Abstract:
Mediastinal germ cell tumors are infrequent. However, the mediastinum is the most common extra gonadal location for germ cell tumors. These may be teratoma, immature teratoma, malignant teratoma, seminoma, yolk sac tumors, embryonal carcinoma, choriocarcinoma and mixed germ cell tumors. Teratoma is the most common of the mediastinal germ cell tumors. They usually cause non specific symptoms and can be diagnosed with a Computer Tomography (CT) Scan. Surgical resection ensures cure in most cases. We present a series of mediastinal germ cell tumors operated upon at our institution.

Keyword: Germ cell, Tumor, Teratoma, Mediastinum, Biopsy, Tumor marker, Benign

FIGURE 5
INTRODUCTION:
Primary mediastinal germ cell tumors are rare neoplasm and accounts for 5-10% of the mediastinal tumors. Only 5% of the germ cell tumors (GCT) are extra gonadal. The most common extra gonadal site of involvement is the mediastinum. GCT are among the most common tumors in the anterior mediastinum accounting for nearly 15% of the tumors in this location. 85% of the germ cell tumors are benign and are mostly teratomas. Seminoma and non seminomatous germ cell tumors are the other germ cell tumors encountered. Various theories are postulated for the development of these tumors in the mediastinum. They are thought to be due to the mismigration of germ cells along the urogenital ridge during embryogenesis. The incidence of germ cell tumors is equal in men and women and usually present in the second to the fourth decade of life. These tumors are slow growing masses and may be asymptomatic for a long time. The most common presenting feature seen is chest pain. They may gradually expand and cause compression of the adjacent structures and erosion of airways. Physical examination is often unrevealing. Most of these tumors can be picked up on plain radiography as a well circumscribed mediastinal mass. Computed Tomography (CT) scan is often diagnostic. GCT are seen as heterogeneous lesions with calcifications and fat density. Assessment of tumor markers like Alpha feto protein (FP) and Beta human chorionic gonadotropin (HCG) are essential in evaluation of these masses.
If the tumor markers are elevated, the tumor should be considered as malignant germ cell tumor. The role of trans thoracic image guided biopsy to confirm the diagnosis of germ cell tumor is controversial. This might be necessary when the diagnosis is doubtful or for a large malignant looking lesion to establish diagnosis before neoadjuvant therapy. Testicular ultrasound should be done to rule out a primary lesion. Surgical resection results in cure of nearly all patients and may be achieved through sternotomy, thoracotomy or by video assisted thoracoscopic surgery. Complete resection should be attempted in all cases. Mortality rates are nearly zero. Prognosis is excellent after resection. 10 year survival rate is reported to be around 93%.

METHODS AND MATERIALS:
All the patients with germ cell tumors of the mediastinum surgically treated in the Department of Cardio-Thoracic Surgery at our institution in the last 5 years were included in this series. A retrospective analysis of these tumors was done in this study. The data was obtained from the medical records of these patients maintained by the Medical records Department. The patients were followed up in the out patient department.

RESULTS:
1 There were a total of 25 cases of mediastinal germ cell tumors which were operated upon in our institution in the last 5 years.

2 This formed 12.5% of the anterior mediastinal tumors in our study and 8% of mediastinal tumors operated in the same period.

3 This formed 1.9% patients admitted for surgery in the general thoracic surgery department for various conditions.

4 These were most commonly noticed in the 4th decade (44%) and the average age at presentation was 30.9 years.

5 There was a predilection for female sex who constituted nearly 60% of the cases (Figure 1).

6 The most common presenting symptom was cough which was seen in 40% of the cases. The other symptoms were breathlessness, pain and haemoptysis. There was one patient with symptoms and signs secondary to superior vena cava obstruction due to a large tumor mass. Incidental detection of the tumor was uncommon (Figure 2).

7 The duration of symptoms before presentation ranged from 1 week to 11 years with most of the patients being diagnosed within 6 months in 60% cases.

8 All but two patients had a well-defined mediastinal mass on plain chest radiography (Figure 3). One of these patients had a mediastinal mass with fluid level and as suspected had a ruptured germ cell tumor which was confirmed on CT scan (Figure 4).

9 CT scan was done for all patients (Figure 5) and was diagnostic in 80% of the cases. CT scan showed a heterogeneous mediastinal mass with areas of fat density.
The tumor size ranged from 3cm-23cm and average size was 8.2 cm.

CT guided biopsy was done only for 6 patients and was negative in 3 of them.

Levels of FP and HCG were assessed in 20 patients. It was elevated in only 3 patients; one of these three patients had a benign tumor which had ruptured. The other 2 patients with elevated markers had malignant neoplasm.

Total excision of the tumor was possible in 24 patients (Figure 6). One patient with advanced malignant tumor refused postoperative treatment and was discharged. Two of these patients with malignant neoplasm had received neoadjuvant chemotherapy and later the residual tumor was excised.

Excision was done through posterolateral thoracotomy in 64% of the cases and in the rest through a sternotomy.

Concomitant lobectomy was done for 3 cases in which the tumor was adherent to the lung.

In our study the most common GCT of the mediastinum was the benign teratoma which accounted for 88% of the cases. Three of the patients had malignant germ cell neoplasm including seminoma and malignant non seminomatous germ cell tumor.

There were no major post operative complications in our study. Two patients had prolonged air leak and serous discharge from the drains which settled with conservative management.

The average post operative stay was 7.8 days. There was no perioperative mortality in this study.

**DISCUSSION:**

Teratoma are tumors composed of tissue foreign to the organ or anatomic site at which they arise. Only 5-10% of GCT are extragonadal in location. They are seen mostly between 2nd and 4th decades of life. Our study also concurs with the other series in the literature and noticed these tumors predominantly in the 4th decade. Females were more commonly diagnosed with this lesion in our series as also reported by Wychullis et al. These tumors are generally slow growing tumors and may remain asymptomatic for long duration. In our study we found only 8% of the tumors incidentally. In most studies in the literature chest pain was the commonest presenting feature, however in our study most patients (40%) presented with cough. CT scan is the diagnostic investigation and the diagnosis can be made with fair amount of certainty in most cases as noted by Brown et al. CT scan diagnosed the tumor in nearly 80% of the cases in our study. The use of CT guided biopsy is controversial and may be used in selected cases before planning neoadjuvant therapy or to rule out a metastatic lesion. We had a positive yield of only 50% after CT guided biopsy was done. Tumor markers FP and HCG needs to be evaluated in all patients with anterior mediastinal mass. However it is elevated only in malignant germ cell tumors. In our study only 1 patient with a ruptured benign teratoma had elevated FP. 2 patients with malignant germ cell tumor had these markers raised. Resection can be achieved via sternotomy or thoracotomy in most cases.
It is best done by video assisted thoracoscopic surgery if and when feasible. We performed this by sternotomy in 36% and thoracotomy in 64% cases. The morbidity and mortality after the resection of the tumor is nil in the present study and also in other references searched.8

**CONCLUSIONS:**
Germ cell tumors are the second most common of anterior mediastinal tumors and account for 12.5 % of these. They are most commonly seen in the 2nd to the 4th decade of life with a female preponderance. Cough is the most common presenting feature with most patients being diagnosed within 6 months of symptoms. Chest X ray shows a mass in the Mediastinum but does not provide any further information regarding the nature of the disease. CT scan is diagnostic in most of the cases and accurately describes the anatomy of the tumor and its relationship to the neighboring structures. Image guided biopsy is not needed for the evaluation of these tumors unless they are being planned for neoadjuvant therapy. These tumors can be resected completely and safely either through a sternotomy or thoracotomy. Video assisted thoracoscopic surgery can also be done for selected cases with good results and minimal morbidity. Large malignant tumors can be treated with neoadjuvant therapy before surgery is attempted. Mortality is nil and morbidity from the surgical procedure is nearly absent.

**REFERENCES:**
5 Robinson LA, Rikkers LF, Dobson JR. Benign mediastinal teratomas masquerading as a large multiloculated effusion. Annals of Thoracic surgery. 1994; 58: 545

**LEGENDS:**
FIGURE 1: Pie diagram showing distribution of the tumor in the two sexes.
FIGURE 2: Bar diagram showing distribution of the symptoms among the patients
FIGURE 3: Chest x ray showing a large mediastinal mass (Arrow).
FIGURE 4: CT scan of a patient with germ cell tumor that had ruptured into middle lobe showing fluid air level in the cyst (Arrow).
FIGURE 5: CT Scan thorax showing a heterogenous anterior mediastinal mass with areas of fat, calcification and cystic changes (Arrow). Minimal bilateral pleural effusion is also seen.

FIGURE 6: Resected specimen of a benign mediastinal germ cell tumor having hair in the mass (arrow).