

The challenge of pulmonary tuberculosis and the thoracic surgeon

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I am grateful to the association for having given me this opportunity to deliver this prestigious oration. Dr. Pitambar Shatpathy's statement regarding post-graduate training mentions that "Many of the chiefs and senior surgeons responsible for training in the specialty often vehemently argue, almost in these words, "*Cases of bronchiectasis are uncommon these days and surgery had virtually no place in modern management of pulmonary tuberculosis*. So, in a way this presentation is a clear example of the old adage "the more the things change, the more they remain the same".

Three main killer-diseases of civilization, which concern cardio thoracic surgeons, are coronary artery disease, carcinoma lung and pulmonary tuberculosis. In all these three conditions, medical management, and other than surgery play a big role. I wish to examine this issue in detail here.

At the Lala Ram Sarup (LRS) Institute of Tuberculosis (TB) and Respiratory Diseases, New Delhi, an autonomous institute under ministry of health and family welfare, govt. of india, a 520-bed hospital, of which 106 beds are dedicated to thoracic surgery and empyema management. Patients are referred from many states of north india as well as adjoining countries like Nepal, Bhutan and even Bangladesh.

Tuberculosis has infected humans for thousands of years. Spinal columns of Egyptian mummies show definite pathological evidence of tuberculosis. Peruvian mummies, dating from pre-Columbian times, showed typical calcified tuberculosis foci in lungs and corresponding lymph nodes in mediastinum. Ancient Chinese writings dating back to 2-3 centuries B.C., described a condition called "Leoping" which, in all probability, was tuberculosis. "Rigveda" terms

tuberculosis as "Rajyakshma" meaning 'King of diseases'. Writings of Sushruta, at school of medicine, Kashi, in the vedic period (600 B.C.), nearly 150 years before Hippocrates, contain different cures for tuberculosis. In Greek literature, around 460 B.C., Hippocrates identified phthisis as the most widespread disease of the times. Celsius, the great Roman physician also mentioned remedies for tuberculosis.

In the 18th century, it was believed that the disease could inspire genius. It was 'fashionable' to suffer from TB of lungs, everybody was consumptive, poets and artists especially, and it was good form to spit blood after each emotion that was at all sensational and to die before the age of thirty. Such people were considered 'geniuses.' Many talented and famous people succumbed to this disease in the 19th and 20th century. This list includes names like the famous poet John Keats, inventor of stethoscope Laennec, celebrated nurse Florence Nightingale, Kamala Nehru, wife of our first prime minister, noted mathematician Ramanujan and the founder of Pakistan, Jinnah.

Where does a thoracic surgeon fit in this history? A Roman physician, Gorgio, in 1696, reported that a TB patient had improved dramatically after he suffered a sword wound in his chest, which produced a pneumothorax. This started the concept of collapse therapy. Carson, in 1822, suggested that something must be done in order to force artificially, by external means, the diseased lung to rest. Forlanini, an Italian physician, observed in 1890 that lung collapse tended to have a favorable impact on the outcome of the disease. This ended the depressing era of helplessness in the face of advanced TB and active therapy had begun. Later many other surgical procedures, e.g. artificial pneumoperitoneum, phrenic crush, plombage, thoracoplasty and resection followed.

In the post chemotherapy era, introduction of successful anti-tubercular chemotherapy decreased the need of surgical intervention. Most TB surgeons took to developing cardiac surgery. The need for surgery in India, on the other hand, always remained considerable because of sheer number of cases. With multi drug resistant tuberculosis (MDR-TB) and human immune

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deficiency virus (HIV), the west rediscovered interest in the subject. In the post-globalization phase, publications of interest are coming from former Soviet republics, Japan, Italy, Hungary, Turkey, Argentina, Peru, Pakistan and elsewhere¹⁻⁶.

Towards the end of 20th century, there was a resurgence of TB in the developed world. The threat of MDR-TB increased. Deadly association with HIV-Acquired Immune Deficiency Syndrome (AIDS) was recognized. World Health Organization (WHO) declared TB as a global emergency in 1993. WHO and International Union against Tuberculosis and Lung Diseases (IUTALD) have published data about hot spots of MDR-TB worldwide. It includes countries like Estonia, some provinces of China and Tamil Nadu from India. Other regions in India may also be having significant number of cases of MDR-TB but the paucity of reliable and adequate data is disabling in ascertaining the exact picture.

Nine million new TB cases and three million deaths per year occur globally. Ninety five per cent of the cases and ninety eight per cent of TB deaths take place in the developing countries and 25% of the latter are avoidable ones. Future global projections, of tuberculosis without effective interventional measures indicate that one billion will be newly infected between 2000 and 2020, 200 million will get sick and 35 million will die. India, as a single nation, has the highest burden of tuberculosis in the world. There are 400 million infected persons, out of whom 20 million are cases of tuberculosis. Five million out of these are infectious cases. Two million new cases of TB are reported in India every year and 5,00,000 individuals succumb to this disease every year.

Tuberculosis kills more people in India than HIV, sexually transmitted diseases (STD), malaria, leprosy and tropical diseases combined. The total economic burden of TB for India alone is estimated to be Rs. 13,645 crores annually. As the disease commonly affects wage earners, TB control program has been termed by some as the biggest poverty alleviation program.

The following are well-accepted indications of surgery in tuberculosis:

- Diagnostic
- MDR-TB
- Complications and sequel:
 - Hemoptysis
 - Destroyed or bronchiectatic lungs
 - Empyema with or without Broncho-pleural fistula (BPF)

There are some well-established pre-requisites before a patient is taken up for surgery. It is of utmost

importance that a detailed discussion is held with the patient and his relatives. This should include a frank talk about the natural course of the disease in the absence of any surgical intervention and the exact aim and objective of the proposed surgery in a given case. Risks of surgery and anesthesia are carefully explained and also the short term and long term results, if surgery is successful. It is of vital importance that a patient of pulmonary TB has taken an adequate course of Anti Tuberculosis Treatment (ATT) before the surgical decision is taken. Even an episode of massive hemoptysis as a presenting feature of pulmonary TB in a non-treated case is rarely an indication of surgical intervention. Patient's cardio-respiratory reserve to withstand surgery of this magnitude or proposed lung resection is carefully assessed. Various criteria have been laid down for different surgeries and we decide in consultation with our pulmonologists and anesthesiologists about the fitness of a given case after taking into account all the factors. Patients are urged to stop smoking at least three weeks before surgery in order to ensure better post-operative results. Post-operative physiotherapy exercises like deep breathing, coughing and shoulder exercises are taught to the patient in the pre-operative period while forewarning him or her about a certain amount of expected post-operative pain. The patient should be as 'dry' as possible before surgery, meaning thereby that sputum or pus production (in cases of empyema) should be minimized by appropriate measures like antibiotics, postural drainage, respiratory exercises, steam inhalation and nebulizers etc. Some of these patients are quite weak and depleted nutritionally. Their nutritional status is built up before surgery by rest and adequate diet ensured by hospitalization.

MDR-TB: MDR-TB is a complex medical problem. If the causative mycobacterium is shown to be resistant to rifampicin and isoniazid, it is labeled as a MDR-TB. The second line drugs used in such patients, viz., kanamycin, ethionamide, cycloserine and thiacetazone and Para Amino Salicylic Acid (PAS) are costly. A full course of one year is likely to cost around Rs. 1.5 lakhs. The efficacy of these drugs is lower than the first line drugs. Moreover, their toxicity and incidence of side effects is higher. In summary, MDR-TB is a challenging medical problem. This unfortunate condition results from the innate resistance of the organism, poor compliance of patients and various socio-economic factors and administrative constraints, which contribute to non-availability of drugs. High cost, poor compliance, comparatively low efficacy and significant toxicity of second line anti-tubercular drugs used to treat these patients further complicates the picture.

Indications of surgery in cases of MDR-TB

The decision about proper case selection is the most important one in this situation. There is a justified indication for surgery in only selected cases of MDR-TB. These situations are:

1. The disease is sufficiently localized
2. Adequate trial of ATT has been given
3. There has been drug failure
4. Patient is chronic secretor

These are broad indications for surgery in patients of MDR-TB or persistent sputum positive status. However, there are specific situations listed below where surgery is a good adjuvant in the management:

1. When sputum smear or culture is positive for AFB, despite 4 to 6 months of appropriate and supervised ATT
2. When there have been two or more relapses
3. One or more relapse while on therapy
4. The organism has been shown to be resistant on culture and sensitivity
5. When the patient is likely to relapse in the judgment of the physician
6. Anticipated non-compliance in an admitted patient after discharge

LRS Experience

In the last twelve years, of the 967 thoracotomies, 74 were carried out for MDR-TB⁹. There were 52 males and 22 female patients. Pneumonectomy was carried out in 37, lobectomy in 21, bilobectomy in 9 patients and thoracoplasty was performed in 7. All these surgeries were carried out under general anesthesia with double lumen endotracheal intubation. There are dense adhesions and sufficient blood is arranged in all cases and electro-cautery is liberally used. Airway Filters and disposable anesthesia circuits are routinely employed to prevent spread of infection. There were 3 early deaths due to bleeding, respiratory failure and septicemia respectively. Five late deaths occurred as a result of cachexia or persistent sputum positive tuberculosis. Broncho-pleural fistula developed in five patients and other complications prolonging hospital stay were seen in another 12 patients. Sputum conversion to negative state occurred in 60 patients, out of which 12 again became positive in the follow up. 18 patients were lost to follow-up, 30 patients remained sputum negative in a follow up ranging from 8 months to 12 years. Second line reserve ATT was continued for another 24 months whenever feasible.

Even though lung resection is the preferred operation, it may not be feasible or appropriate in some cases

having bilateral lesions. The old operation of thoracoplasty with apicolysis is still useful. Overall, surgery adds to the medical management and improves the prognosis but the results are satisfactory. This experience when compared to that of Peru, where surgery for MDR-TB is state funded under a WHO project⁷. Results are quite similar and comparable.

Hemoptysis

Surgery is not immediately required in cases of hemoptysis caused by pulmonary tuberculosis. Massive recurrent hemoptysis is the only justified indication in this setting. Conservative measures like positioning the good lung up after localizing the site, antibiotics, rest and sedation are almost always successful in control lung bleeding and surgery can be planned. There are other interventional measures, which have their selected role in appropriate situations:

- Endotracheal intubation to secure airway, suctioning and bronchoscopy
- Endobronchial tamponade with Fogarty catheter
- Laser photocoagulation (Nd-yag or argon)
- Endobronchial haemostatic agents
- Selective bronchial artery embolization

However, surgery is the most definitive and curative modality for treating massive and recurrent hemoptysis (8). of the 721 patients of hemoptysis treated surgically in our institution in the last 9 years, 547 had a tubercular etiology, be it tubercular cavities or destroyed lungs, aspergilloma in pre-existing cavities or post-tubercular bronchiectasis. Other causes included bronchiectasis, lung cancer, carcinoid tumor, trauma and dermoid cyst. Various procedures done were pneumonectomy (157), lobectomy (425), lobectomy with segmental resection (36), bilobectomy (84), thoracoplasty (17) and bronchoplasty (2). However in the technique, some points need to be emphasized. These are challenging surgeries involving careful dissection because of dense and unpredictable adhesions. A properly placed double-lumen endotracheal tube, by which the anesthesiologist can collapse or inflate the lung depending upon the needs of the surgeon, is crucial. Position of this tube is confirmed with pediatric fiberoptic bronchoscope and the time spent here is time well spent. This also protects the other healthy lung and ensures safety during surgery. The dissection of vascular structures at hilum or in the fissure requires precise combination of sharp and blunt dissection. Adhesions are always a major challenge in this surgery. We always use a transfixation suture on the proximal side while dividing arteries and

veins. Bronchus is closed with a bronchial stump stapler. We have found good results with staplers ever since we started using them.

There were a total of 12 deaths in this series, 5 early and 7 late deaths. Two patients died of hemorrhage and three of respiratory failure in the early post-operative period. One of them died of intra-operative hemorrhage during surgery on the table- a real nightmare for the surgeon. There were 52 cases of broncho-pleural fistula (BPF), about 8% of the cases operated. These complications were managed by tube thoracostomy, followed by open window thoracostomy or thoracoplasty as required. Other complications like wound infection, atelectasis and pneumonitis are quite manageable. There is almost always complete control of hemoptysis in the post-operative period. Minor re-bleeds occurred in 24 cases in a long follow-up, which were managed with conservative measures. However, massive recurrence took place in two cases, which required re-operation in the form of completion pneumonectomy.

Empyema

It forms a major reason for referral to our institute and at any given point of time, 40-50 patients of empyema remain admitted. Various interventions are required according to the state of a given patient and the treatment has to be individualized. Newer modalities like Video-Assisted Thoracic Surgery (VATS) are generally inappropriate in these patients, but are useful as adjuncts in ensuring proper drainage. We treated 122 cases with repeated needle aspiration, with antibiotics and ATT only. This group mainly consisted of children. Majority of them were treated with good tube drainage for adequate duration of time. 870 patients required only tube thoracostomy, whether blind or after rib resection under anesthesia or intercostal block. Good drainage at correct place and adequate duration is the key to success. Unfortunately, there is a lot of mismanagement of this simple procedure. An intercostal tube drainage (ICD) should not be taken lightly and should be planned in a deliberate manner. VATS was used in 183 cases mainly to facilitate drainage, but turned out to be the final and definitive procedure in some cases. Thoracoplasty is required fairly often in our setting to close persistent pleural spaces and was performed in 353 patients for empyema. Decortication was performed in 390 patients. Open drainage or window thoracostomy, when patient was unfit for a more definitive procedure, was used in 364 patients. Thus, a total of 2282 patients of empyema were treated

in our department in the last 12 years by various surgical interventions. We have never used intrapleural fibrinolytic agents, as their cost is quite prohibitive and appear unsuitable in our cases.

Empyema is a challenge, and requires a common sense approach, for its management. Decortication is indicated in persistent pleural spaces with late fibrinopurulent stage. Even though, early decortication has been advocated by some authors, in our own experience, less aggressive methods suffice, if the history is less than two months. Tube failure or delayed referral is the most common indication. However, good results are obtained in carefully selected and prepared cases. VATS has a role in early cases where the pleural fluid has just begun to organize. I feel that third to fourth week of empyema is the most appropriate time for this intervention. Thoracoplasty is partial decostalization of the thoracic cage to obliterate persistent pleural space. Whenever lung is unlikely to expand because of extensive disease or multiple broncho-pleural fistulae, thoracoplasty is an appropriate intervention and is required quite often in our setting. It is most suitable for post-operative empyemas. Results are quite gratifying.

Bronchoscopy

Both rigid and fiber-optic bronchoscopy are excellent procedures and every thoracic surgeon should be able to perform them well. It is required in pre-operative evaluation prior to all these surgical operations. Sometimes, bronchoscopy is needed in post-operative period to remove thick secretions or blood clots from the tracheo-bronchial tree. Occasionally, it is a therapeutic procedure. Where total collapse of left main bronchus by a protruding caseating lymph node was removed with rigid bronchoscopy as a foreign body and the patient subsequently required no other treatment except adequate ATT.

Mediastinoscopy

It is required less often nowadays. However, a mediastinal lymphadenopathy, which can be TB, sarcoidosis or lymphoma, is a perplexing clinical situation and if other measures fail to show a conclusive diagnosis, mediastinoscopy is a justified. Many times, we have detected these nodes to be tubercular.

Post-Operative care

Results in surgery for TB improve if attention to detail is given in post-operative period. Initial management

is ideally done in an Intensive Care Unit (ICU). Antibiotics and painkillers are routinely given. Blood is transfused as per requirements. Respiratory exercises should be encouraged and all measures to relieve pain should be taken. Incentive spirometry is a useful tool to achieve these aims. Care of the chest tubes is an essential ingredient of this care and they should be removed only when their output has completely stopped.

Future possibilities

There are exciting developments taking place in the field of TB control. Efforts are being made to develop more effective drugs, which may reduce the course of ATT to less than two months, thereby eliminating the problem of poor patient compliance. Newer and effective vaccines are also being developed. A targeted drug delivery system may also be developed in the near future. Research is being done to invent better diagnostic techniques. In the light of all these developments, some people have dared to put forward the utopian possibility of complete eradication of this ancient scourge of mankind. It is imperative that thoracic surgeons continue to play a leadership role in all these developments.

Arnold Toynbee, an eminent historian, wrote in the context of imperialism, "*When people have moved on to new empires, I am struggling with the pages of this old story in the hope that by the time it is over, it will reveal to me as to why it was so important.*" I have always found these words to be very inspiring in my own limited context.

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