Surgery for pulmonary tuberculosis — a 15-year experience

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Abstract

Background: Surgery for pulmonary tuberculosis (TB) has become rather limited. However, it is still required for some sequelae and complications. This is a 15-year retrospective study of cases operated upon for pulmonary TB at a centre. Patients and methods: A total of 2878 cases underwent surgical procedures for various complications of pulmonary TB over a 15-year-long period. After excluding those managed by tube thoracostomy, rib resection and open-window thoracostomy, 1297 cases out of this series were taken up for major thoracic surgical procedures. A total of 98 were operated for persistent sputum-positive status, 740 for recurrent massive haemoptysis or chest infections, 2024 for empyema and 18 for diagnostic reasons. Procedures were 830 lung resections, 12 primary thoracoplasties, 295 space-reducing thoracoplasties, 158 decortications, 744 open-window thoracoplasties and 837 tube thoracotomies alone. Results: There were 18 early deaths and 37 late deaths. The cause of death was haemorrhage in seven cases and respiratory failure in nine cases and septicaemia in two cases. Late deaths were mostly because of progressive tubercular disease. There was significant morbidity in terms of broncho-pleural fistula (BPF) in 95 cases and persistent sinus in 37 cases. Milder complications such as pneumonia, fever and wound sepsis were noticed in some cases but definite records were not available. BPF was managed by tube drainage followed by either window thoracostomy or thoracoplasty. In multi-drug-resistant (MDR) cases, persistent documented sputum negativity was achieved in 64 out of 86 cases. Results were better in haemoptysis and chest infection group where the desired result was achieved in 699 cases. Conclusions: Surgery in pulmonary TB is still relevant in many cases and yields a very gratifying result. It is a challenging surgery and this series is a very large one.

Keywords: Surgery; Pulmonary tuberculosis; Thoracic

1. Introduction

With the availability of effective chemotherapy for pulmonary tuberculosis (TB) after 1950s, indications of surgical intervention became limited. However, despite the advances and success of medical therapy, treatment failure, symptomatic complications and sequelae of the disease continue to warrant surgical treatment. This is a 15-year retrospective study of cases operated upon for pulmonary TB in a tertiary-care institution.

2. Methods

Records of cases that had undergone various surgical procedures for pulmonary TB were evaluated. A total of 2878 procedures were carried out for various indications. After excluding those managed by tube thoracostomy, rib resection and open-window thoracostomy, 1297 cases of this series were taken up for major thoracic surgical procedures. The indications were:

1. Persistent sputum-positive state: 98 cases
2. Massive recurrent haemoptysis or persistent chest symptoms: 740 cases
3. Empyema: 2024 cases
4. Diagnostic: 18 cases

All the patients were evaluated and prepared by a detailed protocol. An informed consent was taken after a discussion with the patient and his close relatives about the pros and cons of opting for surgical. This discussion necessarily included information about the natural history of the disease in the absence of surgical intervention, risks of anaesthesia and surgery, possible complications of haemorrhage and respiratory failure, requirement of blood transfusion and its possible hazards and the expected results and benefits of surgery. Pulmonary function testing and assessment of cardiorespiratory status were carried out in detail. Liver and renal function tests and haematological investigations were other routine preoperative tests. Disease localisation was performed with radiological studies,
computed tomography (CT) scan being performed only in selected cases. Diabetes, if detected, was controlled and the patient put on insulin, preoperatively. Bronchoscopy was carried out to assess the airway and remove mucus plugs in occasional cases. Acid-fast bacillus (AFB) studies of bronchoscopic washings were always carried out. Smokers were asked to stop smoking 3 weeks before surgery.

2.1. Persistent sputum-positive state

Active disease (World Health Organization (WHO) Category II) is defined as failure of chemotherapy, progression of disease despite chemotherapy, relapse or diagnosis confirmed at the time of surgery for either suspected or unsuspected disease, with or without preoperative chemotherapy [1,2]. However, this group of surgical cases included all those cases, which were sputum positive despite at least 4 months of supervised chemotherapy under the revised national TB control programme (RNTCP). As there is a significant incidence of non-compliance in this group, it was essential to be sure that the cases were indeed non-responsive to medical therapy. Multi-drug-resistant TB (MDR-TB WHO Category IV) includes only those cases in which resistance to at least rifampicin and isoniazid could be demonstrated in culture-sensitivity studies. Out of the 98 cases operated upon in this group, MDR status was demonstrated in 15 cases. One case was shown to be resistant to ofloxacin and kanamycin also, in addition to rifampicin and isoniazid, thus being an extremely drug resistant (XDR) case by definition. The remaining cases in this group were taken up for surgery for reasons such as two or more relapses following chemotherapy, one or more relapse while being on chemotherapy, repeated default or non-compliance or likely relapse in the judgement of the treating physician. A total of 68 were males and 30 females, age range being 21—52 years. The procedures carried out were 52 pneumonectomies, 25 lobectomies, nine bilobectomy cases and 12 primary thoracoplasties (Table 1). Thoracoplasty was performed in those cases that had bilateral disease and hence were unsuitable for resection.

2.2. Massive recurrent haemoptysis or persistent chest symptoms

A total of 645 patients were operated upon for massive recurrent haemoptysis. These patients had at least two or more episodes of haemoptysis, and each episode had required hospitalisation; the blood loss was more than 500 cm³ in 24 h. Twelve of these patients had already undergone bronchial artery embolisation, which had provided partial and temporary relief. The lesions encountered in this group were:

1. Tubercular cavities or destroyed lungs: 298 patients
2. Aspergilloma: 144 patients
3. Post-tubercular bronchiectasis: 298 patients

In addition, 95 patients in this group did not have massive haemoptysis (Table 2). Their symptoms included mild haemoptysis, fever, cough with expectoration; the episodes occurred more than 3—4 times a year, and hence, the quality of life was judged to be poor without surgical intervention. In this group, 577 were males and 163 females. The age range was from 23 to 57 years. The procedures done were 212 pneumonectomies, 452 lobectomies, 68 bilobectomies and eight segmental resections (Table 3).

2.3. Empyema

Empyema as a complication of TB was seen fairly frequently. These were managed under the care of chest physicians with surgery being resorted to, whenever necessary. This group included patients from even the paediatric age group, the overall range being from 2 to 67 years. All the records of these patients were not available. The surgical procedures performed in these cases for management were compiled and are provided in Table 4.

1. Intercostal tube management, with or without rib resection: 837
2. Space-reducing thoracoplasty: 295
3. Decortications: 158
4. Open-window thoracostomy: 744
Antibiotics, painkillers, anti-tubercular drugs, cough expectorants and good supervised physiotherapy were ensured in all these patients for their management and to achieve optimal results.

All those patients, who were taken up for thoracotomy, underwent the procedure under general anaesthesia with double-lumen endotracheal intubation placed under supervision using a paediatric fibre-optic bronchoscope. As a lot of adhesions are seen in these cases, electrocautery was liberally used and careful dissection of pulmonary vessels was always carried out. Extraleural mobilisation of the lung was carried out in difficult cases. In some cases, intrapericardial control of pulmonary vessels had to be undertaken. Bronchial stump was usually closed with TRH-30 stapler. In some cases, interrupted vicryl sutures were used for this purpose. Pulmonary vessels were divided after good dissection and double ligatures were placed on either end. One or two chest drains were left for postoperative drainage.

Patients were intensively monitored in the postoperative period. The postoperative management included antibiotics, analgesics, chest physiotherapy, breathing exercises, shoulder exercises, blood replacement whenever needed and good care of chest tubes.

### 3. Results

In the entire series, there were 18 (1.37%) early deaths and 37 (2.83%) late deaths. The cause of death was haemorrhage in seven cases. Two cases were lost intraoperatively because of excessive bleeding from injury to subclavian or pulmonary vessels during mobilisation and dissection. Both these cases were those suffering from aspergilloma in pre-existing tubercular cavities. One of them had already undergone bronchial artery embolisation, which had apparently frozen the perivasculares tissues and extrapleural space by avascular necrosis. In the other five cases, significant postoperative oozing of blood continued, resulting in haemorrhagic shock. Respiratory failure in nine cases and septicaemia in two cases were the other causes of death. A total of 37 late deaths were reported in the follow-up, mostly because of progressive tubercular disease and cachexia.

In those who were operated upon for a persistent sputum-positive state, three died in the immediate postoperative period, one from respiratory failure and two from sepsis. However, out of the 95 surviving cases, only 86 were sputum negative 2 weeks after surgery. In the remaining nine cases, primary thoracoplasty failed to convert the sputum status. There were eight late deaths because of progressive tubercular disease. A total of 22 patients again became positive in the follow-up period. As many as 64 (65.3%) cases remained sputum-negative as long as they remained in follow-up. However, 18 of these were lost to follow-up. Broncho-pleural fistula (BPF) developed in seven cases, which was managed by tube drainage followed by window thoracostomy and, finally, thoracoplasty in two cases.

In those operated upon for haemoptysis and chest symptoms, 33 patients died: 11 in the early postoperative period and 22 in follow-up. The cause of death was haemorrhage in seven patients and respiratory failure in four. The 22 patients who died later on had TB-related complications. Haemoptysis was fully controlled in 605 (93.7%) cases and the chest symptoms were relieved in 94 cases (98.9%). Re-operation had to be performed for significant haemoptysis in two cases. A total of six patients continued to have some recurrent episodes of bleeding, which were managed medically. As many as 88 cases had developed BPF, which was managed by tube drainage followed by window thoracostomy and finally, thoracoplasty in 15 cases. The rate of development of BPF in the entire series is 7.28% after excluding procedures such as tube thoracostomy and window thoracostomy. This was seen in seven out of 86 surviving lung resection cases of the sputum-positive group. In the other group, BPF developed following right pneumonectomy in 35 cases, following left pneumonectomy in 26 cases and following upper lobectomy in 18 cases. No patient in the lower lobectomy or bilobectomy group developed BPF. Other minor complications, such as wound sepsis, fever, prolonged air leak and pneumonia, developed quite frequently, but the records were not available.
Four patients of empyema, who were taken up for thoracoplasty, died because of respiratory failure. Seven of those operated upon for empyema died of various reasons. However, control of pus drainage was achieved in most of these cases. Some persisting draining sinus remained in 37 patients. Even in those offered only open-window thoracostomy, total control was achieved in most of the cases (Figs. 1 and 2).

Eighteen patients were taken up for diagnostic reasons. The indications included mediastinal lymph node biopsy (13 cases), tuberculoma (three cases) and pleural biopsy in two cases. Those diagnosed by video-assisted thoracic approach or mediastinoscopy were not included in the series.

No case in this series was human immunodeficiency virus (HIV) positive.

4. Discussion

The history of surgical treatment has progressed from the isolation, fresh-air sanatoria era to various collapse techniques era, and now the surgical resection era. Surgical treatment peaked in the mid-1950s, but subsequently decreased with the emergence of effective drug chemotherapy. In developed countries there are fewer individuals or centres with surgical capacity and TB experience. In developing countries and emerging economies there are larger caseloads, as well as many surgeons with a large clinical experience, but insufficient clinical and logistical support [3].

Since there are no randomised prospective studies, surgical recommendations for surgery are based primarily on case reports, retrospective studies, experience and consensus [3].

This large series shows the experience of TB surgery in one centre in India. There are very few series reported from the West in recent years. However, in the post-globalisation era, there have been many studies reported from countries other than USA and Europe. Indications in most of the series suggest that the evolving considerations are ruling out cancer, failure of chemotherapy, sequelae/destroyed lung, failed operation, haemoptysis, MDR-TB, pleural disease and aspergilloma [4]. This series reflects indications according to a specific local situation.

Recent published series have demonstrated mortality ranging from 0% to 3.1% [5—9]. Mortality rate in our series — 1.37% early and 2.83% late — compares quite favourably with these other published series. It may be noted that while calculating these percentages, window thoracostomy and tube thoracostomy have been excluded. The reasons for death are standard and most of the other series have also listed the same reasons. Morbidity reported in most other recent series ranges from 3% to 53.7%. We have no information about the rate of minor complications but BPF developed in 7.28%. In our experience, postoperative empyema and BPF are best managed by prolonged tube drainage followed by open-window thoracostomy and thoracoplasty, if required.

Recently, the epidemic of human immunodeficiency virus—acquired immunodeficiency syndrome (HIV—AIDS) has generated a lot of attention and concern for this problem. It has been suggested that this will further increase the surgical indications and caseload. However, in this series, there has been no such case highlighting the fact that conventional forms of TB continue to challenge pulmonologists and thoracic surgeons in developing and emerging economies, even though HIV—AIDS is likely to bring newer challenges.

We have continued to use primary thoracoplasty with apicolyis for treatment failure cases when they were not suitable for lung resection, with occasional success in achieving the sputum-negative state. However, in nine out of 12 such cases, this result could not be achieved. Despite this setback, we have reasons to believe that these cases did show clinical improvement. Hence, this operation continues to be an important tool in the armamentarium of a TB surgeon.

In this series, we have attempted to use the most recent techniques, including good cardiac monitors, anaesthesia...
support, paediatric fibre-optic bronchoscope to secure correct placement of the double-lumen endotracheal tube, liberal use of electrocautery, staplers for bronchial stump closure and adequate postoperative pain relief with epidural catheters and improve the results to the most optimum level.

In the reported series, operative aspects have been well addressed, yet stapling versus suture techniques for lung and bronchus, air leak management, and residual space problems need further discussion. Pain relief, rehabilitation and long-term performance criteria are rarely discussed. Cost reports are rarely mentioned, since most reports are non-American [3,4].

In our experience, all these issues require continued commitment from all the stakeholders to improve the results of this highly complicated and complex set of surgical patients.

It may be noted that the majority of empyema cases have been managed by conservative and established techniques such as tube thoracostomy with or without rib resection or open-window thoracostomy with quite satisfactory results. Even though VATS debridement was used in many cases to facilitate drainage, we could not find the technique of significant practical benefit in the majority of cases as rib crowding and pleural symphysis are present quite often in this setting.

5. Conclusion

This is one of the largest series of surgical operations done in one centre for pulmonary TB in recent decades. It has helped us in accumulating a lot of expertise and experience, which has valuable lessons. Most of the TB control programmes focus on logistical and administrative issues of delivery of adequate drugs to a sputum-positive patient, development of better diagnostic techniques and preventive vaccines, and justifiably so. However, because of sheer magnitude of the problem of pulmonary TB, there is an urgent need to define and incorporate surgery in national and international control programmes.

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References