Aspergillosis is a ubiquitous fungus which affects the immuno-compromised patients or patients having structural lung disease. It manifests as invasive pulmonary aspergillosis (IPA), also known as an aspergilloma. Aspergillosis typically occurs in a pre-existing cavity. The most common presentation is hemoptysis, other symptoms include expectorant cough or dyspnea.

The cavity is seen on chest X-ray as an ‘air crescent shadow’. Other modality used to evaluate is CT scan. Once the fungal ball is formed, permanent cure can be achieved only by surgical resection. Surgery is associated with a high rate of complications and is therefore controversial. The morbidity and mortality associated with surgery is due to the dense adhesions which are formed during the disease process. Further surgi-
cal resection is not feasible in severely compromised lungs and when there is bilateral disease where only palliative care may be offered. Non surgical options include anti-fungal therapy and brachial artery embolization. Both options are not satisfactory as the anti-fungal agents do not penetrate the cavity and the embolization procedure is only a temporary solution for the underlying problem.

The cavity can be formed due to tuberculosis, sarcoidosis, bronchogenic cyst, histoplasmosis, lung abscess or carcinoma lung. However in developing country like India tuberculosis is the most common cause.

The incidence of aspergilloma in post TB cavity is 11-17%. A study by Chen et al suggested that the interval between the diagnosis of TB and aspergilloma development varied from less than a year to up to 30 years. Aspergillomas can be extremely variable in its course, ranging from undergoing spontaneous lysis (7-10%) to causing severe hemoptysis.

The purpose of this study was to assess the symptomatology of invasive pulmonary aspergilloma (IPA) and its management at TB hospital Erranum, Hyderabad.

**Materials and methods**

The medical records of all the patients with diagnosis IPA at TB Hospital Erranum, Hyderabad in Department of Cardio-thoracic Surgery between January 2013 and September 2017 were retrieved and reviewed. All those patients who underwent conservative management and primary surgery done at other hospital were excluded from the study. The demographic data, primary diagnosis and the preoperative details were reviewed. All patients were given a course of fluconazole 1 week prior to the surgery.

Intraoperative data was recorded and the immediate postoperative outcomes were considered in the study. The Institutional Ethical Committee clearance was taken for the study (Ref. No.:187).

The statistical analysis was done using SPSS software.

**Results**

Over the period of 4 years and 8 months, 26 patients underwent surgery for IPA with age ranging from 20 to 50 yrs. The male to female ratio was 2.25:1. The majority of the patients (80.8%) had a primary diagnosis of pulmonary tuberculosis. 15.4% had bronchiectasis. One patient had no history of any other primary pulmonary pathology and IPA was incidentally detected.

The most common presenting complaint was hemoptysis which was seen in 76.9% of the cases. 4 patients had excessive sputum production. Remaining 2 patients did not have any complains specific for IPA (Table 1).

Upper lobectomy was the most common surgery that was performed for the patients and was done for 80.8% of the patients. One patient had a limited disease for which a wedge resection was enough. Another patient had extensive involvement of the lung for which a pneumonectomy had to be done.

Complications were seen in 34.6% of the patients in the post operative period. The most common complication was bleeding within the thoracic cavity (>800ml drainage in 6 hours) (Fig 1). All the cases with complications were managed conservatively with the intra-operative intercostal drain placement. Only one patient had excessive bleeding and had to be re-explored and no obvious bleeding vessel found, clots evacuated. One patient succumbed to the disease in the post operative period (Table 1).

**Table 1: Presentation and outcomes of IPA**

| Features         | Number of cases |
|------------------|-----------------|
| Location of fungal ball | 17 right and 9 on left |
| Hemoptysis       | 20              |
| Sputum only      | 4               |
| Complications    | 9               |
| Mortality        | 1               |

fig 1. Post operative complications. BPF=Broncho-pleural fistula, SSI=Surgical site infection
Aspergillosis is an infection caused by the pigmented mold—Aspergillus. 90% of IPA is due to Aspergillus fumigatus. Infection occurs by inhalation of spores which infiltrate the respiratory mucosa. The primary immune response is cell-mediated therefore the infection is primarily seen in immunocompromised individuals. Three common clinical forms of aspergilloses are allergic bronchopulmonary aspergillosis, aspergilloma and invasive pulmonary aspergillosis.

Most common form of aspergillosis is the aspergilloma or fungal ball. It occurs by colonization of a pre-existing pulmonary cavitatory lesion (Fig 2). The cavity can be formed due to tuberculosis, sarcoidosis, bronchogenic cyst, histoplasmosis, lung abscess or carcinoma lung. TB is the most common cause. Sarcoidosis and malignancy are also associated with such lesions. The fungal ball is mobile within the cavity and usually does not completely fill the space, resulting in “air crescent sign” seen on the radiographs (Fig 3).

Chronic irritation due to the fungal ball causes erosion of vessels and leads to hemoptysis, which is the most common presentation. Only 50% of the patients show positive sputum cultures but most of them are positive to serum antibodies to aspergillus. The anti-fungals show variable response to aspergilloma. Itraconazole may achieve significant intra-cavitatory levels, however the mainstay of treatment has always been surgery. Occasionally, in cases of massive hemoptysis bronchial artery embolization may be beneficial. Surgical resection for aspergilloma can include wedge resection, segmentectomy or lobectomy for simple aspergillomas. Complex aspergillomas and lesions with thick walled cavity require more extensive resection in the form of lobectomy, bilobectomy or pneumonectomy. In a study by Kim et al they were able to perform only a wedge resection for 38% of simple aspergillomas and 20% of complex aspergillomas. Lobectomy was required in 50% of simple aspergillomas and 59% of complex aspergillomas. Pneumonectomy was performed in 4% of complex aspergillomas and none of the simple aspergillomas.

Complex aspergillomas were more likely to result in post operative complications, including prolonged air leak (15%), residual pleural space (10%) and empyema (3%). Regnard et al reported 87 patients with a slightly lower rate of lobectomy...
(41%) and a slightly higher rate of pneumonectomy (11%). They also performed a large number of cavernostomies (19%) for patients not felt to be candidates for resection owing to underlying pulmonary disease. They noted a high operative blood loss (>1,500 ml) in 40% of pneumonectomy patients and 22% of lobectomy patients as well as a high rate of prolonged air leak and residual pleural space issues after lobectomy. Babatasi et al reported 85 procedures with a similar distribution with complications like prolonged air leak and significant hemorrhage. They also reported a significant complication rate in terms of prolonged air leak (50%) and hemorrhage (12%) after cavernostomy unlike the previous group.

Most studies suggest that the risks and benefits of resection must be carefully assessed and the symptoms in terms of cough, chest pain and hemoptysis should be significant enough to merit the risk of resection. Careful operative planning is necessary.

In our study we have found that the majority of the patients were managed with a lobectomy satisfactorily. More aggressive resection is required rarely. Further the post operative complications though significant can be managed conservatively.

Conclusion

Pulmonary aspergilloma is a rare complication of cavitating diseases of the lung. Early diagnosis can enable a lung sparing surgery that is associated with acceptable complication rates and good post operative outcomes.

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