Pulmonary resection can improve treatment outcome in re-treatment pulmonary tuberculosis and its complications

Ali Rifaat, M.A. Ghaly, Ehab Sobhy, Abdulla Badr, Alaa Metwally

Cardiothoracic Surgery, Chest Departments, Zagazig University Hospitals, Egypt

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Abstract  Background: Pulmonary tuberculosis (TB) is a widely spread disease, usually treated by multidrug therapy, nevertheless there are increasing number of cases in which medical treatment fails and requires surgical intervention specially those with large cavitary lesions or persistent sputum positive for Ziehl Neelsen (ZN) stain. Our objective was to assess the role of pulmonary resection in treating certain cases of pulmonary TB and its outcome and morbidity.

Methods: In this study 45 tuberculous patients were selected for pulmonary resection (patients with large cavitary lesions and persistent sputum positive for ZN stain, massive hemoptysis, relapsed TB and treatment failure patients). Twenty-eight lobectomies (18 lobectomy for patients with relapsed TB with large cavities, persistent sputum positive and 10 lobectomy for patients with massive hemoptysis). Fourteen elective pneumonectomy for patients with symptomatic destroyed lung and 3 completion pneumonectomy were carried out.

Results: Thirty-five patients (78%) were sputum positive preoperatively and 31 patients (69%) had cavitary lesions radiologically, MDR-TB was found retrospectively in 16 patients. Mortality was 4.4%, and postoperative complications were encountered in 44.4% of the participants. Forty-three patients (95.5%) became sputum negative 3–9 months after surgery. Male sex, HCV infection, operation time, and intraoperative bleeding were predictive of bad outcome in this study.

Conclusions: Surgery is effective when medical therapy fails to control pulmonary TB and its complications. MDR-TB patients are among those who benefit from pulmonary resection. Postoperative medical therapy is important to improve results and in achieving negative sputum conversion in TB patients including MDR-TB patients.

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related hemoptysis is much lower than in the developing countries [2] that witness losers of anti-tuberculosis chemotherapeutic protocols, non adherents to treatment and increased number of multidrug resistant TB (MDR-TB) [3].

MDR-TB, a condition defined as resistance at least to both isoniazid and rifampcin requires usually the surgical option. Certain conditions can precipitate the development of MDR-TB including: incomplete anti-TB treatment and intravenous drug abuses [4].

Proper selection of patients and decision for surgical interference can provide a high success rate and salvage of the lung parenchyma, where medical treatment fails to control pulmonary TB [5,6].

This prospective study was done to assess the role of pulmonary resection in treating certain cases of pulmonary TB, and to assess its outcome and morbidity.

Patients and methods

The study was carried out at Cardiothoracic and Chest Departments, Zagazig University Hospitals and Chest Hospital in the period between May 2009 and June 2012. Surgical resection was carried out for 45 diagnosed tuberculous patients who were referred to our tertiary center.

The study included 45 TB patients with; destroyed lung (14 patients), treatment failure (8 patients), relapsed pulmonary TB (13 patients) and 10 old TB patients presented by massive hemoptysis. The studied patients were diagnosed as pulmonary TB by medical history, clinical examination, radiological and laboratory investigations including sputum and broncho-alveolar lavage (BAL) fluid ZN stain, according to file records of the patients. Upon readmission sputum samples were collected for sputum ZN stain and culture, positive samples were sent for sensitivity to the ministry of health (MOHP) central laboratories. Surgical indications are:

1. Symptomatic destroyed lung in 14 patients (recurrent pneumonia and recurrent hemoptysis),
2. Massive hemoptysis in 10 patients,
3. Relapsed TB in 13 patients,
4. Treatment failure in 8 patients.

Massive hemoptysis was defined as coughing of >600 ml blood/day [9]. Multidrug resistant TB (MDR-TB) was defined as resistance at least to both isoniazid and rifampcin [10]. All patients were on anti-TB therapy for a mean duration of 28 ± 6 months preoperatively.

All participants had routine pulmonary scanning with serial chest roentgenography (CXR) and computed tomography (CT). It was assured that all elective patients (The 35 patients rather than the 10 patients with massive hemoptysis) had adequate pulmonary reserve before the decision for resection was undertaken.

In the 10 patients with massive hemoptysis, rigid bronchoscopy was performed prior to surgery in order to clear tracheobronchial tree and to localize and confirm the side of bleeding and double-lumen endotracheal tubes were employed in those patients to prevent aspiration to the other lung, single-lumen tubes were used in the rest of cases.

The 28 lobectomies and 17 pneumonectomies (14 elective, one intraoperative and 2 postoperative completion pneumonectomy) were performed all through posterolateral thoracotomies under general anesthesia. Bronchial stumps were closed with conventional sutures; however intercostal muscle flaps were decided intraoperative for weak stumps in 2 cases including the completion pneumonectomy.

All patients were subjected once more to bronchoscopy through their endotracheal tube before extubation for bronchial toilet. After discharge, non MDR-TB patients were sent to chest hospital to complete their medical treatment to improve the outcome of surgery, patients were submitted to anti-TB therapy with isoniazid (5 mg/kg/day), rifampcin (10 mg/kg/day), pyrazinamide (40 mg/kg) and ethambutol (25 ml/kg/day) till sputum conversion. MDR-TB patients were referred to a specialized center for individualized second line chemotherapy according to chest hospital protocol.

Follow-up was done for all non MDR-TB participants through monthly visits to our outpatient clinic for a mean period of 21.4 ± 6 months (range = 15–27 months), chest roentgenograms were done every month and sputum cultures every 3 months. Data were collected and continuous variables were expressed as mean ± SD, while categorical variables were expressed as number (No.) and frequencies as (%).

Results

Table 1 showed that the study comprised 45 pulmonary tuberculous patients, 29 males and 16 females (with age range of 24–68 years) who underwent pulmonary resections with mean operative time of 163.08 ± 35.12 min. In the present study 16 patients were proved to have MDR-TB where their sensitivity reports were obtained after they underwent their surgical procedure. Nineteen patients (42.2%) of this study were HCV positive including the 16 MDR-TB patients, condition of high incidence in Egyptian population, and no other co morbidities were found.

Cavitary lung lesions were found in 31 (69%) patients including the MDR-TB group, 29 patients (64.4%) had right lung lesions. It was striking that 16 MDR-TB patients in this study were HCV positive, a finding that could suggest a probable correlation between HCV and response to anti-TB therapy specially with the presence of history of regular anti-TB therapy in 13 (81.25%) of those patients.

Table 2 showed that mortality due to respiratory failure (RF) took place early postoperatively in 2 patients (4.4%); both were HCV positive, male participants with relatively prolonged operative time. One of them was 64 year old patient who underwent left pneumonectomy for destroyed lung; whereas the second was 31 year old patient who underwent right pneumonectomy for destroyed lung.

Apart from intra and post operative bleeding which occurred in 15 patients (33.3%), postoperative complications were encountered in 5 patients (11.1%), 2 lobectomy patients developed empyema (>350 ml/day) with bronchopleural fistula (BPF) within the first week after surgery and both underwent completion pneumonectomy plus reinforces of their bronchial stumps with intercostal muscle flaps. In the later post operative period, 3 pneumonectomy patients developed empyema with BPF and were submitted to tailoring thoracoplasty and transported intercostal muscle flaps to close their stumps.
Hitherto, none of the 5 patients had further complications. The remaining participants spent an otherwise uneventful postoperative period, and all patients including morbidity cases were discharged in a mean period of 16.7 ± 3.62 days after resection (range = 8–39 days).

It was transpired that resections were very successful for the 16 MDR-TB patients in our study and all MDR-TB patients showed improvement of their pulmonary pathology.

Discussion

TB is the world’s second cause of infectious disease deaths after HIV [7]. Surgery plays a decisive role in the overall management of MDR-TB and provides a somewhat better mortality and morbidity. Surgical resection is done because the bacterial count within the cavity is high and antibiotic treatment fails to reach the site of infection. Thus, to cure the disease completely, it is imperative to resect the cavitary lesion and damaged lung.

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In the present study all the 16 MDR-TB patients were chronic HCV positive. The finding looks accidental and cannot be related to a causal relationship. This finding could be explained by the patient fear about the hepatic complications of the anti-tuberculous drugs which drive them to stop the drugs without consultation, or stop the regimen prematurely before completion of the regimen and consequently the development of MDR-TB and failure on the next regimen.

On the other hand, all mortality and postoperative complications developed in HCV positive participants, although they were well compensated both clinically and laboratory, but most of those patients had low normal serum albumin (3–3.5 mg/dl) which might let such patients susceptible to postoperative complications that need good nutritional status for healing e.g., bronchopleural fistula which necessitates reinforcement with intercostal muscle flap.

It was reported that; MDR-TB is more prevalent among retreatment cases than initial treatment cases [9,10] and reserve drugs are generally less effective and more toxic than standard therapy, besides they must be given daily and some need to be taken several times a day [11,12]. Furthermore, it was reported that 40% of non responding MDR-TB patients have calamitous outcome [13,14]. In the present study the 16 MDR-TB patients had received 3–5 courses of anti TB, none of these MDR-TB patients showed improvement of their pulmonary pathology.

In the present study, mortality was reported to be 4.4% (2 patients) both were HCV positive, male participants with prolonged operative time. The first was 64 year old patient who underwent left pneumonectomy for destroyed lung in which massive intraoperative bleeding occurred due to dense adhesions, whereas the second was 31 year old, smear positive MDR-TB who also died due to intraoperative bleeding.

In other retrospective studies [8], early mortality was reported to be less than 3%. Another study reported 7.6% mortality because of the death of one patient who had a vital capacity of less than 50% and a low FEVı, which necessitated a pneumonectomy, resulting from laceration of the main pulmonary artery during the hilar dissection. Such higher mortality in that study is due to the small number of patients included in the study (one death out of all 13 patients) [15].

The occurrence of mortality in 2 patients with HCV in the present study could not be attributed to the liver disease that could make the patients more susceptible to major intraoperative bleeding because other HCV patients had undergone a successful surgical maneuver and uneventful post operative time.

Sadik et al. [15] reported 92.3% cure rate (12/13 excluding the one patient who died) in their study, which was comparable to the present study where we reported a cure rate of

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### Table 1 Demographic and clinical profile of the studied patients.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age in years (range)</td>
<td>24-68</td>
</tr>
<tr>
<td>Gender (Male/Female)</td>
<td>9/16</td>
</tr>
<tr>
<td>Smear +ve before surgery, no. (%)</td>
<td>35 patients (78%)</td>
</tr>
<tr>
<td>Treatment duration before surgery (M ± SD)</td>
<td>28 ± 6 months</td>
</tr>
<tr>
<td>Radiographic characteristic</td>
<td></td>
</tr>
<tr>
<td>Cavitary lesions, no. (%)</td>
<td>31 patients (69%)</td>
</tr>
<tr>
<td>Side, no. (%)</td>
<td>Rt. (64.4%)/Lt. (31.2%)/Bil. (4.4%)</td>
</tr>
<tr>
<td>MDR-TB, no. (%)</td>
<td>16 patients (35.5%)</td>
</tr>
<tr>
<td>HCV +ve, no. (%)</td>
<td>19 patients 42.2%</td>
</tr>
<tr>
<td>Number of drugs used before surgery, no. (%)</td>
<td>4 drugs (57.8%)/5 drugs (42.2%)</td>
</tr>
</tbody>
</table>

### Table 2 Types of surgery and postoperative outcomes.

<table>
<thead>
<tr>
<th>Procedure</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pneumonectomy</td>
<td>14 31.1</td>
</tr>
<tr>
<td>Completion pneumonectomy</td>
<td>3 6.6</td>
</tr>
<tr>
<td>Lobectomy</td>
<td>28 62.2</td>
</tr>
<tr>
<td>Post-operative complications</td>
<td></td>
</tr>
<tr>
<td>Postoperative hemorrhage</td>
<td>15 33.3</td>
</tr>
<tr>
<td>Bronchopleural fistula with empyema</td>
<td>5 11.1</td>
</tr>
<tr>
<td>Postoperative early death</td>
<td>2 4.4</td>
</tr>
<tr>
<td>Smear –ve after surgery</td>
<td>43 95.5</td>
</tr>
<tr>
<td>Post operative LOS</td>
<td>16.7 ± 3.62 days</td>
</tr>
<tr>
<td>Follow-up (months)</td>
<td>21.4 ± 6 months</td>
</tr>
</tbody>
</table>
et al. [6], male gender was found to be correlated with all mortality cases and with 80% of morbidity cases in our patients, and so were certain operative factors as prolonged operative time and intraoperative bleeding. Pulmonary resection is usually technically difficult in TB patients, as the chronic inflammatory process may produce more adhesions, chronic sepsis, scarring, and excessive bleeding together with poor general condition of patient [16]. Fortunately, we did not face postoperative complications listed in previous works e.g., persistent air leak, atelectasis, organized hemothorax or wound infection [1,6], and morbidity in our work confined itself to empyema with BPF in 11% of cases which is lower than percentages found in other researches [15].

In order to ward off delayed operative treatment for pulmonary TB, we coordinated with main chest hospitals in our regions, arranged for regular meetings to address surgical pulmonary TB candidates either with MDR-TB or destroyed lungs to be transferred to thoracic surgery. Moreover, we held regular seminars in their places to draw the attention of the chest physicians to the benefits of surgery for such patients. This collaboration will drive the physicians and encourage them to schedule more TB patients for surgery.

We maintained all the series on strict anti-TB therapy post-operatively for at least 1 year including individualized chemotherapy according to cultures from resected lungs of MDR-TB patients in a quest to reach the best of outcomes.

Conclusion

Surgery is effective when medical therapy alone fails to control pulmonary TB and its complications. MDR-TB patients are among those who benefit from pulmonary resection. Postoperative medical therapy is important to improve results and in achieving negative sputum conversion in TB patients including MDR-TB patients. Cooperation between physicians and surgeons is mandatory for proper selection of surgical candidates and proper time for surgery.

Recommendations

Future studies are recommended for comparing tuberculosis pathology in HCV positive and negative patients, and the relation between HCV and compliance to anti-TB drugs.

Conflict of interest

None.

References