Surgery in Tuberculosis
Introduction

- There is still a lot of tuberculosis around.
- Now we have ATT, DOTS, DOTS plus . . .

勉 What if it doesn’t work?

勉 Role of Surgery
So, what are the surgical options for tuberculosis for a patient?
Surgical Options

Resectional Therapy: "Remove it"
- Pulmonary
  - Wedge
  - Segment/lobe
  - Lung +/- pleura
  - Sleeve
  - Cavernostomy
- Pleural
  - Decortication
  - Drainage
    - Open
    - Closed

Collapse Therapy: "Shut it"
- Artificial Pneumothorax
- Plombage
- Thoracoplasty
- Pneumonolysis
- Pneumoperitoneum
- Phrenic nerve paralysis

Other
- Myoplasty
- VATS
Introduction...

- TB has affected mankind since time immemorial
- Surgery only therapeutic option till the middle of 20th Century
- MDR and HIV pandemic have brought about a renewed interest in surgery
CAVERNOSTOMY ERA

- Method of leaving open large tubercular cavities through chest wall
- 18\textsuperscript{th} century and first half of 19\textsuperscript{th} century
- Earliest mention in 1726
- In 1938 revived by Monaldi
- Crude procedure and invariably caused tubercular bronchopleuro cutaneous fistula that drained indefinitely
BED REST THERAPY

- First successful therapy widely used in T/t of TB
- Principle was to ↓FRC and thus ↓ the static tension on the walls of tubercular cavities allowing them to collapse
- Introduced in 1880 by Dettweiler in Germany and Turban in Switzerland and in 1900 in USA by E. L. Trudeau
- Abandoned because of poor response and a high relapse rate.
Collapse Therapy Era

- Evolved concurrently with the bed rest therapy
- Used in 70% of sanatorium patients
- Purpose was relaxation of diseased long so as to provide the scar tissue produced by natural healing process a better chance to contract.
ARTIFICIAL PNEUMOTHORAX

- In 1892 Forlanini first to introduce nitrogen in pleural space
- In 19898. Murphy of Chicago used the technique on a wide scale
- 1st half of 2nt Century used as an adjunct to bed rest
- Pneumothorax relaxed the lung producing contraction of scar tissue and approximation of cavity walls
Artifical Pneumothorax (cont...)  

- Procedure had to be repeated till results were satisfactory
- PT could be maintained in only 25%.
- Empyema developed in 20%.
- 1/5th of patients were dead after 10 to 20 years.
- Abandoned to give way to better procedures
PNEUMOLYSIS

- Artificial Pneumothorax was ineffective in presence of adhesions
- Pneumolysis to break the adhesions was of 2 types intra and extrapleural
- Intrapleural: Jacobeus used a modified Cystoscope as a Thoracoscope and divided the lesions using cautery (applicable to thin adhesions only)
Extrapleural Pneumolysis or Plombage

- In 1900's Tuffrel created an extrapleural space which he filled with air (extrapleural pneumothorax) and later by Plomb (Paraffin, Lucite balls, gauze and oil).
- Problem of migration and infection
- Sloughing of cavity walls occurred as the blood supply was compromised resulting in BPF and Empyema.
- Renewed interest in Extrapleural Pneumothorax as Air was used as Plombage and peripheral cavities were excluded.
Pneumoperitoneum and Phrenic Nerve Paralysis

- Both caused the diaphragm to elevate and compress the lung producing some effect on apical cavities
- ↓ in FRC just like bed rest
- Extensively used in 1930s
- Phrenic nerve paralysis caused mediastinal flutter that interfered with ventilation and fell into disuse.
Subcostal and Extraperiosteal Plombage

- Some groups dissected the periosteum from the ribs and placed plastic balls in the pocket so formed.
- Compressed the underlying lung
- Avoided paradoxical motion of the chest wall
Subcostal/ Extraperiosteal Plombage – the procedure

PRE OPERATIVE

POST OPERATIVE

Subcostal/ Extraperiosteal Plombage – the procedure

Lucite Balls

POST OPERATIVE

THORACOPLASTY

- In 1885 Cerneville removed anterior portions of 2nd and 3rd ribs to collapse cavities
- Procedure was not sufficiently extensive
- In 1967 Brauer advocated extensive 2nd to 9th rib resections to collapse diseased lung
- High mortality (30%) and pendulum respiration were associated with this procedure.
THORACOPLASTY (cont…)

- In 1935, Alexander the father of thoracoplasty in USAS perfected the technique of Staged Posterior Lateral Thoracoplasty
- Operative mortality was only 2%
- Cavity closure and sputum conversion was achieved in 80%
THE MODERN ERA

- Started 1950's onwards
- Resections were the main operations during this era
- Resection of localized Tb in conjunction with
- Streptomycin produced excellent results
- By mid 1960's infections were treated satisfactorily with anti tubercular drugs surge became infrequent
- Recent increase in HIV, atypical Tb and drug resistance has resulted in resurgence in the number of operations being performed
THORACOPLASTY
THE PROCEDURE

1. Chest deformity
2. Scoliosis → physical therapy
3. Cavity closure and sputum negative in 80 – 90 %

Current Indications for Surgery in Pleuropulmonary TB

- TO PROCURE TISSUE MATERIAL for confirmation of diagnosis
- MDR TB
- Complications of TB
  - Hemorrhage
  - BPF
  - Empyema
  - Bronchiectasis
  - Tracheal or bronchial stenosis
  - Broncholiths
  - Pulmonary aspergilloma
DIAGNOSTIC INDICATIONS

- Diagnosis of an SPN suspected to be due to TB
- Open thoracotomy or VATS may be used
- VATS can be used for pulmonary mediastinal or pleural sampling and can alleviate the need for open thoracotomy *

PREREQUISITES

- Reasonably localized and amenable to surgical restriction
- Pt. should have adequate C-P reserve
- V/Q scan to confirm physiologic inertness of region to be resected
- Ideal is to give ATT to achieve sputum negativity or reduce bacterial load to minimum possible
- Preop bronchoscopy to exclude endobronchial disease
Surgery for MDR TB

- Resistance to R, H and other first line drugs as S, Z and E increase the likelihood of failure of medical therapy.
- If the disease is localized and pt. has adequate CP reserve operation should be considered.
- 3 months of intensive chemotherapy with drugs to which organism is susceptible to precede surgery.
- ATT to continue for long periods (>1 yr.) after surge to prevent recrudescence of the disease.
Surgery for MDR TB (cont…)

- A series of 42 MDR patients received an avg. of 5.8 drugs preoperatively*
- 29/42 were sp+ before and 3/42 after the surgery
- Overall mortality was 14⁰ as compared to 22⁰ in the medical group
- Only 1 case of *Mycobacterium tuberculosis* developed a BPF
- More liberal use of muscle flaps to reinforce bronchial stumps lowers the rate of BPF, empyema air leaks or residual space problems

Bronchopleural Fistual and Empyema

- BPF can be spontaneous or follow pulmonary resections
- Post resection BPF incidence is 2-3% and spontaneous BPF forms 27% of all tubercular BPF's.
- ICD – ATT suction form the primary modality of treatment
- If fails, open window thoracostomy can be done
BRONCHOPLEURAL FISTULA (cont...)

- Post resection fistulae can be closed with ICD in only 20% of the cases
- Failure of these producers, require a thoracotomy and decortication or a thoracoplasty
- If the underlying lung is incapable of expansion, lobectomy or extrapleural pneumonectomy (for destroyed lung) may be required.
- Suture ligation and use of pedicle muscle flaps have been recommended to fill the cavity and buttress the suture site
- Myoplasty can obviate the need for thoracoplasty and achieve a high closure rate
HEMOPTYSIS

- Moderate hemoptysis can be controlled with sedation bed rest and ATT
- Bronchoscopy to localize the site of bleed and cause of bleeding
- In massive hemoptysis, maintain the airway optimize oxygenation and stabilize the hemodynamic status
- Place bleeding lung in dependent position.
HEMOPTYSIS (cont…)

- Topical therapy with fibrin, thrombin, epinephrine endobronchial tamponade or double lumen intubation can be tried.
- Arteriography and embolization should be used emergently for those who continue to bleed despite endobronchial therapy.
- Surgery is the definite form of therapy when lesion has been localized, embolization is not available or has failed.
ASPERGILLOMA

- Expectant attitude for uncomplicated asymptomatic aspergilloma.
- In symptomatics* having hemoptysis (small, recurrent or massive and those with prior embolization which has a high recurrence rate). Chronic cough. Low grade fever, resection should be done.
- In high risk patients cavernostomy can be done.

Medical treatment in form of intracavitary fungal agents intravenous or oral itraconazole have not shown any consistent benefit with regard to alleviation of symptoms of prevention of hemoptysis
Bronchostenosis and bronchiectasis

- In case of minimal parenchymal damage repeat dilation has been successful.
- Balloon dilatation for short structures
- Self expanding metallic stents have been tried
- Combination of dilatation with Co$_2$ laser
- Sleeve resection with end to end anastomosis
For extensive bronchiectasis secondary to bronchostenosis resection of diseased segment is indicated.
PREOP MANAGEMENT

- Correct Anemia
- Correct Electrolyte Fluid Disorder
- Correct Infection and Arrhythmias
- Improve Nutrition
- Stop Smoking
- Appropriate Chest Therapy
PATIENT SELECTION

- **Contraindications**
  - Non ambulatory status
  - MI in last 3 months
  - FEV1 less than 0.6 lts

- **For pneumonectomy**
  - MVV more than 55%
  - FEV1 more than 2 lts
  - FEV25-75 more than 1.6 lts.
PATIENT SELECTION (cont...)

- Lobectomy
- MVV>40%
- FEV\textsubscript{1}>1lt
- FEV\textsubscript{25-75} > 0.6 Lt.
- Segmentectomy
- MVV>35%
- FEV\textsubscript{1}<1lt.
- FEV\textsubscript{25-75}>0.6lt.
General Principles: Post-operative complications

Sputum retention

- The most common problem post resection

Anticipate in
- Extensive surgery
- Limited pulmonary reserve, phrenic nerve/recurrent laryngeal nerve resection

Leads to
- Retention pneumonia
- Hypoxemia, arrythmias

Management
- Vigorous physiotherapy, Suction bronchoscopy, tracheostomy if recurrent

Videoscope Assisted Thoracoscopic Surgery

History

- 1806 – Phillip Bozzini – first endoscope equipment – “Lichtleiter”
- 1910 – HC Jacobeus
  - thorascopy good for TB
  - First thoracoscopy procedure - *pnemonolysis*

![Image of Hans Christian Jacobaeus (1879-1937)]
VATS for Tuberculosis

Diagnostic
- Biopsy – pleura, lung

Therapeutic
- Resectional surgery
  - Pulmonary
  - Pleural
- Pleurodesis
All the best..