Surgical Experience in Mediastinal Cysts: At the Thoracic and Vascular Department in Ghazi Al Hariri, Surgical Subspecialties Hospital, Medical City,Baghdad, Iraq

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ABSTRACT:

BACK GROUND:

Cystic lesions of the mediastinum are not uncommon, comprising 20% to 32% of all primary mediastinal tumors. They are particularly significant because of the difficulty in making a differential diagnosis: they can simulate multiple lesions, both benign and malignant.

OBJECTIVE:

The objectives of this study were to review the clinical presentations and the results of surgery in patients with mediastinal cysts.

PATIENTS AND METHODS:

A retrospective study of twenty-two patients with mediastinal cysts, who were admitted and surgically treated at Ghazi Al-Hariri for surgical sub specialties hospital during ten years from January 2003 to December 2013. Clinical features, imaging techniques, surgical approaches, morbidity, mortality and follow-up were analyzed.

RESULTS:

Out of twenty-two patients with mediastinal cysts, there were 13 males (59.09%) and 9 females (40.9%) patients. There were 12 pediatric (54.54%) patients ≤ 16 years of age and 10 adults (45.45%) patients (age range, 36 days to 40 years; average age, 20 years). All patients with mediastinal cysts were symptomatic. Overall common symptoms were dyspnea (68.1%), followed by cough (50%), chest pain (31.8%), tachypnea (4.5%), dysphagia (4.5%), vomiting (4.5%), and fever (4.5%). Cysts excision were performed in all cases with an uneventful recovery and with no recurrence during the follow up period.

CONCLUSION:

Most of mediastinal cysts located at middle compartment, Surgery for mediastinal cysts is associated with low morbidity and mortality rates and a very low recurrence rate. It offers a definitive diagnosis and cure.

KEY WORDS: mediastinum, cyst, mediastinal tumors, median sternotomy.

INTRODUCTION:

The mediastinum is defined as the thoracic space that lies between the two pleural cavities. It extends from the thoracic inlet cephalad to the superior surface of the diaphragm caudad**.**

In 1972, Shields [(1)] proposed a simpler three-compartment model consisting of an anterior compartment, middle (or visceral) compartment, and posterior compartment (paravertebral sulcus). All three compartments are bounded inferiorly by the diaphragm, laterally by the pleural space, and superiorly by the thoracic inlet. The components of these three compartments are shown in table I.

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Table I: Components of Mediastinal Compartments as Proposed by Shields (1).

Anterior	Visceral(middle)	Paravertebral(posterior)
Thymus	pericardium	Sympathetic chain
Internal thoracic vessels	Great vessels	Proximal intercostal nerve,artery,and vein
Internal thoracic lymph nodes	Trachea	Posterior paraesophageal lymph nodes
Prevascular lymph nodes	Proximal right and left main stem	Intercostal lymph nodes
Fat and connective tissue	Oesophagus	
	Phrenic nerve	
	Thoracic duct	
	Proximal azygous vein	
	Paratrachial and subcarinal lymph nodes(levels 2,4,and7)	
	Pleuropericardial lymph nodes	
	Fat and connective tissue	

Mediastinal cysts are common lesions encountered in children and adults. Most are congenital lesions, and they account for 20% to 32% of all primary masses of the mediastinum. Despite the frequent discovery of these cysts in infancy and childhood, half or more of these cysts are not identified until the third or fourth decade of life. Classification is usually based on etiology (1) as shown in table II

Table II: Classification of mediastinal cysts. (1).

Mediastinal cysts	Subtypes
Congenital	
Mesothelial	Pericardial cyst Pleural cyst
Foregut	Bronchial cyst Esophageal cyst Gastroenteric cyst Neuroenteric cyst
Lymphatic	Lymphangiomatous Thoracic duct
Acquired	
Inflammatory	
Thymic	
Dermoid	
Thyroid	
Parathyroid	

Bronchogenic Cysts:

Bronchogenic cysts are most often spherical, unilocular cystic masses in contact with the tracheobronchial tree. Infrequently the cysts may be lobulated, multiloculated, or rarely multiple. They may be located near or within the wall of the oesophagus, in the lung, or even within the pericardial sac**.**

Oesophageal Cysts:

Esophageal cysts, sometimes referred to as esophageal duplications, are much less common than bronchogenic cysts. The esophageal cysts are thought by Abel [(2)] to arise from persistent vacuoles in the wall of the foregut that develop during the solid tube stage of oesophageal development.

Tracheoesophageal Cysts:

Abel [(2)] described mediastinal cysts with mixed features of both bronchogenic and oesophageal cysts. He suggested that these rare cysts result from tracheoesophageal fistulas that close off and become isolated cystic structures during early embryogenesis.

Neurenteric Cysts and Gastroenteric Cysts:

A thoracic neurenteric cyst is defined as a thin-walled cystic structure with an associated cervical or thoracic vertebral anomaly. [(3)]

Gastroenterogenous cysts of the mediastinum are gastric cysts that may or may not communicate with the gastrointestinal tract below the diaphragm. The cyst may also be associated with vertebral anomalies, although it has no intravertebral communication. [4]

Mesothelial cysts:

comprise a variety of cysts that have been reported as pleuropericardial cysts, pleural cysts, lymphogenous cysts, and simple mesothelial cysts of the mediastinum.

Thymic cysts:

are inevitably found along the developmental tract of the thymus and hence can be located in the neck or in the anterior compartment of the mediastinum; these cysts can be either congenital or acquired. Congenital cysts are typically unilocular, contain clear fluid, have walls that are thin and show no evidence of inflammation on careful histopathological examination. On the other hand, acquired cysts are usually multiloculated; the cysts contain turbid fluid or greasy material, have thick and fibrous walls and typically have evidence of significant inflammation and fibrosis on histopathological examination. [5]

Hydatid Cysts:

Primary mediastinal cysts caused by the larval stage of E. granulosus are rare. Cysts located here may expand the adjacent intercostal spaces, erode through the chest wall, or migrate into the spinal canal via an adjacent intervertebral foramen.

Secondary echinococcal cysts in the mediastinum occur more commonly than do the primary ones. These secondary cysts are the result of a rupture of a Para mediastinal hydatid cyst, penetration of a sub diaphragmatic cyst through the diaphragm, or migration of one or more of the hydatid cysts into the visceral compartment via the oesophageal hiatus.

AIM OF STUDY:

This study was planned to review and describe clinical presentations, diagnostic procedures, locations, histological subtypes, treatments, and outcomes of patients with mediastinal cysts, who were managed at Thoracic and vascular department in Ghazi Al-Hariri surgical subspecialties hospital.

PATIENTS AND METHODS:

A retrospective study of twenty-two patients with mediastinal cysts, who were admitted and treated surgically at Ghazi Al-Hariri surgical subspecialties hospital, during ten years from January 2003 to December 2012.

During the preoperative assessment, radiological evaluations were the primary step including chest radiographies, computed tomography scans and magnetic resonant imaging. Echocardiography, abdominal ultra sound, rigid bronchoscopy, and rigid esophagoscopy were done for some of the patients.

All the patients after preoperative preparation underwent surgery at Thoracic and vascular department in Ghazi Al-Hariri surgical subspecialties hospital.

The indications were to achieve exact diagnosis, to remove pressure on the vital mediastinal organs and to avoid possible complications like malignant transformation. Surgical procedure was chosen with regard to location and extension into surrounding structures.

Excisions were performed mostly via thoracotomy (posterolateral thoracotomy, double lumen endotracheal with complete excision to the cyst), while cysts located at the level of the thoracic inlet approached by exposing the mediastinum with a proximal sternotomy extending into the neck on the side of the documented lesion (Median sternotomy).

Special form was used to divide patients as regard their age, gender, clinical presentation, preoperative investigations, operative findings and post-operative complications (morbidity and mortality).

RESULTS:

During a period of ten years, 108 patients were referred to our department for surgical management of mediastinal masses. Twenty-two of them were mediastinal cysts and comprising 20.37 % of total mediastinal tumors. There were 13 males (59.09%) and 9 females (40.9%) patients (male to female ratio 1.44:1). There were 12 pediatric (54.54%) patients ≤ 16 years of age and 10 adults (45.45%) patients. age range from 36 days to 40 years; average age, 20 years.

Histologically, there were 13 bronchogenic cysts (59.09%), 2 gastro enteric cysts (9.09%), 2 pericardial cysts (9.09%), 2 hydatid cysts (9.09%), 1 esophageal cyst (4.5%), 1 thymic cyst (4.5%), and 1 dermoid cyst (4.5%).

The distribution of patients as regard to age, gender and histological type is illustrated in table III.

Table III: Mediastinal cysts in different age, gender, and histological type.

Histology	1day-16 years	17-20 years	21-30 years	31-40 years	Male	Female
Bronchogenic cyst	9	2	1	1	9	4
Pericardial cysts	-	-	-	2	1	1
Gastroenteric cysts	2	-	-	-	2	-
Esophageal cyst	1	-	-	-	-	1
Thymic cyst	-	-	-	1	1	-
Dermoid cyst	-	-	1		-	1
Hydatid cyst	-	-	1	1	-	2
Total	12 (54.54)%	10 (45.45)%			13 (59.09)%	9 (40.09)%

All patients with mediastinal cysts, at the time of presentation were symptomatic. These symptoms usually appeared in progressive fashion in most patients. Overall common symptoms were dyspnea (68.1%), followed by cough (50%), chest pain (31.8%), tachypnea (4.5%), dysphagia (4.5%), vomiting (4.5%), and fever (4.5%). As shown in table IV .

Table IV: Symptoms of mediastinal cyst

Symptoms	Dyspnea	Cough	Chest pain	Tachypnea	Dysphagia	Vomiting	Fever
Bronchogenic cyst	9	9	4	-	-	-	-
Gastroenteric cyst	2	-	-	1	-	1	-
Oesophagial cyst	-	-	-	-	1	-	-
Pericardial cyst	2	-	-	-	-	-	-
Hydatid cyst	-	2	2	-	-	-	-
Thymic cyst	1	-	1	-	-	-	-
Dermoid cyst	1	-	-	-	-	-	1
Total	15 (68.1)%	11 (50)%	7 (31.8)%	1 (4.5)%	1 (4.5)%	1 (4.5)%	1 (4.5)%

Seventeen of twenty-two mediastinal cysts (77.27%) were located in the middle mediastinum, followed by three cysts (13.63%) in the posterior and 2 cysts (9.09%) anterior mediastinum. As shown in table V.

Table V: Localizations of mediastinal cysts.

Mediastinal cysts	Anterior mediastinum	Middle mediastinum	Posterior mediastinum
Bronchogenic cysts (13)	-	12	1
Gastro enteric cysts (2)	-	-	2
Esophageal cyst (1)	-	1	-
Pericardial cysts (2)	-	2	-
Hydatid cysts (2)	-	2	-
Thymic cyst (1)	1	-	-
Dermoid cyst (1)	1	-	-
Total (12)	2 (9.09)%	17 (77.27)%	3 (13.63)%

Diagnostic evaluations in all cases began with conventional chest radiographs. CT chest was performed in all patients, which revealed round, well circumscribed masses of water density or a little higher. Preoperative blood investigations for all patients were done.

Some specific investigations were done such as echocardiography for pericardial cysts; abdominal ultra sound for mediastinal hydatid cysts, rigid esophagoscopy for esophageal cyst; and rigid bronchoscopy for dermoid cyst were performed.

Surgical procedure was chosen with regard to the tumor size, location and extension into surrounding structures. Excisions were performed via median sternotomy in 2 patients (9.09%), and thoracotomy in 20 patients (90.9%), (Right thoracotomy in 15 patients (68.1%), and left thoracotomy in 5 patients (22.7%). As shown in table VI.

During the postoperative period three patients presented with complications (one wound infection, one atelectasis, and other one with pneumonia and wound infection.). The follow-up period was 12 ± 10 months. There was no recurrence for any particular cyst. There was no mortality after surgical removal of mediastinal cysts.

Table VI: Surgical approaches

Cysts	Surgical approaches
Bronchogenic cyst (n=13)	10 right thoracotomy 3 left thoracotomy
Pericardial cyst (n=2)	2 right thoracotomy
Gastro-enteric cyst (n=2)	1 left thoracotomy 1 right thoracotomy
Hydatid cyst (n=2)	1 left thoracotomy 1 right thoracotomy
Esophageal cyst (n=1)	Right thoracotomy
Thymic cyst (n=1)	Median sternotomy
Dermoid cyst (n=1)	Median sternotomy

DISCUSSION:

Mediastinal cysts are not uncommon and easily diagnosed by routine radiographic imaging procedures. These cysts comprise 20% to 32% of all mediastinal masses. Mediastinal cysts were further classified into foregut-derived cysts, which represented more than half of cystic lesions of the mediastinum, mesothelial cysts including pericardial pleural cysts, thymic cysts, and other rare cystic lesions such as cystic teratoma and hydatid cysts. [6]

Mediastinal cysts accounts for 20.37% of all mediastinal masses in our study while Takeda [7] reported mediastinal cysts comprising 13.0% of total mediastinal tumors in their study and Pedro [8] reported mediastinal cysts representing approximately 8.7% of all mediastinal masses in their study. However, it is difficult to calculate the exact prevalence of the cysts, since some aged patients have lesions that remain forever silent.

Symptoms are nonspecific and mostly due to compression to the adjacent structures. In our study, all patients (100%) with mediastinal cysts were symptomatic. Dyspnea was the most common presenting complaint regardless of cystic pathology. This may be result of compression, irritation or inflammation of pleura while 50% of cysts reviewed by Anderson and colleagues were symptomatic [9], Ahmed and co-workers (3) reported that 70% of the patients were symptomatic, Pokrny and Goldstein [10] have noted that infants generally present with respiratory symptoms whereas older children present with pain.

Majority of lesions in our study were found in the middle mediastinum (77.27%), The remainders of lesions were in the posterior compartment (13.6%) and the anterior compartment (9.09) and these results are compatible with other studies, Whooly BP (6), Takeda S (7), Pedro Bastos (8) and Hidir Esme [11].

Whatever the etiology is, these masses have similar imaging appearances. Extensive degeneration of solid masses may lead cyst formation that radiologically indistinguishable from true cysts. [12].

Conventional chest radiograms are primary step in evaluation and usually demonstrate them as a

sharply emarginated, round or oval area of increased opacity. [12]

Magnetic resonance imaging tends to be the current imaging modality of choice for establishing diagnosis and determine cyst location. Magnetic resonance imaging is helpful especially in differential diagnosis of other mediastinal masses and in assessment of the chance of complete resection in some cases. [13]

Magnetic resonance imaging was not performed in our study, because conventional methods and computed tomography helped us to define cystic characteristics and to plan the surgical procedure.

In our study, there was no complication related with major morbidity and mortality, due to the absence of complicated cysts in any patients. The morbidity of cysts regardless of nature is usually resulting of an enlarging lesion on adjacent structures such as the heart, great vessels, tracheobronchial tree, or esophagus. And also infection of cyst, intracystic hemorrhage, spontaneous rupture, airway obstruction hemodynamic compromise including cardiac tamponade and recurrence after resection are other reported morbidities. [14] Malignant degeneration of these cysts was rarely reported. [7, 15]

In our study mediastinally located bronchogenic cysts constituted 12.03% of all mediastinal tumors and 59.09% of all mediastinal cysts. Bronchogenic cysts constitute 5 - 10% of all mediastinal tumors and 50 - 60% of all mediastinal cystic pathologies. They can be found at any location of body [16,17]. In the series of Takeda, (7) 48% of cystic mediastinal lesions were bronchogenic cysts. Bronchogenic cysts are sometimes found in association with other congenital pulmonary malformations such as sequestration and lobar emphysema, [18] but we don't have such association.

In our study have 2 patients with pericardial cyst both cysts on the right side (100%) which is compatible with other studies. Most of pericardial cysts arise in anterior cardiophrenic angle and are frequently on the right side and pedunculated. [19].

In our study, all our patients were symptomatic, the reported studies dyspnea and chest wall discomfort are most frequent symptoms, but patients are usually asymptomatic. [7,11]

In our study, primary thymic cysts represent 4.5% of all mediastinal cyst and 50% of all anterior mediastinal cysts, while Takeda, [7] reported thymic cysts were second large group of cyst with 28.6% of the mediastinal cysts. Uniloculated cysts are usually congenital with thin cystic wall and contain serous fluid.

Multiloculated cysts with thick wall contain gelatinous fluid and though to be acquired in origin [20]. There is debate in treatment of unilocular thymic cysts. Some believe all cysts should be removed for definite diagnosis and to prevent future complications. However, multilocular cysts must be excised because of risk of malignant degeneration. [20]

In our study, there were 2 cases of gastro enteric cysts located in the posterior mediastinum, one in right side and one in left side, also there was 1 case of teratoma that was located in anterior mediastinum, Clinical and radiological findings were compatible with other studies. [10,21]

Hydatid disease of true mediastinal involvement is very rare but we encountered 2 cases (9.09). Both of them were intact, therefore symptoms were referable to their mass effect. In an endemic area the incidence of hydatid cysts can be as high as 0.38% of primary mediastinal echinococcal cysts. [22]

No conservative treatments used in our study, some authors support waiting or conservative treatments on a symptomatic case but are controversial and the results are not always satisfactory. [23,24]

The traditional approach to mediastinal cysts, especially with atypical radiologic features or being symptomatic, is surgical excision for definitive diagnosis and treatment with acceptable mortality and morbidity. [23]

We preferred thoracotomy and sternotomy for almost all cases. There is also encouraging results for thoracoscopic excision of mediastinal bronchogenic cysts in selected patients. [24] With its postoperative advantages, VATS may be preferred in suitable patients and at full facility, instruments, and experienced departments. Unfortunately, the VATS was not used in our hospital for removal mediastinal cyst.

CONCLUSION:

Majority of mediastinal cysts located at middle (visceral) compartment of mediastinum.

Bronchogenic cysts are most common mediastinal cysts.

Symptoms based on location and etiology.

Radiological evaluation is primary and important step in diagnosis of mediastinal cysts, which include chest radiographies, and computed tomography scans.

Treatment of choice is complete surgical excision.

Advantages of complete surgical excision are preventing potential complications, difficult to remove when infected, establish diagnosis, excellent prognosis, low morbidity and mortality.

Recommendation:

Video assisted thoracoscopic surgery is a good tool for management of mediastinal cysts, and should be available in thoracic surgical center.

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