Pulmonary Resections Types, Indications, and Complications

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ABSTRACT:

BACKGROUND:

A variety of pulmonary resection techniques are currently available, including pneumonectomy (intrapleural, extrapleural, intrapericardial,and sleeve pneumonectomy), lobectomy and sleeve lobectomy , segmentectomy, wedge resection and non-anatomic parenchymal sparing resection.

OBJECTIVE:

To evaluate the experience with pulmonary resections at our hospital.

METHODS:

This is a retrospective study utilized medical records of 110 patients from 1st of January 2013 to the 31st December 2014. After doing the routine laboratory work and chest x-ray for all patients, they were operated under general anesthesia with double lumen endotracheal tube, for whom different types of pulmonary resections were performed for different reasons.

RESULT:

A total of 110 patients, 65 males (59.1%) and 45 females (40.9%). Lobectomy is the most common type of pulmonary resection used 62.7%.Malignant tumor is a common indication for pulmonary resection 36.3%. Trauma and hydatid cyst are a significant cause of pulmonary resection in our country. Mortality rate for pulmonary resection is 9.09%.

CONCLUSION:

Pulmonary resections are the most used surgical modalities for treatment of many pulmonary diseases. It is a safe procedure providing the proper selection of the patient and assessment regarding pulmonary function status**.**

KEYWORDS: pulmonary resection, pneumonectomy, lobectomy, segmentectomy.

INTRODUTION:

Pulmonary resection is the operation that defines the thoracic surgeon. Lobectomy and pneumonectomy are widely used to treat lesions of the lung. However, many thoracic patients have (COPD) or emphysema and have minimal lung reserve that unable to tolerate such extensive lung resections, segmentectomy is a good option in such patients. Thoracoscopic resection has now been well documented to offer advantages over thoracotomy for anatomic lung resection for non–small cell lung carcinoma (NSCLC)and is the preferred approach for resecting early- stage disease.[1-4]Currently close to 40% of lung resections are performed in the US using VATS technique.[1,2]A recent analysis of the Society of Thoracic Surgery database from 2000-2010 found that 35% (4531/12970) of all lobectomies registered are performed by VATS techniques.(This has increased from 20% in a previous analysis in 2006).[3,4]

A randomized trial found VATS techniques have less complications overall (18% vs. 50%).[5]

METHODS:

At ibn –alnafees hospital, and over a period of two years (1st january2013-31st december2014)110 patients underwent pulmonary resections, of different age groups and for different reasons, their case records studied. Preoperative assessment includes history and physical examination, chest X ray, computed tomography, MRI, complete blood picture, biochemical analysis, ECG, sputum cytology and acid fast bacilli, pleural aspirate cytology, pulmonary function test. After double lumen endobroncheal tube insertion and single lung

Ibn-Anafees hospital.

anesthesia initiated, standard posterolateral thoracotomy (or other types for sublober resections) was used. The patient is positioned in a lateral decubitus position , the bed is flexed, and axillary roll is used .The incision is centered 1 or 2 cm under the scapular tip and extended anteriorly along the rib and posteriorly at the midpoint between the medial border of the scapula and the spine. The latissimus dorsi muscle is either mobilized and preserved or divided for additional access. If the latissimus is divided, it is often helpful to mobilize it off the serratus anterior and overlying soft tissue for ease of later closure. The chest is entered in the fifth interspace and after releasing the lung, the hilum and mediastinum are palpated to assess the extent of involvement and determine respectability. Individual ligation technique done, and no stapling device was used, interrupted silk suture used for bronchial stump closure. One chest tube used for pneumonectomy, it kept clamped for 1-2 days with intermittent release of the clamp for 5 minutes every 5 hours. Two chest tubes kept on suction on the underwater seal bottles as long as there is air leak, for other type of resections. Patients transferred to intensive care unit with intravenous antibiotics and proper analgesia. After one night in ICU patient referred to word.

RESULTS:

Of those 110 patients, there were 65 males (59.1%) and 45 females (40.9%). Figure (1).

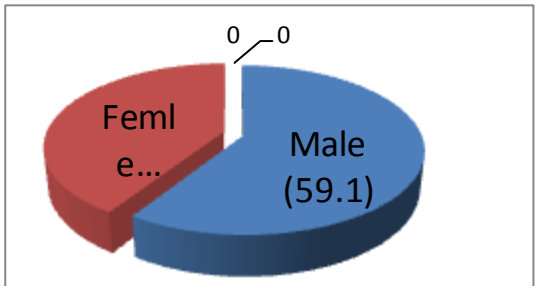

Figure 1:Sex distribution

For patients above 30 years, tumor is the most common indication while for those below 30 years old, trauma and hydatid cyst are most common indication. The most common indication of pulmonary resection for all age groups was tumor (malignant), 40 patients (36.4%), followed by hydatid disease 28 patients (25.4%), and then trauma 20 patients (18.2%).Congenital lobar emphysema and bronchiectasis 6 patients (5.4%) for each. Lung abscess 5 patients (4.54%), Tuberculosis, 3 patients (2.72%) and lastly 2 patients with sequestration (1.8%).Patients group (51-60y) are the most frequently operated patients in this study. (Table 1)

Table 1:Pulmonary diseases according age groups.

Diseases	0-10 y	11-20 Y	21-30 y	31-40 Y	41-50 Y	51-60 Y	61-70 Y	71-80 Y	Total
Tumor	\	\	1	4	8	13	11	3	40
Hydatid disease	5	3	6	7	4	2	\	1	28
Trauma	1	5	7	3	1	2	\	1	20
Congenital lobar emphysema	6	\	\	\	\	\	\	\	6
Bronchiectasis	\	1	2	2	1	\	\	\	6
Lung abscess	1	1	\	\	\	2	1	\	5
TB	\	1	\	1	\	1	\	\	3
Sequestration	/	1	1	\	\	\	\	\	2
Total	13	12	17	17	14	20	12	5	110

Pneumonectomy done for 10 patients (9.09%) and most of it for malignant tumors that located centrally, while lobectomy done for 69(62.7%) patients. (Table 2). Chest tube was removed at 1st or 2nd postoperative day in pneumonectomy, while in cases of lobectomy it was removed at mean 3.47days (range 2-20 days) for the apical tube, and a mean 5.27 days(range 3-28 days) for basal chest tube(table 3).

Table 2:Types of resections.

Diseases	pneumonectomy	lobectomy	bilobectomy	Wedge resection	Total
Tumor	5	32	1	2	40
Hydatid diseases	\	18	1	9	28
Trauma	3	3	1	3	10
Lung abscess	\	3	2	5	10
Bronchiectasis	\	6	2	\	8
Emphysema	\	6	\	\	6
TB	2	1	3	\	6
Sequestration	\	2	\	\	2
Total	10 (9.1%)	69 (62.7%)	12 (10.1%)	19 (17.2%)	110

Table 3:Postoperative pleural drainage time.

Type of resection	Apical tube/Mean Days	Basal tube/Mean Days
Bilobectomy	4	6.3
Lobectomy	3.47	5.27
Pneumonectomy		4
Wedge resection	3.1	3.2

Postoperative complications occurred in 20 cases (18.2%). Empyema is the commonest, (6 cases), 3 of them occurred in lobectomies for complicated hydatid cyst and 3 cases after pneumonectomy for trauma, malignancy and tuberculosis, the last 2 died.Bronchopleural fistula(BPF) is a serious complication and occurred in 4 patients, 2 of them also develop empyema and died postoperatively, the other 2 reoperated and fistula obliterated in proper way. (Table 4)

Table 4: Postoperative complications.

	Pneumonectomy	Lobectomy	Bilobectomy	Segmentectomy	Total
Empyema	3	3	\	\	6(5.4%)
Atelactasis	1	3	1	\	5(4.54%)
Wound infection	1	3	\	1	5(4.54%)
BPF	2	1	1	\	4(2.36%)
Arrhythmia	1	1	\	\	2(1.8%)

The mean postoperative hospital stay 7.43 days, it ranged from 1-35 days. (Table 5)

Table 5: Mean postoperative hospital stay in days.

Disease	Mean postoperative stay	Disease	Mean postoperative stay
TB	10 days	Hydatid disease	7.3 days
Lung abscess	10 days	Sequestration	5.5 days
Bronchiectasis	9 days	Emphysema	5 days
Tumors	8 days	Trauma	4.7 days

The mortality in our study, 10 (9.09%) patients, half of them due to malignant tumor.

DISCUSSION:

Pulmonary resection procedures are still among the most used surgical modalities for treatment of many pulmonary diseases. It is considered now to be a safe procedure providing the proper selection of the patient and assessment regarding pulmonary function status. Surgery for lung resection evolved through the twentieth century from a highly morbid procedure (50% mortality) to (<2% mortality) and 2-3 day admission procedure.[6-8]

In this study, data in case records of 110 patients admitted to the thoracic surgical unite at Ibn-Alnafees teaching hospital from 1st January 2013--31st December 2014; those patients underwent pulmonary resections for different causes. 65 males (59.1%) and 45 females (40.9%) this male predominance , due to, smoking is more in male patients in our society and more male inflicted in war injury. 40 patients (36.4%) underwent different types of resections due to malignant lung tumors, and the highest incidence was the 6th decade(13 patients). Of those 40 patients, 5 patients (4.5%) underwent pneumonectomy and 32 patients (29.1%) underwent lobectomy, 1 patient by bilobectomy and the last two by wedge resections are carried out for carcinoma. At the 7th decade, 11 patients and 3 at the 8th decade underwent lung resection for lung tumor. However, age alone is not a contraindication to lobectomy or wedge resection in early disease, although it is a factor to be considered before pneumonectomy .[6] Lobectomy for malignant lung tumor done in 60% of patients with resectable tumor, this is because most of the patients are in the early stages (I and II) or due to limited respiratory reserve specially those in the 6th decade. VATS pulmonary resection is not present in our institution till now because of instrumentation and training deficiency.

Hydatid disease is the 2nd most common cause of resection in our series 28 patients (25.4%) this is very high results due to, hydatid cyst is a common problem in our country and patients usually present late in our country in a complicated state, because they are mostly living in rural area.

Trauma is becoming a significant problem during the last years due to the war against terrorism ,10 patients (9.1%) underwent pulmonary resection due to chest trauma, 8 patients sustained war injury and 2 civilian injury (road traffic accident) 3 patients treated with pneumonectomy,3 patients with lobectomy,1 patients with bilobectomy and the last 3 patients with segmental resection. This elevated figure due to the prevalence of war injuries.

Congenital lobar emphysema represents 50% of all congenital lung anomalies. It is due to obstruction of a lobar bronchus, usually an upper airway, resulting in overexpansion of alveolar airspaces but lacking parenchymal destruction.[9]For patients who are symptomatic, all emphysematous tissue should be resected and lobectomy is frequently required.[9]

In bronchiectasis and lung abscess there is 6 and 5 patients respectively. Patients with bronchiectasis is treated by lobectomy, while in lung abscess 2 underwent pneumonectomy,1 lobectomy and 2 bilobectomy. This low figure is due to the use of proper antibiotics. Despite the rarity and difficulty of preoperative diagnosis, intralobar sequestration should always be kept in mind especially in cases of lung abscesses involving the lower lobes, and when suspected, a CT chest and angiogram should be done to confirm diagnosis and define the aberrant systemic blood supply.

In tuberculosis 3 patients underwent pneumonectomy this is because most TB patients referred for surgery too late after the disease destroyed most of lung.

Postoperative care:

The most important issues following any kind of pulmonary resection are pain control, pulmonary physiotherapy for secretion mobilization, and the chest tube management.[10] pain can be controlled by a thoracic epidural catheter placement, patient-controlled analgesia, subpleural catheter placement, (unfortunately not used in our hospital) or standard pain management with paracetamol or diclofenac or opiod injections. Physiotherapy including mobilization, incentive spirometer, breathing, and cough exercises is one of the key factors for a successful outcome. Postoperative chest x-ray is necessary to evaluate the expansion of the remaining lung and the position of the chest tubes. Chest tubes are on negative 10 cm-20cm water seal. When there is no air leak and the output is less than 200 to 300 mL in 24 hours the chest tube is removed.

COMPLICATIONS:

Complications following pulmonary resections include atelectasis , pneumonia, wound infection, bleeding, prolonged air leak, persistent space, very rarely bronchopleural fistula and chronic pain syndrome, which affects quality of life and requires pain medicines or other interventions. Most studies suggest decreased pain scores in the immediate postoperative period and up to 3 months time with techniques that avoid intercostal nerve bundle

compression compared with traditional pericostal closure.[11] These techniques include intracostal closure (drilling holes in the rib for sutures), mobilization of the intercostal muscle off the rib before retraction with subsequent passage of the suture around the rib alone, and passage of the suture immediately underneath the bottom rib (avoiding the neurovascular bundle).[11]

CONCLUSION:

Pulmonary resections are indicated in both malignant and nonmalignant diseases of the lung. The candidate patient should have enough cardiopulmonary reserve to tolerate the planned procedure. The surgeon should be familiar with the surgical anatomy and the anatomical variations for the pulmonary vessels. Postoperative pain management is imperative to prevent complications such as atelectasis and resultant infection and space problems.

Recommendations:-

1-Proper selection of patient and careful postoperative monitoring is very important way for obtaining good results.

2-Proper postoperative pain relief and chest physiotherapy is the corner stone in postoperative management.

3-Need more support from MOH for improving surgeon skill in thoracoscopic surgery by training courses in developed centers.

REFERENCES:

1. de Hoyos A, Kerstein Kea, Mahtabifard A. General Thoracic Surgery. Shields, T ed. Ch 33-35. 7th ed. Philidelphia, PA: Lippincott, 2009.
2. Brunelli A, Xiume F, Refai M, et al. Bilateral staged uniportal VATS for synchronous lung cancers. Interact CardiovascThoracSurg 2006;5:658-59.
3. Ceppa DP, Kosinski AS, Berry MF, et al. Thoracoscopic lobectomy has increasing benefit in patients with poor pulmonary function: a society of thoracic surgeons data- base analysis. Ann Surg 2012; 256:487-93.
4. Boffa DJ, Allen MS, Grab JD, et al. Datafrom The Society of Thoracic Surgeons General Thoracic Surgery database: the surgical management of primary lung tumors. J ThoracCardiovascSurg 2008; 135:247-54.
5. Hoksch B, Ablassmaier B, Walter M, et al. [Complication rate after thoracoscopic and conventional lobectomy]. ZentralblChir 2003; 128:106-10.
6. -Tovar EA, Roethe RA, Weissig MD, et al. One-day admission for lung lobectomy: an incidental result of a clinical pathway. Ann ThoracSurg 1998; 65:803.
7. British Thoracic Society and Society of Cardiothoracic Surgeons of Great Britain and Ireland Working Party. Guidelines on the selection of patients with lung cancer for surgery. Thorax 2001 ;56:89-108.
8. Hartwig MG,D'AmicTA:Thoracoscopic lobectomy: The gold standard for early-stage lung cancer. Ann ThoracSurg 2010;89:S2098–S2101, .
9. Frank W. Sellke, Pedro J dil Nedo, Scott J Swanson: Sabiston & Spencer surgery of the chest.T ed. Ch 9. 8th ed. Philadelphia, PA: Saunders,2010.
10. Wildgaard K, Ravn J, Kehlet H. Chronic post-thoracotomy pain: A critical review of pathogenic mechanisms and strategies for prevention. *Eur J Cardiothorac Surg.* 2009;36:170–80.
11. Douglas J. Mathisen, Christopher R. Morse, Master techniques in surgery, Thoracic surgery, 1st ed. Philadelphia: Wolters Kluwer,2015.