TUBERCULOSIS AND THE EYE

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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

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

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

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

INTRODUCTION TO TUBERCULOSIS

Facts and Data about TB
• TB is one of the world's deadliest diseases:
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

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)

TRANSMISSION

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

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, mycobacteriology 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)

SCREENING FOR TB

Screening for TB

Screening is often performed with the Tuberculin Skin Test
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
- An increase of ≥ 10 mm in size

17 **The 2 step test**

CDC recommends 2 step test for initial test if periodic testing needed
- **Goal:** Prevents interpreting 2nd 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
• 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%! 
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

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

Drugs to treat TB
- Rifampin or Rifapentine
- Isoniazid
- Pyrazinamide
- Ethambutol

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

Drugs to treat TB
- Rifampin or Rifapentine
  - 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
optic neuritis, visual field defects, EOM paresis
  • Pyrazinamide
  • Ethambutol

32 Drugs to treat TB
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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
BACK TO OPTOMETRY

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

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

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

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

THANK YOU
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