Short Term Outcome of Pulmonary Resections For Tuberculosis-Related Hemoptysis

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Objectives: To evaluate the results and short term outcome of pulmonary resections for patients complaining of tuberculosis-related hemoptysis.

Patients & Methods: The study included 18 patients with tuberculosis-related hemoptysis, proved radiologically to have localized pulmonary lesions as a source for hemoptysis, all patients subjected to the routine laboratory investigations. In all patients pulmonary resection was done either in the form of lobectomy (in 15 patients) or pneumonectomy (in 3 patients).

Results: According to severity of hemoptysis 4 (22.2%) patients presented by massive hemoptysis, 6 (33.3%) patients presented by major hemoptysis and 8 (44.4%) patients presented by minor hemoptysis. Radiological findings showed cavitary lesions in 15 (83.3%) patients and 3 (16.7%) patients had destroyed lung. Operative time ranged from 86 to 210 minutes, with a mean of 144 minutes. There was no intraoperative, nor post-operative mortality. There was no major complications with smooth postoperative course and follow-up.

Conclusion: Pulmonary resection for patients having tuberculosis-related hemoptysis carry favorable results and excellent short term outcome.

Keywords: Tuberculosis, Hemoptysis, Lobectomy, Pneumonectomy, Destroyed lung, Cavitation.

Hemoptysis is defined as the expectoration of blood originating from the tracheobronchial tree or pulmonary parenchyma. The severity of hemoptysis has various definitions, ranging from 100 mL to 1 L of blood expectorated in 24 hours. Hemoptysis due to pulmonary tuberculous lesions is a common cause of morbidity, and occasionally mortality.

As mycobacterium tuberculosis (MTB) infects one-third of the world’s population, So, pulmonary tuberculosis (PTB) is a common cause of hemoptysis especially in developing countries. Although, the central mechanisms resulting in tissue damage have not been defined. MTB subverts the host immune response to drive proteolytic destruction of the extracellular matrix and caseation that leads to cavitation.

Hemoptysis due to pulmonary tuberculosis occurs as a complication of many sequelae such as cavities and bronchiectasis. Pulmonary tuberculosis produces a broad spectrum of radiographic abnormalities. Cavitation is the most important radiologic finding in PTB. Cavitation implies a high bacillary burden and high infectivity. Destroyed lung caused by tuberculosis is an end-stage phenomenon prone to serious complications. The involved lung is nonfunctional with demonstrable absent perfusion and ventilation. It is nonetheless richly vascularized by systemic arterial connections. This neovascularization is effected by the bronchial arterial system and includes the adjacent intercostal arteries, branches of the subclavian, axillary, pericardial, diaphragmatic, and esophageal arteries. Thin-walled new vessels bleed readily as evidenced by the commonness of chronic, recurrent, and often massive hemoptysis.

Treatment options for hemoptysis include bronchoscopic balloon tamponade using Fogarty catheter with or without endobronchial instillation of epinephrine, bronchoscopic laser photoablation, bronchial artery embolization and surgical
resection for localized lesions. Bronchial artery embolization rarely results in control of hemoptysis because of the massive collateral blood vessels. Surgical resection is a definitive curative method for hemoptysis with localized lesions.

Patients and Methods

This is a prospective study, included 18 patients presented by different degrees of recurrent hemoptysis, the study was conducted at Department of Cardiothoracic Surgery, Benha University Hospital & Department of surgery in 23rd of July Chest (Sadr El-Marg) hospital since Jan 2008 till Jan 2010 to allow a minimum follow-up period of 6 months for the last case operated upon. Preoperatively all patients subjected to: Full medical history and clinical examination. Chest X-ray PA & lateral views and Chest CT Fig. (1,2) Sagittal CT reformation.Fig.(3) CBC & complete coagulation profile. ECG done for all patients & Echocardiography for selected cases. Liver function tests and Kidney function tests. Bronchoscopic examination by fiber-optic bronchoscope. Sputum analysis for acid fast bacilli for three successive days.

A standard double-lumen tube was used for one-lung ventilation, and the operation was performed through a posterolateral thoracotomy in all patients. After entering the thoracic cavity of the affected side, adhesions are freed by blunt and sharp dissections. For cases operated by lobectomy, lobar arteries and veins of the targeted lobe are identified and transected after ligation by 2 proximal and one distal ligatures, the bronchus of the targeted lobe is freed from the surrounding tissues, clamped by bronchus clamp and resected. The bronchial stump is closed by interrupted 3/0 PDS stiches. For cases operated by pneumonectomy, the main pulmonary artery and the two pulmonary veins of the targeted lung are identified ligated and transected after ligation by 2 proximal and one distal ligatures, the bronchus of the targeted lung is freed from the surrounding tissues, clamped by bronchus clamp and resected. The bronchial stump is closed by interrupted 3/0 PDS stiches.

After assuring hemostasis, two chest-drainage tubes were inserted for cases operated by lobectomy and one chest-drainage tube for cases operated by pneumonectomy intercostal nerve block was performed for postoperative analgesia. Rescue postoperative analgesia was provided in the form of intramuscular injections of mepridine 50 mg only on request or if pain hindered respiration. Resumption of oral intake was allowed once patient was fully conscious and able to swallow. For cases operated by pneumonectomy, the chest tube was clamped close to the skin, opened when needed if the mediastinum is not centralized then removed after 24 hours. For cases operated by lobectomy chest tubes were removed after stoppage of the air-leak and approaching minimal amount of drainage for two consecutive days. Patients were discharged after assuring absence of wound complications.

Results

- The study included 18 patients; 10 females and 8 males with mean age (SD) of 47.94±12.62 years; range: 22-69 years. With mean male age of 53.25 years and mean female age of 43.7 years.
- 11 (61.1%) patients are diabetic, 7 of these patients are female and 4 males
- 5 (27.8%) patients were sputum positive for acid-fast bacilli.
- 4 (22.2%) patients presented by massive hemoptysis, 6 (33.3%) patients presented by major hemoptysis and 8 (44.4%) patients presented by minor hemoptysis.
- Radiological findings showed cavitary lesions in 15 (83.3%) patients and 3 (16.7%) patients had destroyed lung. Of those having cavitary lesions 8 patients had the lesion in right upper lobe, 7 in the left upper lobe. And of those having destroyed lung two had destroyed right lung and one had destroyed left lung. Table (1) shows Demographic & clinical data and CT findings.
- 4 patients of those with cavitary lesions, showed fungus ball within the cavity Fig. (4). 2 of these patients had right sided lesions and 2 left sided.
- Consequently, 8 (44.4%) patients operated by right upper lobectomy, 7 (38.8%) patients operated by left upper lobectomy, two (11.1%) patients operated by right pneumonectomy and one (5.5%) patient operated by left pneumonectomy. Fig. (5)
- Intraoperative blood transfusion ranged from 500 to 1500ml of blood with a mean (SD) of 805.56±348.9 ml.
- The mean (SD) operative time was 144.28±36.3, 3 minutes ranged from 86 to 210 minutes.
- There was no intraoperative mortality.
- 5 (27.8%) patients complicated by prolonged air-leak, one of them had wound infection that became evident on the 5th post-operative day.
- In the three cases for whom pneumonectomy was done the chest tube, was clamped in the operative room and removed after 24 hours, as there was no shift of the mediastinum, the mean period for chest tube removal in this study was 6.39 days with SD of 3.91 and the rage was 1-17 days.
- Hospital stay of the patients ranged from 5-22 days with a mean (SD) of 8.94±4.22 days. Fig. (6)
Fig. 1. CT-Chest showing Rt. Upper lobe large cavity

Fig. 2. CT-Chest showing Rt. Upper lobe multiple cavitary lesions.

Fig. 3. CT-Chest sagittal reformation showing multiple Rt. Upper lobe cavitary lesions.

Fig. 4. CT-Chest showing Rt. Upper lobe cavity with a fungus ball.

Fig. 5. The percentage of the operative procedure

Fig. 6. Interactive graph between the degree of hemoptysis and hospital stay
<table>
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<tr>
<th>No.</th>
<th>Age</th>
<th>Gender</th>
<th>Diabetes</th>
<th>Degree of Hemoptysis</th>
<th>CT Findings</th>
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Table 1. Demographic data, clinical data and CT findings.

**Discussion**

All patients included in this study known to have pulmonary tuberculosis for which they were receiving or still receiving antituberculous medications. Based on the quantity of blood expectorated per day and according to Erdogan et al., hemoptyysis is classified in three groups: persistent minor (less 200 mL daily, lasting at least 4 days), major (200 to 600 mL daily), and massive (more than 600 mL daily). In this study, the same classification is used as an indicator for the severity of hemoptyysis. Erdogan et al., in a similar study on surgical management of tuberculosis-related hemoptyysis, that included 59 patients; the degree of hemoptyysis was massive hemoptysis in 21 (35.6%) patients, major hemoptysis in 24 (40.7%) patients and minor hemoptysis in 14 (23.7%) patients. While, in this study: 4 (22.2%) patients presented by massive hemoptysis, 6 (33.3%) patients presented by major hemoptysis and 8 (44.4%) patients presented by minor hemoptysis. 2 of the patients presented by massive were operated in same day of admission as emergency cases, the other 2 cases were operated in the next day of admission. The other patients were operated in the 3rd & 4th day of admission.

Kim et al. stated that, relative risks of developing PTB of all types and bacteriologically confirmed cases were 3.47 times and 5.15 times higher in the diabetics (TBDM), than in non-diabetics. In this study, 11 (61.1%) patients are diabetic and 5 (27.8%) were sputum positive for acid-fast bacilli. Also, regarding diabetes and TB lesions Pérez-Guzman et al. reported that TBDM patients developed cavitations (82%) vs. (59%) in TB without DM and more multiple cavities were seen in TBDM patients (25% vs. 2%). In this study all patients with destroyed lung (n=3) are diabetic, and 8 patients with cavitory lesions are diabetic.

Ashour et al. reported the incidence of lung destruction in 1600 cases of pulmonary tuberculosis, lung destruction have been present in 172 (11%). The left lung was destroyed in 109 (63 %) and the right in 63 (37%). In this study there were 3 (16.7%) cases of post-tuberculous lung destruction, 2 of them had destroyed right lung and one had destroyed left lung.
In this study, 4 patients had aspergillosis presented by fungal ball within the cavitary lesion, aspergillosis is a very common sequelae of post-tuberculous cavitary lesions as in a study done by Regnard et al. on 89 patients surgically treated for aspergillosis. Seventy percent of aspergillosis had developed in cavitation as sequelae of tuberculosis.

All patients presented by massive hemoptysis (n=4) received preoperative blood transfusion, 4 patients who presented by major hemoptysis (n=6) and 5 patients of those presented by minor hemoptysis (n=8) received preoperative blood transfusion. All patients received intraoperative blood transfusion from 500 to 1500 ml with a mean of 806 ml; there was no postoperative blood transfusion for any of the patients. Regarding this point the results of this study was far away from that reported by Lu et al. as only 5 of 14 patients included in that study required blood transfusion with mean intraoperative and postoperative blood loss within the first 24h of 192.3 ml.

The mean operative time was 144, ranged from 86 to 210 minutes, which was within the normal range of any lobectomy or pneumonectomy. The time depended on the degree of adhesions, the fissure being complete or not, and the time to obtain hemostasis which vary from patient to another.

There was no intraoperative, nor post-operative mortality; and this result was better than that obtained by Ayed who reported hospital mortality rate of 4% (2/53), for cases of pulmonary resection for massive hemoptysis. Also, was better than the results obtained by Erdogan et al. who reported perioperative mortality of 6.8%.

Brik et al. reported bronchopleural fistula and recurrent hemoptysis in a similar study. In this study, apart from prolonged air-leak that occurred in 5 patients and delayed wound healing ended by wound gaping in one patient which resolved by curettage with re-stitching the wound and frequent dressing, there was no notable complications.

Hospital stay of the patients ranged from 5-22 days with a mean of 8.9, which much less than that reported by Andrejak et al. who reported average hospital stay of 25 days.

Sputum culture done for previously sputum positive cases (n=5) after 2 months of the antituberculous medical treatment, and all became sputum negative, and advised to continue the antituberculous regimen for another 4 months. All patients followed for 6 months post-operatively in the out-patient clinic with no recurrence of the hemoptysis, nor any notable complications related to the surgery.

Conclusion

Tuberculosis-related hemoptysis is a serious condition, if the source of hemoptysis is localized, surgical resection of the source of hemoptysis in the form of lobectomy or pneumonectomy carries favorable results and excellent short term outcome.

References


