Original Research Paper

VOLUME-6 | ISSUE-2 | FEBRUARY-2017 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 78.46

TUMORS OF THE MEDIASTINUM – ANALYSIS OF SURGICAL MANAGEMENT AND OUTCOMES

Cardiology

KEYWORDS:

Dr TELLA RAMAKRISHNA DEV — MCh, ASSISTANT PROFESSOR, Department of cardiothoracic surgery , NIZAM'S INSTITUTE OF MEDICAL SCIENCES

Dr MUPPIRI VIJAYA KUMAR — MCh, ASSOCIATE PROFESSOR , Department of cardiothoracic surgery , NIZAM'S INSTITUTE OF MEDICAL SCIENCES

ABSTRACT

AIM : In this study ,the clinical features and surgical treatment of mediastinal tumours are discussed and compared with literature. **MATERIALS AND METHODS :** Between January 2012 and July 2016 records of 76 patients who underwent resection of mediastinal tumours were analysed retrospectively. Demography, patient profile ,histological diagnosis, details of operative technique, perioperative complications and mortality were considered. **RESULTS :** 76 patients underwent excision of mediastinal tumours. There were 39 males and 37 females .The age range was 1 to 82 years out of which 2 were children. Tumours of the anterior mediastinum were most common (64.5%). Among them thymoma was the most common histological diagnosis. Predominant symptoms were those of Myesthenia Gravis (34.2%). Median sternotomy was the commonest incision used. The operative time ranged between 120 and 385 minutes. Mean postoperative stay was 6 days. Mortality was 6.51%. Post operative complications encountered were Myesthenic crises(4), Mediastinitis (1),Lower limb paresis (1) **CONCLUSION:** The outcomes following surgery for mediastinal tumours are favourable when there is meticulous surgical technique, careful coordination with anaesthetist and proper multidisciplinary care of postoperative patient. With lung isolation techniques and judicious instrument use there is no need to convert into extensive incisions like Hemi clam shell and clam shell incision avoiding morbidity. Reducing tumour burden by evacuating part of tumour through opening of capsule is helpful during excision of large mediastinal tumours

INTRODUCTION

The mediastinum is defined as the space between the lungs .Its boundaries are superiorly the thoracic inlet ,inferiorly the diaphragm ,the sternum anteriorly, vertebral column posteriorly ,pleural cavities laterally.

It is divided into compartments which is useful in developing a differential diagnosis and planning techniques for biopsy or resection. The anterior compartment lies between back of sternum and anterior aspect of great vessels and pericardium .It contains the thymus, internal mammary arteries, lymph nodes, connective tissue, fat. The most common lesions are the four T's : thymoma, teratoma, lymphoma and thyroid tissue. The middle compartment extends between pericardium and ventral surface of thoracic spine. The contents are the pericardium, heart, great vessels, airway and esophagus. The most common lesion is lymphadenopathy secondary to lymphoma or metastatic lung cancer. The posterior compartment is made up of the spine and includes the costovertebral sulci. It contains the proximal intercostal neurovascular bundles, spinal ganglia, sympathetic chain ,lymphatic tissue and connective tissue .Neurogenic tumours represent the majority.

The patients age and anatomic location of tumour and associated symptoms often suggest a diagnosis. They give information regarding diagnostic and therapeutic measures. Symptoms if present are due to direct effects of the mediastinal mass or systemic effects of the illness.

Mediastinal tumours are typically diagnosed or suspected based upon abnormalities of posteroanterior and lateral chest Xray .A chest CT with intravenous contrast is the mainstay of the investigative modalities. It helps out in planning resection by evaluating whether there is invasion or compression of adjacent structures and evaluating airway compression before anaesthesia .

Most appropriate approach for resection depends upon patient, location and size of lesion, suspected diagnosis and prior chemotherapy. They can be classified into MINIMALLY INVASIVE (VATS, Robotic assisted) and OPEN approaches(THORACOTOMY,MEDIAN STERNOTOMY,THORACOSTERNOTOMY(CLAMSHELL),HEMITHORACOSTERNOTOMY(HEMI CLAMSHELL).
Thoracotomy is the approach used for middle and posterior mediastinal masses. It is preferred in anterior mediastinal masses when the tumour is completely contained within one hemithorax and not crossing the midline .

Standard median sternotomy is the approach for anterior mediastinal masses which cross the midline and are confined within the pulmonary hila If the mass extends below the pulmonary hilum on one side hemi clamshell approach is preferred. If it extends below both pulmonary hila clamshell approach is usually necessary.

MATERIALS AND METHODS

The records of 76 patients who underwent excision of mediastinal tumours between January 2012 and July 2016 at our institute were analysed retrospectively. There were 39 males and 37 females with ages ranging from 1 year to 82 years. Symptomatology, comorbid conditions, general clinical status were assessed in all patients. Standard chest radiographs (POSTERO ANTERIOR and LATERAL) and pulmonary function tests were basic investigations. High resolution Computerised axial tomography (HRCT) SCAN thorax and abdomen was used in all patients to determine extent of tumour, involvement of adjacent organs and in planning of airway management during anaesthesia and evaluation for metastases. In addition Magnetic resonance imaging (MRI) spine was used in posterior mediastinal tumours involving spine .

Special investigations like Anti Acetylcholine Receptor (AChR) Antibody (Ab) in cases of Myasthenia Gravis, Serum LDH (lactate dehydrogenase), AFP(alpha feto protein), Beta HCG (Human chorionic gonadotropin) in cases of germ cell tumours were conducted.

Bronchoscopy and esophagoscopy were conducted in selected cases with suspected airway and esophageal involvement based on symptoms.
All patients underwent thorough cardiac evaluation with ECG (Electrocardiogram) and Echocardiogram supplanted with Treadmill testing and coronary angiogram as needed

PREOPERATIVE PREPARATION

Preoperative FNAC (fine needle aspiration cytology) and Core needle biopsy were done in suspected malignancies based on CT scan findings. Nutritional status and haematocrit were stabilised before subjecting patients who underwent Neo adjuvant

chemotherapy to surgery. All patients were trained to do respiratory and incentive spirometry exercises before surgery Myasthenic patients who were in preoperative crises were stabilised with plasmapheresis and immunoglobulin therapy and optimisation of Anti Myesthenic medication before surgery.

General anaesthesia was used in all cases with step by step induction with continuous monitoring of gas exchange and hemodynamics . Ventilation was maintained spontaneously until the airway was definitively secured in case of giant tumours which compromised the airway. Thoracic epidural analgesia was used in all patients unless contraindicated. In children perioperative local anaesthetic intercostal infiltration was carried out. Double lumen endotracheal tubes were used in all adults who underwent thoracotomies and sometimes during median sternotomy for large tumours.

Patients underwent standard median sternotomy or ipsilateral posterolateral thoracotomy depending upon size of tumour and proximity to great vessels. Median sternotomy incision was extended into the neck when tumour was found involving the superior mediastinum.

Attempt was made for complete excision of the tumour in all cases. In cases of tumour infiltrating vital structures partial excision was carried out . In large tumours attempts were made to open the capsule and evacuate the contents to aid in excision.

Concomitant procedures were off pump coronary artery bypass grafting in one patient . Cervical laminectomy in 2 patients, Left upper lobectomy in one patient.

Unless otherwise indicated patients were extubated in the operating room and shifted to the intensive care unit Thoracic epidural analgesia supplemented with intravenous analgesia was used for three days shifting to oral analgesics at the time of discharge . drains were removed in the 2nd postoperative day and patients were discharged after five days.

Histopathology reports were reviewed in every patient . Patients were followed up after 10 days ,one month, three months, six months ,yearly after discharge at our department ,Medical oncology and Neurology departments.

STATISTICAL METHODS

Categorical variables are expressed as percentages and continuous variables are expressed as mean.

RESULTS

SEVENTY SIX (76) patients underwent surgery for mediastinal tumours. 39 males (51.31%) and 37 females (48.68%) were operated . The age range was 1 to 82 years (table 1)

TABLE 1 AGE DISTIBUTION

Age group	Number of patients
1 – 10	02 (2.63%)
11-20	04 (5.26%)
21-30	19 (25.0%)
31-40	12 (15.78%)
41-50	21 (27.63%)
51-60	11 (14.47%)
61-70	04 (5.26%)
71-80	02 (2.63%)
81-90	01 (1.31%)

51 (67.10%) patients presented with anterior mediastinal tumours, 3 patients (3.95%) presented with middle mediastinal tumours. 22 patients (28.94%) with posterior mediastinal tumours.

The presenting symptoms were those of Myasthenia Gravis in most patients with anterior mediastinal tumours (39.21%). Cough(100%) was the predominant symptom of middle mediastinal tumours. Neurological symptoms (36.36%) were the predominant symptom in posterior mediastinal tumours.(table 2)

TABLE 2 SYMPTOMATOLOGY

SYMPTOM	NUMBER OF PATIENTS
INCIDENTAL DIAGNOSIS	04
COUGH	04
CHEST PAIN	17
STRIDOR	01
HEMOPTYSIS	01
DYSPNOEA	15
SUPERIOR VENACAVA SYNDROME	02
HORNERS SYNDROME	01
MYASTHENIA GRAVIS	20
NEUROLOGICAL SYMPTOMS	08

BENIGN tumours (61.84%) were more common than malignant tumours (38.15%). Tumours of the Thymus (69.38%) were the commonest presentation among anterior mediastinal tumours. Schwannoma (54.54%) was the commonest tumour in the posterior mediastinum (table 3)

SURGICAL PROCEDURES

Standard Median Sternotomy approach was alone used in 56 patients. Posterolateral thoracotomy approach was used in 17 patients. Both Median Sternotomy and Posterolateral thoracotomy were used in case of cavitary carcinoma which needed left upper lobectomy and a case of poorly differentiated Neuroblastoma in which D5 –D6 Laminectomy was performed.

In cases of DUMBELL tumours prior Laminectomy to remove the intra spinal part was done in 1 patient followed by Posterolateral thoracotomy (STAGED approach), whereas Single STAGE approach (both Laminectomy and removal of thoracic part through thoracotomy in single sitting) was done in 2 patients

TABLE 3 HISTOPATHOLOGICAL DIAGNOSIS

HISTOPATHOLOGICAL DIAGNOSIS	NUMBER OF PATIENTS
Thymoma	25
Thymic Hyperplasia	7
Malignant Germ Cell Tumour	5
Mature Teratoma	8
Solitary Fibrous Tumour	1
Chondroid Hamartoma	1
Cavitary Carcinoma	1
Thymic Carcinoma	2
Vascular Hamartoma	1
Pericardial Cyst	2
Enteric Cyst	1
Schwannoma	12
Ganglioneuroma	2
Neuroblastoma	2
Round Cell Tumour	1
Synovial Sarcoma	3
Malignant Schwannoma	1
Neurenteric Cyst	1

VOLUME-6 | ISSUE-2 | FEBRUARY-2017 • ISSN No 2277 - 8179 | IF : 3.508 | IC Value : 78.46

Debulking was done in case of Recurrent Synovial Sarcoma (1), Thymic Carcinoma (1), Round Cell Tumour infiltrating pulmonary hilum.

Procedure was abandoned in case of Inflammatory Myofibroblastic Tumour infiltrating Great vessels ,Thymic Carcinoma infiltrating Great vessels,Lung and sternum, a case of massive Vascular Hamartoma, a case of Malignant Germ Cell Tumour infiltrating pulmonary hilum and the patient not tolerating pneumonectomy, a case of Synovial Sarcoma posterior mediastinum wherein life threatening bleeding was encountered and the patient not tolerating the procedure.

Concomitant procedures were OFF Pump coronary artery bypass grafting in one patient and Diaphragmatic reconstruction in a case of recurrent Germ Cell tumour.

Procedures to remove RESIDUAL tumour Post Chemotherapy were done in 2 patients with Malignant Germ Cell Tumour.

PERIOPERATIVE OUTCOME

Mean operative time was 3 hours. 34 patients (50%) required blood transfusion.

Mortality was of the order of 5 patients (6.57%). They were in a case of Thymic carcinoma debulking due to pneumonia, a case of Thymic carcinoma with Superior vena cava syndrome in whom Off Pump coronary artery bypass grafting was performed due to Low cardiac output, a case of Cavitary carcinoma who developed Critical limb Ischemia and Broncho pleural Fistula , a case of Recurrent Germ Cell tumour who developed Broncho Pleural Fistula and succumbed to Cancer Cachexia 4 patients developed Myasthenic Crises after Thymectomy and were managed appropriately with respiratory support, plasmapheresis with or without intravenous immunoglobulin therapy and supportive care. 1 patient developed Mediastinitis and Sternal Dehiscence after Debulking of Recurrent Synovial Sarcoma who was managed with culture specific antibiotics and nutritional support and treated conservatively, a case of Schwannoma who developed ipsilateral lower limb paresis due to hematoma managed conservatively.

DISCUSSION

Mediastinal Tumours are a rare entity in the chest . In our study 76 cases were evaluated. We had an almost equal ratio of males (51.32%) and females(48.68%). Majority of patients were in the age groups 41-50 years (27.63%) and 21-30 years(25%).

Benign tumours(61.84%) were more common than Malignant tumours (38.15%) similar to studies conducted by Davis et al {1} and Adegboye et al{2}. The studies conducted by Akshatha Rao Aroor et al {3} and Vaziri et al{4} reported a higher incidence of Malignant tumours over Benign tumours.

Anterior mediastinal tumours(64.5%) comprised the commonest tumour in our study comparable to other studies{1,2,3,5}.Thymoma was the commonest among them (69.38%).Most patients with Thymoma had symptoms of Myasthenia Gravis (53.6%). This was also the finding in other studies{5,6}. Surprisingly no case of Lymphoma was encountered in our study as ours was a surgical study in contrast to other studies { 2,3,4}

Middle mediastinal involvement was seen in 3.95% of cases Posterior mediastinal tumours comprised 31.6% of cases compared to other studies, Adegboye et al(22.9%){2} and Davis et al(26%){1} . Almost all cases of posterior mediastinal masses were symptomatic at presentation .Schwannoma was the commonest tumour(50%).

General anaesthesia for patients with severe positional symptoms from a Giant Anterior Mediastinal tumour is not safe{7}. Strategies to consider include awake fibreoptic intubation,maintenance of spontaneous ventilation,avoidance of muscle relaxants, intubation distal to airway compression,positional changes, immediate available of rigid bronchoscopy and elective Cardiopulmonary Bypass in extreme cases {8}.

We feel that Double Lumen Endotracheal Intubation with collapse of ipsilateral lung has helped us in complete excision of Giant Anterior Mediastinal Masses avoiding use of extensive incisions like CLAMSHELL and HEMI CLAMSHELL sparing the patient of morbidity.

Use of Thoracic Epidural Analgesia has decreased the incidence of morbidity due to pain allowing early rehabilitation of the patient.

Median Sternotomy was the incision of choice even for Giant Mediastinal Tumours. With judicious use of Favaloro Mammary retractor and Long Cautery tip we avoided conversion into extensive incisions like CLAMSHELL AND HEMICLAMSHELL{9}.

In Malignant NON SEMINOMATOUS GERM CELL tumours our approach has been initial treatment with Chemotherapy and proceeding to surgical resection of the RESIDUAL mass{10}.

Posterolateral Thoracotomy was used in cases of neurogenic tumours of the mediastinum. In Dumbell shaped tumours prior Laminectomy was done following which excision of the intra thoracic part was carried out at later date through Posterolateral Thoracotomy(STAGED APPROACH). SINGLE STAGE APPROACH was used in 1 case .We encountered no complications of wound sepsis and Cerebrospinal fluid leak unlike in other series{11, 12}.

Mortality was in the order of 6.57%, comparable to other series .We did not encounter any airway complications which are expected during anaesthetic induction of Giant Anterior Mediastinal tumours {7,8} . Except for one case of highly vascular Posterior Mediastinal Synovial Sarcoma in which torrential life threatening bleeding was encountered, no cases were re explored on account of bleeding even in Giant Mediastinal tumours which occupied more than two thirds of hemithorax .

Post operative Myasthenic Crisis is common after thymectomy .The incidence ranges from 12% to 34% {13 ,14}. Post operative Crises in these patients have been related to history of Myasthenic crisis, preoperative serum Anti Acetylcholine Receptor Antibody levels>100 nanomoles/litre, presence of preoperative bulbar weakness and intraoperative blood loss greater than 1 litre{14}. Current mortality is of the order of 4% {15}.Our mortality was 1.31%.This reduction was mainly possible because of prior diagnosis before Crises and instituting Plasmapheresis and Intravenous Immunoglobulin therapy and ventilatory support . Interdepartmental coordination is prerequisite in such cases

CONCLUSION

The outcomes following surgery for Mediastinal tumours are favourable when there is meticulous surgical technique,Careful coordination with anaesthesist ,proper Multidisciplinary care and follow up of the patient. With Lung Isolation and judicious instrument use there is no need to convert into extensive incisions like CLAMSHELL AND HEMICLAMSHELL sparing the patient of morbidity. Reducing the tumour burden by evacuating part of the tumour through opening of the capsule is helpful during excision of Giant Mediastinal tumours.

REFERENCES

{1} Davis RD, Oldham HN, Sabiston DC. Primary cysts and neoplasms of the mediastinum: recent changes in clinical presentation ,methods of diagnosis , management and results ANN THORACIC SURG.1987;44:229-37.

{2} Adegboye VO,Ogunseyinde AO , Obajimi MO , Ogunbiyi O , Brimmo AL , Adebo OA . Presentation of primary mediastinal masses in Ibadan . EAST AFRICAN MEDICAL JOURNAL .2003; 80: 484-87

{3} Akshatha Rao Aroor , Rama Prakasha S , Shubha Seshadri , Teerthanath S , Uppoor Raghuraj. A study of clinical characteristics of Mediastinal Mass JOURNAL OF CLINICAL AND DIAGNOSTIC RESEARCH .2014 FEB; VOL 8(2):77-80

{4} Vaziri M, Pazooki A, Zahedi, Shoolami L . Mediastinal masses : Review of 105 cases ACTA MEDICA IRANICA 2009;47 : 297-300

{5} Singh G , Amin Z, Wuryantoro , Wulani V , Shatri H . Profile and factors associated with mortality in mediastinal mass during hospitilization at Cipto Mangunkusumo Hospital Jakarta .INDONESIAN JOURNAL OF INTERNAL MEDICINE , 2013 ; 45: 3 – 10.

{6} Dubashi B, Cyriac S , Tenal SG. Clinicopathological analysis and outcome of primary mediastinal malignancies A report of 91 cases from a single institute ANN THORACIC MEDICINE 2009; 4: 140 -42

{7} Peter Slinger , Karsli, Cengiz . Management of patient with large anterior mediastinal mass : Recurring myths CURRENT OPINION ANAESTHESIOLOGY FEB 2007 –VOL 20 ; ISSUE 1 :Pg 1-13

{8} Chih Min Ku MBBS ,M . Med Chapter in textbook PRINCIPLES AND PRACTICE OF ANAESTHESIA IN THORACIC SURGERY pages 201-210 PETER SLINGER MD FRCPC

{9} Bains MS, Ginsberg RJ , Jones WG 2nd et al . The Clamshell incision : an improved approach to bilateral pulmonary and mediastinal tumour ANN THORACIC SURGERY 1994 ; 58: 30-33

{10} Vuky J , Bains M, Bacik J , Higgins G , Motzer RJ , Bosl GJ . Role of post chemotherapy adjunctive surgery in management of patients with non seminoma arising from the mediastinum JOURNAL CLIN ONCOLOGY 2001 ; 19: 682 -688

{11} Grillo HC, Ojemann RG , Scannel JO et al Combined approach to " DUMBELL" intrathoracic and intraspinal neurogenic tumours ANN THORACIC SURGERY 1983 36 – 402

{12} Shadmehr MB, Gaissert HA , Wain JC et al The surgical approach to DUMBELL tumours of the mediastinum ANN THORACIC SURGERY 2003 ; 76: 1650

{13} Kas J . Kiss D, Simon V, Svastics E ,Major L , Szobor A . Decade long experience with surgical therapy of myasthenia gravis : early complications of 324 transsternal thymectomies ANN THORACIC SURGERY 2001 ; 72 : 1691-1697

{14} Watanabe A, Watanabe T, Obama T et al . Prognostic factors for myasthenic crisis after transsternal thymectomy in patients with myasthenia gravis JOURNAL THORACIC AND CARDIOVASCULAR SURGERY 2004 ; 127: 868-876

{15} Thomas CE , Mayer SA ,Gungor Y et al . Myasthenic crisis : clinical features , mortality, complications and risk factors for prolonged intubation NEUROLOGY 1997 ; 48 :1253 - 1260