

TUBERCULOSIS

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- Tuberculosis has been classified anatomically in several ways. The American school distinguished between childhood and adult tuberculosis. Primary infection with its sequel disseminated tuberculosis is regarded as the childhood manifestation and bronchogenous tuberculosis as the adult form of tuberculosis. This classification has no pathologic basis.
- Primary infection is marked out by the almost invariable combination of a focus at the portal of entry with a homologous change in the corresponding lymph nodes (primary complex).

- Dissemination may follow primary infections, and is more often in children than in adults.
- In early childhood cavitation of a primary lesion may lead to a type of lesion anatomically indistinguishable from adult tuberculosis and pulmonary tuberculosis observed in adults may be a cavitation primary focus.

PRIMARY TUBERCULOUS INFECTION

Sites of primary infections

- Common sites (95 percent)
 - Lung.
 - Intestine.

○ Rare sites (5 percent)

- Tonsil (75% bovine).
- Conjunctiva.
- Nose.
- Middle ear.
- Skin.
- Genital organs.

Results of a primary infection

- Primary complex.
- Conversion of tuberculin test from negative to positive.
- Every primary infection is invariably followed by a state of bacillaemia.

Primary complex

- Primary complex consists of:
 - Caseous focus in an organ.
 - Caseous focus in the corresponding lymph node.
- Situation of the primary complex :
 - Mostly subpleural.
 - Usually in the lower part of the upper lobe or in the upper part of the lower lobe
- Size of the primary complex:
 - Usually smaller than a hazelnut, and remains smaller than the corresponding lymph node.
 - The focus, however, may be as large as a tangerine or so small not exceeding 1 mm in diameter

- After healing, the focus becomes much smaller, most quiescent foci being no bigger than a pea or a lentil.
- When primary complex occurs in an adult lymph node involvement is only microscopic
- Main histological features of the primary complex:
 - The pleura over the primary focus is often thickened, and this circumscribed pleurisy may go on to exudation.
 - The focus consists of a circumscribed caseous pneumonic area in which the elastic alveolar framework is preserved.
 - Small adjacent nodules in the neighborhood

are usually interstitial epithelioid tubercles

- The primary focus is encapsulated by strong fibrotic and hyalinizing connective tissue and is surrounded by normal aerated parenchyma.
- In the regional lymph node the bacilli cause local proliferation of the reticulum cells, tubercles are formed and caseation may involve the whole tissue, when the process is acute.

Fate of primary complex

- Healing
 - Fibrosis
 - Caseation, calcification, ossification
- Progression
 - Haematogenous dissemination
 - Bronchogenous

- Both disseminated and bronchogenous tuberculosis are classified as part primary tuberculosis, if progression occurs "under your eyes" the term progressive primary is used.

Haematogenous disseminated tuberculosis

Factors influencing the form of dissemination

- 1. Dose of bacilli reaching the blood stream. .**
- 2. Virulence of bacilli (being of limited importance compared to the dose.**
- 3. Individual resistance.**

Forms of dissemination

- 1. Acute tuberculous septicaemia.**
- 2. Miliary tuberculosis acute or chronic.**
- 3. Chronic disseminated tuberculosis.**
- 4. Isolated organ tuberculosis, surgical tuberculosis.**

1. Acute "fluminant" tuberculous septicaemia

- Causes a clinically obscure picture of acute pyrexia with leucopenia, resembling typhoid fever.
- As a rule, the tuberculous origin of the condition is not recognized before P.M. examination. Commonly the spleen and liver are enlarged and studded with irregular and ill defined necrotic foci usually under 1 cm in diameter, but no attempts at tubercle formation. Sometimes the anatomical findings are scanty and similar to those found in coccal septicaemia such as petechiae and swelling of spleen and kidneys.
- The condition seems to be the early sequel to a severe primary infection acquired in a middle aged or an elderly person.

- Chemotherapy is likely to be successful if early diagnosis is made. Apart from leukopenia with or without pancytopenia, liver and bone marrow biopsies are of great value. Another point to be remembered is that corticosteroids treatment may be the initiator of acute tuberculous septicaemia

2. Miliary tuberculosis

Characterized by the simultaneous formation of foci usually of millet-seed size with identical anatomic features. Miliary tuberculosis may be acute or chronic.

A. Acute miliary tuberculosis

Source of Bacilli

Acute miliary dissemination is often encountered in infants when, following primary infection, there is a progressive lesion in the lymph nodes.

In adults, it is more likely to occur in individuals free from caseous or progressive tuberculosis. The best known reasons for the occurrence of acute miliary dissemination

1. Gross trauma to a tuberculous organ e.g. curetting a tuberculous endometrium or massage of a tuberculous joint.
2. Liquefaction in an old primary lesion, which may erode a blood vessel and liquefied material, rich in bacilli, reaches the blood stream.

Vascular tuberculous lesions are a common finding in acute miliary tuberculosis chiefly in large veins, thoracic duct and less frequently in arterial system e.g. aorta, endocardium. The characteristic vascular lesion "Weighert's focus" is a caseous focus in the intima, tending to liquefied and is very rich in tubercle bacilli.

Lesion

Foci found in acute miliary dissemination vary in character, chiefly with the duration of the process. Foci of short duration (2-4 weeks) chiefly consist of areas of leucocytic pneumonia with necrosis (exudative reactions). Typical epithelioid and giant cell tubercles occur only after 6-10 weeks (productive reactions).

- **B. Chronic miliary tuberculosis**

Points of difference from acute form.

Number of bacilli ejected in the blood stream is smaller.

The route by which the organism reaches the lung may be considered as a factor conditioning form and chronicity of miliary spread. Bacilli may escape through the lungs, and re-enter the organ by the bronchial arteries eliciting scarce and small interstitial nodules. Obviously it is a state of high resistance that allows bacilli to enter the lung without

causing changes, and to re-enter via bronchial arteries, affecting only septal tissue.

Reaction is a proliferative reaction "epitheloid and giant cells tubercles".

3. Chronic disseminated tuberculosis

Bronchogenous - disseminated tuberculosis.

It has some features in common with bronchogenous tuberculosis namely: symptoms and long duration of illness. However they differ in that:

1. Origin of chr. dis. tuberculosis is invariably haemic not in frequently so in bronchogenous.
2. Bronchogenous tuberculosis, apart from some negligible terminal foci, is not found in extra-pulmonary organs. In chr. diss. tub. extrapulmonary lesions are invariably present

Miliary chronic disseminated tuberculosis

When the changes in the lung in chr. diss. tuberculosis resemble miliary dissemination, the individual foci are sharply defined and connected with one another by fine, barely visible fibrotic strands. The fibrotic nature of the lesion causes distortion of distal respiratory elements and lead to emphysema "Chronic Emphysematous disseminated tuberculosis".

Other lesions sometimes found in chronic disseminated tuberculosis

- 1) Large apical foci including tuberculoma.
- 2) Simon's foci.
- 3) Punched out cavities.
- 4) Cortico-pleural tuberculosis.
- 5) Chronic laryngio-pulmonary tuberculosis.

1. Large apical foci including tuberculoma

They show a caseous and frequently calcified centre with thick fibrotic capsule and surrounding fibrosis of the lung tissue. The pleura covering the apical focus is thickened and often indented.

The foci are not infrequently multiple and disseminated over the apical, subapical and even infraclavicular areas. Usually, however, one or two foci are found in the apex.

2. Simon's foci

Usually smaller than the former and are due to early bacteraemia following the formation of the primary lesion in the hilar nodes when bacilli are conveyed by lymph stream to the right heart and then again to the lungs.

3. Punched-out cavities

1. Found in 1/3 cases of chr. diss. tuberculosis with pulmonary involvement.
2. Usually multiple and develop rapidly.
3. They develop after rapid and complete liquefaction of necrotic tissue. Patients displaying such cavities often have no sputum denoting that necrotic material is resorbed rather than expectorated, and space is rapidly distended with air

Bronchogenous Tuberculosis

Early foci

1. Assman's Focus; an ill-defined acute exudative and caseous lesion appearing in the radiograph in the lateral and dorsal area below the clavicle.
2. Round or Circular; Focus single or multiple, well defined caseous foci restricted to the cranial portion of the lung.

Origin of the early foci

- Fresh primary.
- Reactivated primary.
- Post-primary foci
- Reinfection foci.

Pathologic forms of bronchogenous tuberculosis

- Caseous pneumonia.
- Fibro-caseous "cavitary" tuberculosis.
- Fibroid tuberculosis

Complications of pulmonary tuberculosis

Erythema Nodosum (4 per cent) and Phlyctenular Conjunctivitis (80%)

Both represent an allergic hypersensitivity of the tissues to some bacterial products and other substances T.B, streptococci, leprosy, sarcoidosis, coccidioidomycosis and sulphonamides. Lesions are self limiting and resolve within a few weeks.

Tuberculous laryngitis

May complicate advanced bronchogenous lesions. Ulceration and edema usually involve interarytenoid region, posterior part of the larynx near vocal processes and epiglottis . Early the lesion may be asymptomatic, but huskiness of voice, pain and dysphagia are common symptoms

Lesion may be hematogenous ("Miliary or Chr Lar. Pulm. T.B.). Lesions are of "Lupoid" type.

Tuberculous endobronchitis

Usually associated with neglected pulmonary tuberculosis. Small radicals are chiefly affected, larger ones may be attached by an extension of the process or by localized foci. Localized bronchial involvement may occur in absence of obvious pulmonary lesions, they are usually derived from previous erosion of a lymph node abscess through the bronchial wall "persistent +ve sputum without obvious pulmonary lesions".

Obstruction is in part, caused by inflammatory products in the lumen, but mainly by cellular infiltration of the bronchial wall. Cellular infiltration --> Caseation -> Ulceration --> Fibrosis --> Stricture formation.

- Complete obstruction —> Atelectasis -> Ectasia
- Partial obstruction —> Loc. obstr. Emphysema or tension cavities.

Destruction of cartilage occurs in severe cases.

Symptoms ; usually include persistent cough and wheezing. Signs include persistent ronchi.

Bronchoscopy is required to establish a diagnosis.

Tension cavity

- Usually peripheral.
- Thin-walled.
- Ballooned rounded.
- Changes rapidly in size on subsequent radiographs.
- Usually shows a fluid level.

Broncholithiasis

One or more stones may be expectorated especially by a patient with multiple calcified foci in the lung - May be associated with hemoptysis, and previously noted calcified opacity on the chest radiograph may disappear. It suggests a local recrudescence or erosion by a malignant tumour.

Other complications

- Tuberculous enteritis.
- Tuberculous bronchiectasis.
- Spontaneous pneumothorax.
- Tuberculosis of chest wall.
- Pericardial effusion

- Constrictive pericarditis.
- Pleural effusion.
- Pneumocmosis:
 - Silicosis and tuberculosis.
 - Silico-tuberculosis.
 - Progressive massive fibrosis.
- Fungus infection "mycetoma".
- Amyloidosis.
- Carcinoma of the bronchus

Diagnosis of Pulmonary tuberculosis

Diagnosis of Primary Pulmonary Tuberculosis

Condition is usually asymptomatic, and if S and S develop, they are usually non-specific. Disease should be expected if an obscure febrile illness or a state of general ill health affects contact of a known active case.

Radiologic changes are usually observed at the time of tuberculin conversion -70 to 90 per cent of children show shadow on their chest radiographs "glandular component", while <30% of adults, only, show "pulmonary component". Shadows usually persist for 6-24 months. Calcification is usually observed after a year or more in pulmonary, glandular or both components

Sputum is rarely produced in children with primary infection. Gastric washings are commonly obtained for mycobacterial studies. Positive smears are rare and positive cultures in 20-25 per cent of the cases. Serological tests and mycob. DNA amplification techniques may prove helpful. Tuberculin test is positive.

Diagnosis of Hematogenous Pulmonary Tuberculosis

In acute miliary tuberculosis, disease starts as a febrile illness in children or as a condition of vague ill health in adults, in addition various respiratory symptoms may develop. Fever may be the only sign, crepitations may develop later. Hepatomegaly, splenomegaly and lymphadenopathy occur in a proportion of cases. Choroid tubercles are present in 90% of children, less so in adults.

Chronic (cryptic) miliary and disseminated tuberculosis is usually encountered in the elderly usually presents as a state of ill health with normal chest radiograph, absence of choroid tubercles and tuberculin test may be negative. Various blood dyscrasias, elevation of transaminases, hyponatremia and hypokalemia are commonly observed. Chest radiograph may be normal or may show miliary shadows "usually in upper $\frac{2}{3}$ of lung field, later confluence of shadows may be observed. Reticulation due to lymphatic involvement and evidence of primary infection or post primary lesion may show. Pleural effusion may be present.

Diagnosis of hematogenous tuberculosis can be made from:

- Fever.
- Splenomegaly.
- Blood dyscrasias..
- Disturbed liver functions.
- Electrolytes disturbance.
- Positive tuberculin.
- Shadows on chest radiograph.
- Detection of A.F. bacilli,
- Liver and bone marrow biopsy.

Diagnosis of bronchogenous tuberculosis:

- No specific symptoms.
- Signs depend on underlying pathology consolidation, fibrosis, cavitation, collapse, localized emphysema ...).
- Radiologic features are variable. However, presence of bilateral upper zones, chronic shadows, cavitation and calcification suggest diagnosis of tuberculosis.
- In Egypt tuberculin is a good negative test.
- Detection of AfB, in sputum, gastric washings, laryngeal swabs, tracheal aspirate or bronchial lavage by smear, cultures or animal inoculation is decisive. Tuberculosis being a bacteriologic diagnosis.
- Newer diagnostic techniques, BACTEC, ELIZA, PCR...?

Estimation of the Extent of a Tuberculous Lesion

- Minimal lesion.
- Moderately advanced lesion.
- Far advanced lesion.

Assessment of Activity of a Tuberculous Lesion

- Active.
- Inactive.
- Quiescent.

1. Minimal:

Minimal lesions include those that are of slight to moderate density but which do not contain demonstrable cavitation. They may involve a small part of one or both lungs, but the total extent, regardless of distribution, should not exceed the volume of lung on one side that occupies the space above the second condrosternal junction and the spine of the fourth or the body of the fifth thoracic vertebra.

2. Moderately advanced:

Moderately advanced lesions may be present in one or both lungs, but the total extent should not exceed the following limits: disseminated lesions of slight to moderate density that may extend throughout the total volume of one lung or the equivalent in both lungs; dense and confluent lesions limited in extent to one-third the volume of one lung; total diameter of cavitation, if present, must be less than 4 cm.

3. Far advanced:

Lesions more extensive than moderately advanced.

Active:

- Symptoms toxaemia \pm respiratory symptoms.
- X-ray shadows consistent with tuberculosis.
- Sputum +ve for acid fast bacilli.

Inactive:

- No symptoms for the last six months (Toxaemia).
- X-ray shadows showing no progression or regression for the last 6 months, and does not allow the presence of capitation.
- Sputum -ve for acid fast bacilli, by repeated culture, for the last 6 months.

Quiescent:

As inactive but allows the presence of cavitation

Tuberculosis in Special Situations

Diabetes and Tuberculosis

Prevalence of T.B. among patients with neglected D.M. is four times that among non diabetics. In patients with controlled D.M. the prevalence of T.B. is a little more compared to non diabetics.

In uncontrolled diabetics, the T.B. lesion is usually of the pneumonic type "EXUDATIVE". In properly controlled diabetics the T.B. lesion usually assumes a granulomatous "PRODUCTIVE" character.

Progression of the T.B. lesion is more rapid among cases with neglected or uncontrolled D.M. compared to non-diabetics.

Symptoms of pulmonary T.B. do not differ materially in T.B. diabetics and non-diabetics. Hemoptysis, however, is the most common presenting symptoms among diabetics, this can be explained by the vasculitis affecting vascular radicals of all sizes on the arterial and venous sides.

The site of radiological shadow in T.B. diabetics may differ from non-diabetics, a middle or lower zone localization of the shadows is not uncommon among diabetics.

In controlled diabetics, the clinical, radiological and bacteriological response of the T.B. lesion to treatment is similar to that observed in non-diabetic patients.

In controlled D.M., the response of the T.B. lesion to treatment does not differ materially whether control of D.M. is brought about by insulin, oral hypoglycemic agents or a combination of both. It is wise, however, to use insulin if the T.B. lesion is hot.

Treatment of T.B. in diabetics should proceed on the usual lines, and when surgery is indicated for residual and other lesions, it can be safely effected.

Pregnancy and Tuberculosis

The peak of incidence of T.B. in women occurs during the child-bearing period of life.

Response of T.B. to treatment is approximately similar in pregnant and non-pregnant females. Pregnancy can in fact work as an artificial' pneumoperitoneum A.P.P. and adds to the therapeutic response. After delivery a tight abdominal binder should be used, for the mother, to avoid sudden descent of the diaphragm.

In pregnant women, who have effective chemotherapy, the risk of relapse is small or absent; those who Have had similar treatment for past disease also do well.

Streptomycin is ototoxic to the fetus and should not be used in pregnancy. There is no evidence that I.N.H., P.A.S or Ethambutol cause any fetal malformations or are toxic in other ways to the fetus. Rifampicin is not known to be teratogenic in man.

If the maternal lesion is active the baby should be vaccinated soon after birth and segregated from the mother for two months. If the maternal lesion is surely inactive, the mother can suckle and care for her baby in a usual way.

Congenital Tuberculosis

A very rare condition. Source of infection being invariably maternal, though disease **in** the mother may not be clinically obvious "T.B. endometritis".

Fetal infection may be hematogenous via umbilical vein or caused by to inhalation "primary in the lung" or aspiration "primary in liver" of infected amniotic fluid.

The baby is usually premature with lesions involving many organs. Disease usually presents few days after birth with severe respiratory **distress**. Fever and hepatosplenomegaly are commonly present. Enlarged lymph nodes at the porta hepatis may cause obstructive jaundice. Inability of the baby to thrive **is** sometimes, the only presentation

Positive smears may be obtained from gastric washings, liver, lymph node or lung biopsy. Tuberculin test is commonly negative.

Treatment should be immediately instituted with a regimen of three drugs including rifampicin. In critically ill babies corticosteroids may be added.

Prognosis is very poor.

HIV infection and Tuberculosis

If T.B. occurs early in the course of HIV infection, the clinical, radiologic and bacteriologic findings do not differ from those found in HIV negative patients. The disease is predominantly pulmonary, located in the upper lobes and cavitation occurs. Tuberculin test and sputum smears are usually positive.

If T.B. infection occurs late in the course of HIV or in patients with AIDS the features are often atypical "pneumonia - middle or lower zone localization". Tuberculin test being commonly negative. Associated extra-pulmonary tuberculous lesions are common "brain pericardium, bones and G.I.T."

With effective combinations of A.T. drugs given for a period of 9 months, tuberculous HIV positive and negative patients will fare the same regarding rate of sputum conversion and relapse. Combination of zidovudine and A.T. drugs is safe and well tolerated.

Recrudescence, Bacterial Resistance and Relapse in Tuberculosis

Recrudescence

It is the flare up of a T.B. lesion "primary, hematogenous or bronchogenous" that has been in a quiescent phase for a long time. Such a recrudescence may be due to debilitating conditions, immunosuppressive states, or simply the usual strain and stress associated with age. In the latter respect adolescence and old age are particularly vulnerable.

Relapse

Clinical relapse implies the reappearance of symptoms, particularly fever and other toxic manifestations, in a case where symptoms had cleared on using A.T. drugs.

Radiologic relapse means progression of a pre-existing regressive pulmonary shadows, spread of T.B. lesions to other sites in the ipsilateral or contralateral lung field or the development of a new phase of the disease.

Bacteriologic relapse is the development of positive cultures after repeated negative ones "usually three".

If relapse occurs while receiving A.T. Drugs "treatment failure" it is usually associated with development of bacterial resistance and carries a serious prognosis. If relapse occurs after an adequate and apparently successful course of chemotherapy has ceased, it is more likely to be associated with sensitive bacilli.

Bacterial Resistance

Primary resistance means infection with already resistant T.B. Secondary resistance is a state of bacterial resistance developing in a patient infected with drug-sensitive T.B., and because of improper dosage and/or combination and irregular drug intake develops bacterial resistance.

MANAGEMENT OF TUBERCULOSIS

Principles of treatment and activity of antituberculosis drugs.

- Principal or (first line) drugs include Isoniazid, Rifampicin, Pyrazinamide, Streptomycin and Ethambutol.
- Reserve drugs include: Para-amino salicylic acid, Thiacetazone, D-Cycloserine, Ethionamide, Prothionamide, Capreomycin, Viomycin and Kanamycin.
- Recent additions include: Amikacin, Quinolones, Rifobutin and lately Clofazimine (antileprotic drug).
- Isoniazid is the most potent bactericidal agent. Rifampicin has less bactericidal activity. Pyrazinamide and Streptomycin have only low bactericidal activity.
- Rifampicin and Pyrazinamide are very potent sterilizing drugs as they act on slow growers (persisters).

- Isoniazid + Rifampicin or Pyrazinamide are the most potent combinations, addition of Streptomycin or Ethambutol to these combinations adds little to their sterilizing activity.
- Different populations of bacteria are believed to exist within tuberculosis lesions, and each is particularly assessable to the action of different antituberculosis drug.
- Rapidly multiplying extracellular bacilli are killed by Isoniazid and to a lesser extent by Rifampicin and Streptomycin.
- Slowly growing bacilli inside the cells and caseous lesions are sterilized by the action of Isoniazid Rifampicin and Pyrazinamide

- Failure to achieve adequate sterilization leads to relapse, and it has now been established that the shortest course of chemotherapy required for adequate sterilization with currently available drugs is six months.
- Current drug regimens consist of an initial or introductory phase of therapy followed by a maintenance or continuation phase of therapy.

Uses of Corticosteroids in Tuberculosis

- Empirically in seriously ill patients.
- To control hypersensitivity drug reactions.
- T.B. of serious membranes.
- T.B. of meninges and ocular tuberculosis.
- Genito urinary tuberculosis.
- T.B. of lymph nodes when causing pressure symptoms.

Surgical Indications in Pulmonary Tuberculosis

- Destroyed segment, lobe or lung.
- Bronchostenosis.
- Bronchiectasis.
- Residual cavities and cysts.
- Tuberculoma > 2 cm.
- Broncho-pleural fistula.

FACTORS AFFECTING PROGNOSIS IN PULMONARY TUBERCULOSIS

A) Personal factors

1. Age:

Infection in the extremes of age usually carries a guarded prognosis. Progression of a primary lesions is most likely to occur, if infection occurs around puberty.

2. Sex:

Females in the child bearing period may carry a bad prognosis, because of the stress of pregnancy and lactation. Males, in poor families, may have a poor prognosis, because they usually have to carry the family, so they may go back to work when the disease is still active or may not be regular in attending follow up visits and treatment.

3. Occupation:

Patients performing strenuous occupations or working in occupations giving rise to silicosis "silico-tuberculosis- Massive progressive fibrosis" usually carry a bad prognosis.

4. Nutrition:

Malnourished patients, especially those of low protein diet, usually have a poor prognosis. Deficiency of a particular item, however, has never been accused to predispose to or favors progression of the disease.

5. Alcoholism:

Alcoholic, tuberculosis patients were found to fare worse than non alcoholics, contributory factors probably being malnutrition adverse social factors and a direct effect of alcohol on the host defenses.

6. Smoking and addiction:

Non smokers patients were found to carry better prognosis compared to smokers, particularly among those with poor socio-economic conditions. Malnutrition probably being an important factor in this concern. The same applies for addictions.

7. Natural resistance of the patient:

This includes personal, inherited, species and racial factors. Patients with low natural with resistance "asthenic and coloured" usually carry a poor prognosis. They often develop acute progressive forms of the disease.

B) Factors in the tubercle bacillus:

Individuals infected with high dose and or virulent organisms usually develop acute progressive and widespread forms of the disease. The problem of resistance of the bacillus to various anti-tuberculosis drugs is very challenging, and is on the increase, making sterilization of tuberculous lesions difficult and at times impossible.

C) Factors in the lesion

- Almost 95 percent of primary infections heal spontaneously and usually pass unnoticed, five only of these lesions progress.
- Hyperacute, septic and necrotic disseminated lesions are usually fatal if early diagnosis is not made and prompt adequate treatment is instituted. Acute disseminated lesions usually have a more serious prognosis compared to the chronic forms, particularly if vital organs are involved.
- In isolated organ bronchogenous lesions, many factors play a role concerning the prognosis.

- Patients with minimal lesions have a better prognosis compared to those with moderately advanced and evidently those with far advanced lesions.
- Patients with non-cavitary lesions have a better prognosis compared to those with cavitary ones, this is probably so if the cavities are thick walled usually requiring surgical resection or central ones near the hilum where rigid bronchi in their surrounding prevent coaptation of their edges and consequently closure of these cavities.
- Patients with apical lesions fare better than those with lesions elsewhere in the lung. The sluggish lymph circulation in the lungs apices favors fibrosis and consequently healing of these lesions.

- Patients with unilateral pulmonary lesions are in a better situation compared to those with bilateral lesions. The condition is especially so, in the presence of residual lesions necessitating surgical resection.
- Patients with inactive lesions fare better than those with quiescent lesions. Residual cavities in quiescent lesions usually harbor viable dormant bacilli, and consequently relapse rates are high unless surgical resection is performed.

D) Associated medical problems:

- Tuberculous patients suffering from diseases associated with "impaired cellular immunity" as hodgkin's disease, leukaemia; lymphoma and AIDS, usually have a poor prognosis. The same applies for those receiving corticosteroids or other immunosuppressive drugs for treatment of disease or for the suppression of transplant rejections.
- Diabetic patients were found to fare the same as tuberculosis, non-diabetic if diabetes is properly controlled by insulin, oral hypoglycaemic agents or a combination of both.

- In cases with advances renal disease. Rifampicin, pyrazinamide and isoniazid can be safely prescribed in conventional doses. The dose of streptomycin can be adjusted according to the degree of renal impairment. PAS, cycloserine and ethambutol should be avoided. Accordingly the prognosis of tuberculosis is not materially affected in patients with renal disease as powerful antituberculosis drugs can safely be used.
- In the presence of hepatic affection, Rifampicin, isoniazid and pyrazinamide cannot be prescribed, and prognosis is deeply affected.

- In asthmatic patients the use of inhaled glucocorticoids in controlling the disease does not affect materially the prognosis of tuberculosis lesions. In the absence of an effective umbrella of antituberculosis drugs, the use of relatively big doses of steroids can adversely affect the prognosis of the tuberculosis lesion.
- In tuberculosis patients with advanced C.O.P.D; the prognosis of the tuberculosis lesions is usually guarded if surgery is contemplated for residual tuberculosis lesions.
- The stress of pregnancy, particularly in tuberculosis females of low socioeconomic conditions, can adversely affect the prognosis of tuberculosis. The

sudden descent of the diaphragm after delivery can reactivate tuberculous lesion, the induction of artificial pneumo-peritoneum or use of abdominal binders is recommended to avoid this event.

E) Medical facilities:

1. Physician

- Aware of the manifestations of the disease.
- Aware of the diagnostic tools necessary for the proper and early diagnosis of the disease.
- Capable of choosing convenient antituberculosis drugs and prescribe them in effective combinations, proper dosage and correct durations, aware of their side effects and the means to monitor them.

- Aware of the situations necessitating hospitalization or referral to the surgeon.
 - Caring about follow up of his patients.
2. *Regular availability of drugs in the market and particularly so in municipal centers.*
 3. *Availability of diagnostic means.*
 4. *Availability of surgery when indicated.*

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Thank You

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