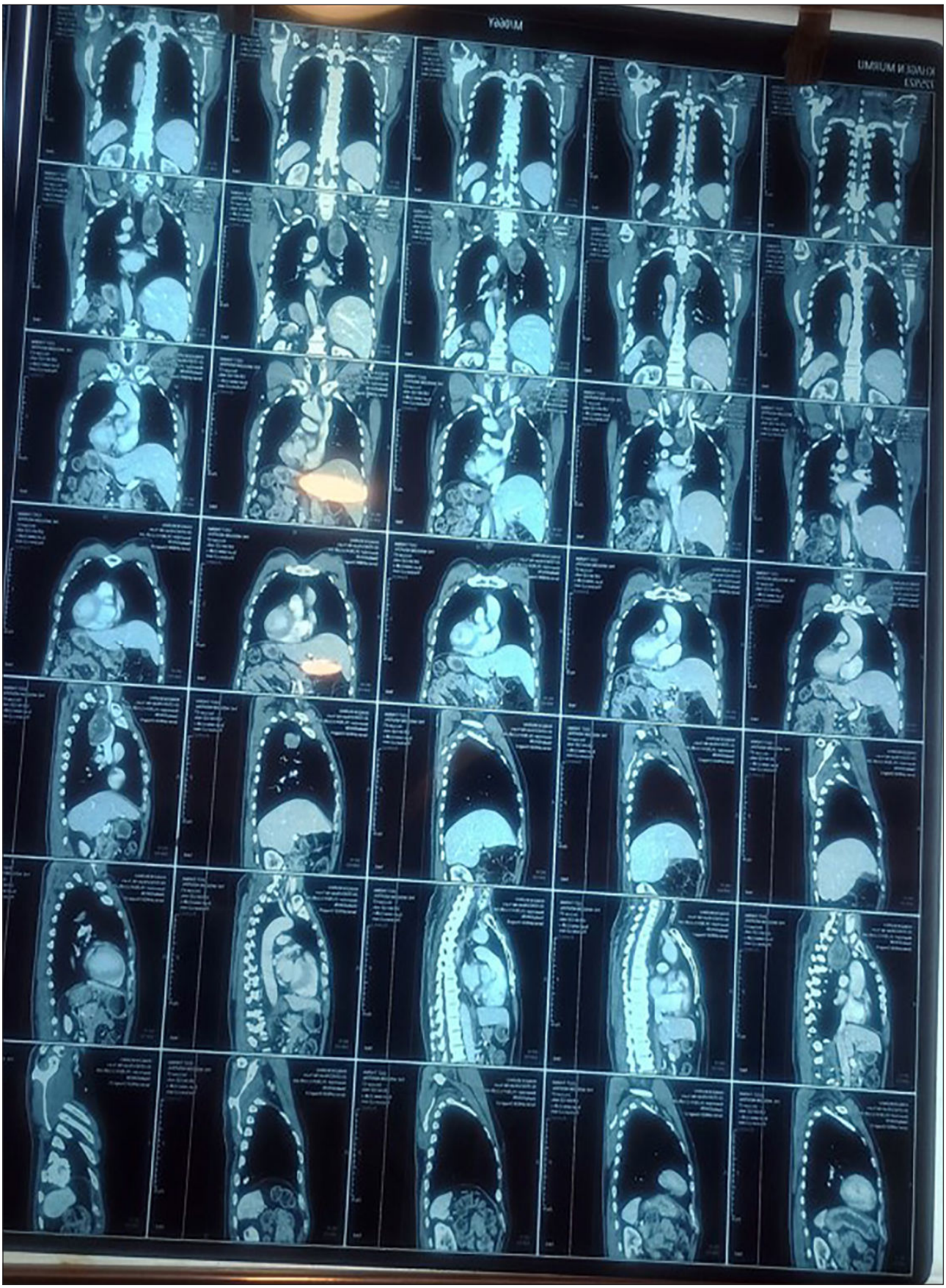


Fig. 3: Inferiorly mass related to azygous vein

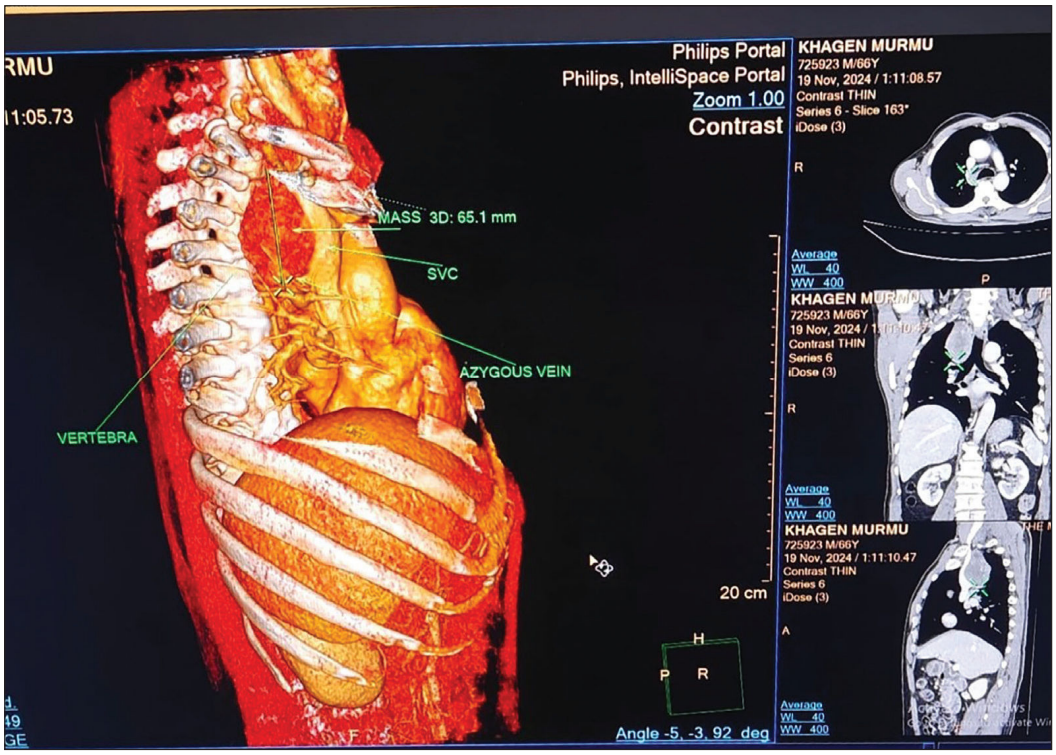


Fig. 4: 3D reconstruction A well circumscribed lesion extending from root of the neck to the inferior of D4 vertebrae on the right side, Anteriorly related to SVC, Inferiorly to Azygous vein.

SURGICAL PROCEDURE

1. Single dose antibiotic prophylaxis given an hour before induction.
2. Under general anesthesia with selective intubation (single lumen endotracheal tube), the patient was placed in prone decubitus Fig. 5. At the start of the intervention, carbon dioxide insufflation at pressures of 5–8mmHg was used to facilitate rapid and complete lung collapse.
3. Four right thoracoscopic ports were utilized, 5th intercostal-space in posterior axillary line (5mm), and 7th intercostal-space in the inferior angle of the scapula (5mm), 7th intercostal-space in parascapular line (10mm), 8th intercostal space posterior axillary line (10mm). Fig. 6 and 7



Fig. 5: Prone Decubitus



Fig. 6: Port Marking planned

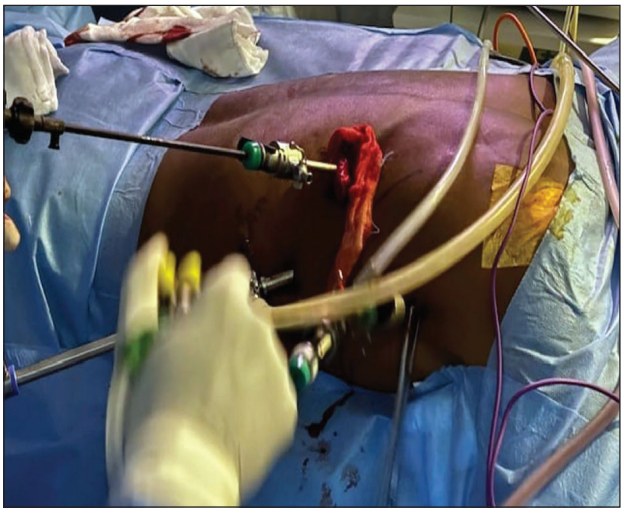
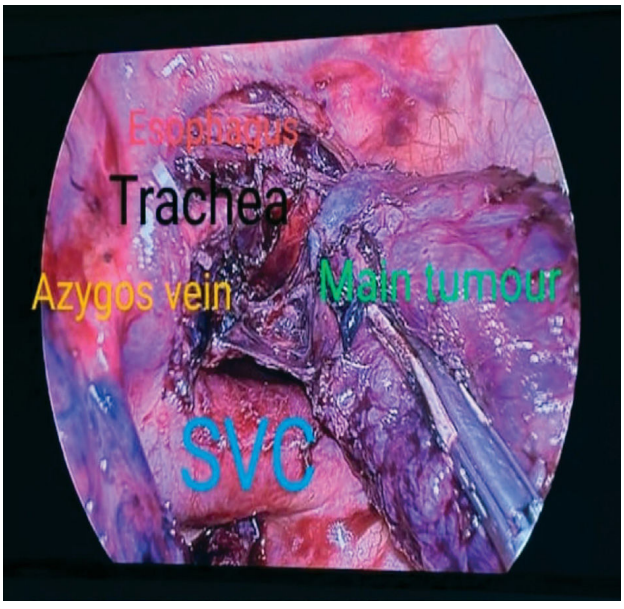


Fig. 7: Final Port Placement



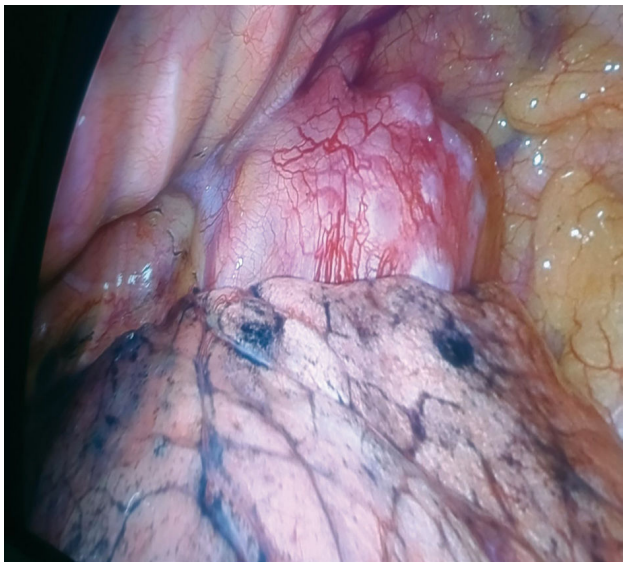


Fig. 8: Intraoperative findings- tumor and its attachments

4. Localization and Identification of the tumor with its adjacent structures of adhesions. Fig. 8
5. Tumor edges were delineated by soft coagulation of the area and careful clipping of the feeding arteries with lock clips.

Tumor false capsule was separated from the adjacent structures - Skeletonization of Azygous vein (inferiorly), Superior venacava (anteriorly), Internal Carotid Artery, Membranous Trachea and Esophagus (supero-posteriorly) with endoscopic soft tissue dissection tools (Maryland dissector and Ligasure).

6. Excision of Pericardial fat from tumor.
7. Exploratory Thoracotomy of 3 cms in Right lateral position was done for safely retrieving the tumor out in an endobag.
8. Hemostasis secured (Total blood loss was 50ml) and wash given.
9. Specimen thus removed was sent for histopathological examination. Fig. 9
10. At the end ICD was placed and connected to an underwater seal followed by re-inspection before wound closure and dressings.
11. An Intercostal nerve block given An intercostal nerve block using 0.025% bupivacaine was performed under thoracoscopic vision from the 2nd to 10th intercostal space.
12. The duration of the procedure was 2 hours (from skin incision to closure).

*** *Post-op Management*:**

1. Postoperatively the patient was extubated on the table, shifted to the recovery room followed by ICU shifting for overnight monitoring
2. He was kept nil per oral with continued RT aspiration.
3. Propped up 30° with moist O2 @ 4L/min continued.
4. IVF NS @ 100ml/hour was given.
5. Inj. Magnex Forte 1.5 gm BD, Inj. PCM, Inj. Pan 40, Inj Ondem and other supportive treatment.
6. On POD-1 patient was mobilised out of bed and maintained well in room air.
7. Allowed only clear diabetic liquid diet, when tolerated well was given diabetic soft diet.
8. Aggressive spirometry, nebulisation and 1 unit of PRBC transfusion was advised.
9. CBG was monitored and managed with Insulin accordingly.



Fig. 9: Tumor bed after delivering tumor out

10. On POD-3 with stable vitals patient was shifted to general ward allowing normal diabetic diet. The chest tube was removed after ensuring the absence of an air leak and drainage of <2 ml per kg of body weight over 24 h. Patient was discharged the next morning.

DISCUSSION

1. ET Tube-A single lumen endotracheal tube (SLET) was placed - to allow intraoperative single lung ventilation. The ventilation of the right lung was stopped accordingly as and when needed making the lung atelectatic, providing sufficient exposure of the chest wall, adjacent structures and tumor.
2. Prone Decubitus-allows for better exposure without the need for retraction that gives an optimal operative view naturally since gravity assisted lungs and pericardium are displaced away from the operative field.[3]
3. CO_2 insufflation at a pressure of 5-8 mmhg - beneficial as it allows the lung to be adequately compressed for better view pushing the diaphragm downwards and increasing the operative space.[3]

Vt was 350ml in and 347 out post excision of tumour showing intact membranous trachea.

The approach was found to be feasible since it was visualised in its entirety with no involvement of chest wall. The presence of maintained fat planes with the adjacent chest wall, vertebral body and other structures is more important than the tumour's size in selecting cases for the thoracoscopic approach.[5]

One of the early application of VATS was resection of posterior mediastinal tumors compared to thoracotomy. Thoracoscopy by skilled surgeons make such critical surgeries possible and less morbid for the patient. Since it requires smaller incisions and is associated with better cosmetic results, less postoperative pain, fewer pulmonary complications, shorter hospitalisation.

RESULT

Considering the dimension and location of the benign tumor gross total thoracoscopic resection is performed. VATS allows an equivalent intrathoracic operation with the same resection margin.Hence this technique is safe and effective.

CONCLUSION

Preoperative diagnosis of mediastinal neurogenic tumors is usually made by radiographic imaging. They are usually seen as a well-circumscribed lesion in the posteroanterior chest radiography. Contrast-enhanced thorax CT gives information about the location, size, density, contrast enhancement, calcification, and its relationship with neighboring structures.

Thus, it is possible to predict the difficulties of resection[4].

Due to frequently benign nature and relatively small size of posterior mediastinal tumors they are amenable for surgical resection using minimally invasive technique adopting VATS[4].

The tumor is usually encapsulated hence can be easily mobilised from its surrounding tissue. Also use of hem-o-lok ligating clips for neurovascular pedicles have made it more easy.

Hence most of the benign tumors without intraspinal involvement can be completely resected thoracoscopically.

Surgical resection simultaneously provides both diagnostic and therapy. The surgical indications for the resection of an intrathoracic nerve sheath tumor include the need to obtain a tissue biopsy specimen for diagnosis, to prevent a malignant transformation, to relieve mass effect within the chest (for example, when pulmonary function is impaired), or to prevent the tumor from extending through the foramen into the spinal canal.[6]

Advantages emphasised mostly are - Better visualisation of the mediastinum, reduction of surgical trauma, shorter hospital stay, less need of painkillers and reduction in the risk of pulmonary complications[4].

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