

## 1 TUBERCULOSIS AND THE EYE

Amiee Ho, O.D.

Pacific University College of Optometry

With contributions by Nada J. Lingel, O.D., M.S., F.A.A.O.

### 2 Course Description

- This course will give an introduction to tuberculosis by some facts and statistics
- This course will provide an overview on tuberculosis transmission, screening, testing, treatment and preventing the transmission of tuberculosis
- This course will also highlight some ocular consequences of being infected with tuberculosis and ocular side effects of tuberculosis medications
- 

### 3 Course Objective

- Briefly introduce tuberculosis and its impact as a public health concern
- To learn about tuberculosis' mode of transmission
- To learn about various screening methods for tuberculosis
- To learn about tools we use to test for tuberculosis
- To learn about what treatment options are available for tuberculosis
- To learn about how to protect yourself from an active tuberculosis patient
- To highlight how a tuberculosis infection relates to optometry and what ocular manifestations you might encounter

### 4 Optometric considerations

- Pulmonary disease can increase the risk of ocular disease
  - Dry Eye
  - Glaucoma
  - ARMD
  - Retinal vascular changes
  - Optic nerve head changes
  -
- Pulmonary disease can contraindicate ocular medications

### 5 Optometric considerations

- Medications taken for pulmonary disease can cause ocular problems
  - 
  - Optic atrophy
  - Glaucoma
  - Cataract
  - Blurred vision
  - Tear effects
  - Conjunctivitis

## 6 INTRODUCTION TO TUBERCULOSIS

### 7 Facts and Data about TB

- TB is one of the world's deadliest diseases:

6 7  **Facts and Data about TB**

- TB is one of the world's deadliest diseases:
  - Approximately 1/3 of the world's population is infected
  - 10.4 million new cases and 1.8 million deaths in 2015
  - TB is a leading killer of people who are HIV +
- Intense public health efforts to control TB has caused all time low incidence rates in US to 3 cases per 100,000 (2015)
  - Rates in US have remained stable since 2013

8  **Rising Concerns**Rising concern:

- Multidrug resistant TB (MDR-TB): resistant to 2 most potent TB drugs (isoniazid and rifampin)
- Extensively drug-resistant TB (XDR-TB):
  - Rare type of MDR-TB
  - MDR-TB + resistant to fluoroquinolone, and at least one of three injectable second-line drugs
  - Increasing worldwide and recent evidence of spread person to person (50% cure rate)

9  **TRANSMISSION**10  **TB transmission**

Virtually all TB is transmitted by airborne particles

- Released during coughing, sneezing, shouting, or singing
- About 30% of heavily exposed are infected
  - % ↑ if patient has DM or HIV+
  - \*Heavy exposure = being around sick person for 24 hours for 6 months

↑ risk with:

- ↑ number of bacteria excreted
- Closeness
- Duration of exposure

11  **TB transmission**12  **Who is at high risk for TB?**Individuals at higher risk for TB:

- Close contacts of patients suspected of having TB
- Immune suppressed (HIV, immune modulators, etc)
- Recently exposed
- Health care workers who serve high risk patients
- Residents and employees in long-term care facilities, jails, myco bacteriology labs, homeless shelters
- Recent immigrants from high TB prevalence countries
- Injectable drug users (suppressed immune system)
- Patients with chronic medical conditions
- Children < 4 years of age (less developed immune system)

13  **SCREENING FOR TB**14  **Screening for TB**

Screening is often performed with the Tuberculin Skin Test

13 14  **Screening for TB**

Screening is often performed with the Tuberculin Skin Test

- AKA: Mantoux test or PPD

The Procedure:

- Purified protein derivative (PPD-S) tuberculin placed intradermal

The Results:

- Exposed or not, does not give info about active or latent

The Details:

- Delayed hypersensitivity response so read 48 - 72 hours later
- Evaluate for size of induration not redness
- Measured in mm transversely to the long axis of the forearm

15  **Interpretation of TB skin test**

Interpretation of TB skin test results depends on risk factors:

Induration of 5 mm or more is positive if:

- Immunosuppressed (HIV or meds) or
- Close contact with person with active TB/recently exposed or
- Chest x-rays show fibrosis consistent with TB

Induration of 10 mm or more is positive if:

- Any high risk individual who does not meet first criteria (includes health care workers)

Induration of 15mm or more is positive in all

16 

Positive Test results:

Mantoux Conversion

Either :

- A change from a negative → a positive reaction

Or

- An increase of  $\geq 10$  mm in size

17  **The 2 step test**

CDC recommends 2 step test for initial test if periodic testing needed

- Goal: Prevents interpreting 2<sup>nd</sup> test ( or future test) results as new infection
- If infected many years ago few sensitized lymphocytes so no significant response on first test
- Repeat test → larger "boosted" response which is considered baseline
- Drugs are super toxic, so should only treat those that need it!

18  **Other screening tests**

Interferon gamma release assays (IGRAs)

Two types of IGRAs are FDA approved:

1. QuantiFERON®-TB Gold In-Tube Test (QFT-GIT)
2. T-SPOT®.TB tests (T-Spot)
- 3.

- Blood samples are mixed with TB proteins (antigens) and controls; then incubated for 16-24 hours
- If infection present: WBCs will release interferon-gamma in response to antigens
- Test result interpretation depends on risk factors and general health of patient

19 20

- Test result interpretation depends on risk factors and general health of patient

## 19 TST vs IGRA

## 20 Tested POSITIVE for TB...

Diagnosis of active or reactivated TB:

- Depends on a good history and clinical evaluation because the disease tends to start insidiously
- Lungs are most common site of disease (in Canada and US)
- Classic symptoms of pulmonary TB (non-specific symptoms)
  - Cough with or without hemoptysis
  - Sweats Chills
  - Anorexia/Weight loss Chest pain (pleuritic disease)
  - Malaise Fever
- TB can also affect other sites like lymphatic system, bones and joints, CNS, kidney, etc.

## 21 TESTING FOR TB

### 22 Chest x-ray

- Posterior-Anterior (PA): standard chest x-ray view
- Since lungs manifests similarly for many diseases:
  - Assume TB if:
    - 1. Tests positive for TB
    - 2. See abnormality in lungs

### 23 Sputum sample

- 3 samples 8-24 hours apart with one in AM
- 

Testing Sputum Samples:

- Stain looking for acid fast bacilli (AFB)
  - Poor sensitivity
- Culture
  - Cultures are likely to be positive with smaller #'s of bacilli and are gold standard but very slow (weeks)
- Perform nucleic acid amplification test (NAA)
  - More accurate than stains and give results in < 24 hours

## 24 Latent vs Active (Reactivated)

## 25 TREATMENT FOR TB

### 26 Treatment

- Currently 10 medications are approved in US and there are multiple treatment regimens
- Treat both latent and active but treatment differs
  - Will ALWAYS treat ACTIVE
  - Will USUALLY treat LATENT
- Considered latent TB if screening test is POSITIVE but there are no signs of active infection by *chest x-ray* or *sputum culture*
- Cure rate for extensively resistant TB is 50%!
- 
- 

## 27

- 
- 
- 

## 27 Treatment

What factors to consider for treatment?

- Age
  - Young pts: will likely treat, will have to live with disease for LONG time
  - Elderly pts: drugs very toxic for elderly pts, TB is SLOW growing
- Immune status
- How long ago pt was exposed
  - Will likely treat more recent latent TB vs old latent TB
- 

## 28 Treatment

- 

Goals for Treatment:

- Cure infection
- Minimize death and disability
- Prevent drug resistance
- Reduce transmission (hit hard in the beginning to prevent spreading!)
- 

## 29 Drugs to treat TB

- Rifampin or Rifapentine
- Isoniazid
- Pyrazinamide
- Ethambutol

## 30 Drugs to treat TB

- Rifampin or Rifapentine
  - Resistant strains develop easily so usually not given alone
    - Rifapentine
      - SE: Reddens secretions including urine and tears, stains contact lenses; liver damage, nausea&vomiting, fever
- Isoniazid
- Pyrazinamide
- Ethambutol

## 31 Drugs to treat TB

- Rifampin or Rifapentine
- Isoniazid
  - Most potent of anti-TB drugs
  - Can be administered alone for latent TB treatment
    - Chief risk: hepatotoxicity (d/c other drugs cleared by liver-alcohol, Tylenol)
    - Other SE: anemia, GI symptoms, rash, peripheral neuropathy, subepithelial corneal infiltrates, optic neuritis, visual field defects, EOM paresis
- Pyrazinamide

## 32

optic neuritis, visual field defects, EOM paresis

- Pyrazinamide
- Ethambutol

### 32 **Drugs to treat TB**

- Rifampin or Rifapentine
- Isoniazid
- Pyrazinamide
  - Resistant strains develop easily so usually not given alone
- Ethambutol

### 33 **Drugs to treat TB**

- Rifampin or Rifapentine
- Isoniazid
- Pyrazinamide
- Ethambutol
  - Does not develop resistance as easily
  - Ocular SEs: optic neuritis, macular edema, and pigmentation changes (permanent)
  - 
  - 
  - \*Note: Care in patients with poor liver function for all TB meds
  - 
  -

### 34 **To supplement the Treatment of LATENT TB**

Pyridoxine (Vitamin B6)

- Usually co-administered for all latent TB treatments
- Very important for:
  - Pregnant patients                      Diabetics
  - Alcoholics                                  Elderly
  - Malnourished individuals
- Helps diminish risk of peripheral neuropathy from isoniazid
- 
- Vitamin C and D may ↑ speed of TB treatment (kill TB faster)

### 35 **PREVENTING TRANSMISSION**

#### 36 **Preventing TB transmission**

Latent TB: nothing to worry about

Active TB or suspected active:

- Place patient in isolated room
- Have patient wear surgical mask (50% effective)
- Ask them to cover mouth and nose with tissues when they cough or sneeze
- HEPA mask for health providers per OSHA
- Once patient treated for 2 weeks, no longer considered infectious
- If believe exposed to disease
  - Wait 8 weeks to take TB skin test (if known previously negative)

### 37 **BACK TO OPTOMETRY**

### 38

37  **BACK TO OPTOMETRY**38  **Risk of Ocular involvement with TB**

- 1- 2 % of patients with TB have ocular sign (non-HIV+)
- ≈ 18% if HIV+ patients with TB have ocular signs
- 
- Suggested that patients with TB have ocular exam
- Ocular signs can also be first indication of TB

39  **Ocular Signs of TB**External Eye Structures

- Ulceration of lids with scarring and ectropion
- Cellulitis
- Dacryoadenitis (gland)
- Phlyctenulosis\*\*
- Keratoconjunctivitis
- Interstitial keratitis (also syphilis)
- Episcleritis and Scleritis

40  **Ocular Signs of TB**Posterior Segment

- Uveitis
- Choroiditis
- Retinal periphlebitis
- Optic neuritis
- Cranial neuropathy

41  **Eye exams for TB patients**Optometric involvement

- Baseline and monthly exams
- Check VA's                      Pupil exam
- EOMs                                R/G color vision
- Amsler grid                        Biomicroscopy
- Visual field                        Dilated fundus exam
- If changes consistent with optic neuritis: inform PCP: d/c ethambutol
- Expect improvement in couple weeks to months

42  **THANK YOU**

Amiee Ho, O.D.  
 Assistant Professor  
 Pacific University College of Optometry  
 amieeho@pacificu.edu