

Lung Resection Surgeries: Clinico-Demographic Profile, Ariscat Risk Score and Immediate Post Operative Complications

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1. Introduction

Lung resection is a surgical procedure performed to remove all or part of the lung. The approach for lung resection surgeries can be, open thoracotomy, Video Assisted Thoracoscopic surgery (VATS) and Robotic Assisted Thoracoscopic surgery (RATS). Various surgical procedures performed in the lungs are: wedge resection (nonanatomic resection), segmentectomy, lobectomy, sleeve resection and pneumonectomy (anatomic resection).¹

Indication for pulmonary resection are primary lung or metastatic malignant tumors and benign conditions like pulmonary blebs and bullae, benign masses and nodules, bronchiectasis or other post infective lung sequelae and traumatic injury to lung.

Post operative complications following thoracic surgeries can be divided into early and late complications. Early complications include acute respiratory failure, atelectasis, pneumonia, acute respiratory distress syndrome (ARDS), aspiration, transfusion related acute lung injury and empyema. The late complications include persistent air leak, post thoracotomy pain, bronchopleural/ bronchovascular fistula, wound infection, and empyema.

Factors associated with development of post operative pulmonary complications are age > 50 years, patients with obstructive airway diseases, restrictive lung diseases, smoking (>20 pack years), poor nutritional status, respiratory tract infection within 2 weeks, emergency nature of surgery and duration of surgery >4 hours⁵.

Multiple predictive models have been developed with the aim of establishing which patients have an increased risk of major morbidity or mortality after major lung resection. The most important ones are: Veterans Affairs National System Quality Improvement Program (VA NSQIP), The European Society Subjective Score (ESSS.01), The European Society Objective Score (ESOS.01), The British Thoracic Society recommended measurement of FEV1 and DLCO for assessment of respiratory morbidity in all patients, The Cardiopulmonary Risk Index (CPRI), Assess Respiratory risk In Surgical patients in CATalonia-ARISCAT Score³.

This study was done with the aim of describing the clinico-demographic profile, preoperative risk assessment score and post operative complications of patients who underwent lung resection surgery in a tertiary care hospital.

2. Materials and Methodology

This retrospective observational study was conducted at the Department of pulmonary medicine and Department of cardiothoracic surgery in SDS Tuberculosis Research Centre and Rajiv Gandhi Institute of Chest Diseases, Bangalore. After obtaining IEC approval, case records of patients who underwent lung resection surgery between January 2019 to December 2022 were reviewed. Patient's demographic data, clinical history, smoking history, comorbidities, vitals at presentation, routine blood investigations including hemoglobin levels was analyzed. The preoperative risk assessment was done using ARISCAT scoring. Early complications (within 72 hours) and late complications (>72hours) were noted and follow up of patients was done till 1 week post operative period.

3. Results

43 patients who underwent posterolateral thoracotomy and pneumonectomy/Lobectomy were included in our study. Patients were followed up to 1 week postoperatively. Among the total patients 23 were males (54%) and 20 were females (46%). Majority of patients belonged to age group between 31-50 years (22 patients, 51%).

Patients presented with varied complaints, the most common being haemoptysis (26 patients, 60%), followed by cough (22 patients, 51%), breathlessness (13 patients, 30%). The mean duration of presentation of illness was 6-8 months. Majority of patients had no comorbidities and among patients with co-morbidities Diabetes Mellites (8 patients, 18%) was the most common. One patient had previous history of lobectomy and one patient had history of Bronchial Artery Embolization for active haemoptysis.

Among the 43 patients, 20 patients had history of tuberculosis in the past. 4 patients were former smokers and 5 patients had history of alcohol consumption in the past. There was no higher incidence of post operative complications among smokers and those with history of regular alcohol intake.

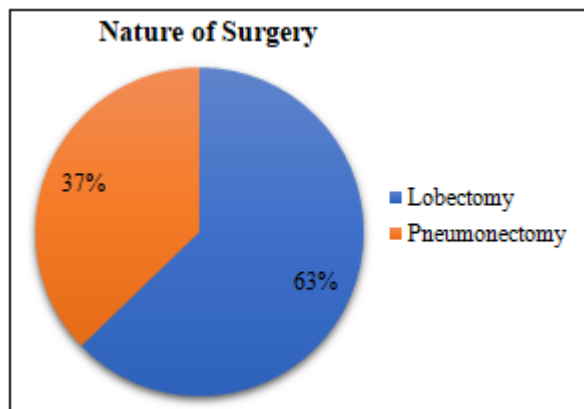
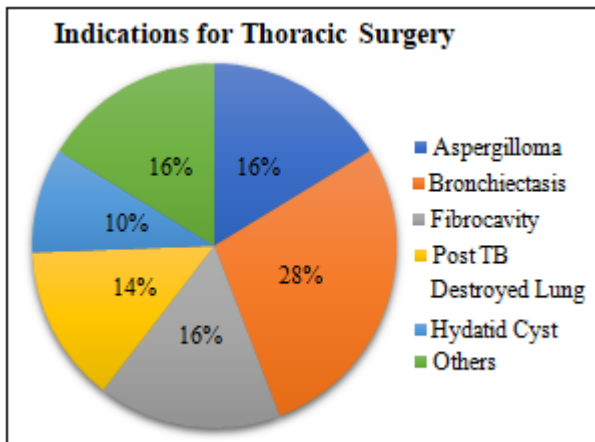
The most common indication for surgery was Bronchiectasis (n=12, 28%) followed by aspergilloma (n=7, 16%) and post TB fibro-cavity (n=7, 16%), post TB cicatrization atelectasis (n=6, 14%) and hydatid cyst (n=4, 9%). Other indications for surgery were anterior mediastinal mass, bullae, haemorrhagic cyst, pulmonary aneurysm.

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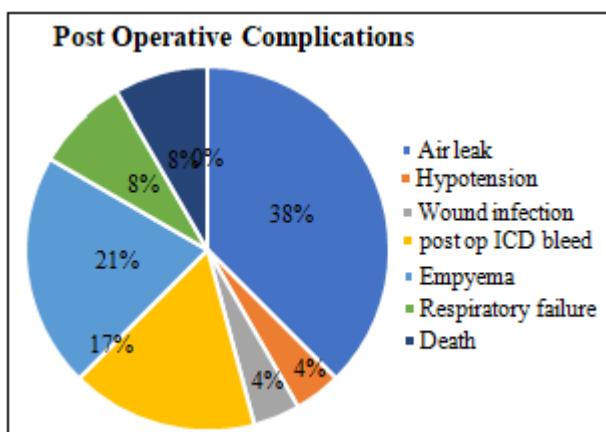
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Among the 43 patients 27 underwent lobectomy (63%) and 16 patients underwent pneumonectomy (37%). Most common lobes involved were right upper lobe, left upper lobe and left lower lobe (7 each). Among the 16 patients who underwent pneumonectomy 12 had disease on the left side and 4 had disease on the right side.



In our study, among the 43 patients who underwent lung resection surgery, post-operative complications were noted in 19 patients (44%). These patients had one or more post-operative complications. Most common complications were persistent air leak in 9 patients (20%), when observed till day 7, followed by empyema (n=5), post operative ICD bleed (n=4), 2 patients had respiratory failure and requirement of prolonged ventilatory support and 2 patients died post operatively.



43 patients were categorized according to ARISCAT scoring and ARISCAT score was higher in patients with post-operative complications (mean: 58.6 ± 12.5) as compared to those without complications (mean 46 ± 10.5). Patients with complications had lower haemoglobin values as compared to patients without post-operative complications.

4. Discussion

Pulmonary complications are a major cause of mortality and morbidity in the early and late postoperative period after thoracotomy and lung resection surgeries. The type and severity of complications depends on type of thoracic surgery and patients' preoperative medical status.

General anaesthesia and surgical procedures affect the respiratory system negatively after thoracic surgical procedures. Decreased diaphragmatic activity and ventilatory response causes decreased lung volumes. These may lead to alveolar collapse, early closing of airways, ventilation/perfusion imbalance, decrease in mucus clearance and increase in bacterial colonization. These changes may result in the development of serious pulmonary complications in patients with impaired baseline pulmonary functions and underlying pre-existing medical conditions⁴.

In a study by Gulay Ulger et al⁸, they compared the effectiveness of ARISCAT score in predicting pulmonary complications after Thoracic surgery. It included 120 patients among whom 26 developed post operative pulmonary complications and these patients had statistically significant high ARISCAT scores. This is similar to our study where post operative complications were more common in patients having high ARISCAT scores pre operatively.

According to Mueller et al², Persistent air leak was the most prevalent postoperative complication with a reported occurrence of 18-26%. The consequences of development of prolonged air-leak are manifold and include: Prolonged chest tube drainage causing prolonged pain, restricted ventilation leading to increased risk of pneumonia, decreased ambulation due to presence of chest tubes and related pain results in increased risk of thromboembolism, necessity of pleurodesis, mechanical ventilation and reoperation, higher readmission rate to intensive care units, prolonged hospital stay. The main postoperative complication in our study was prolonged air leak and prolonged hospital stay.

5. Conclusion

Preoperative assessment of patients with focus on cardiopulmonary function, functional status, and preoperative risk stratification using predictive scores may be helpful in predicting the development of post operative pulmonary complications and helps in reducing the Perioperative mortality and post operative morbidity in patients undergoing lung resection surgeries.

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