Childhood Tuberculosis: Diagnosis, Treatment and Prevention of TB in HIV-infected Children

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The Problem

- One million new TB cases in children < 15 years old annually (WHO)
  - 11% of annual burden of cases
- Frequency depends on local TB/HIV epidemic, age structure, diagnostic tools, Rxn, contact investigation
- Children present with TB at any age
- Transmission to a child, results from close infected adult or adolescent contact
- TB infection \(\rightarrow\) Gohn focus \(\rightarrow\) regional adenopathy
- CMI halts disease progression, not functioning in HIV+
Children Living with HIV in Latin America and the Caribbean

**Number of children living with HIV, 1990-2009**

- Caribbean
- Central America

DIAGNOSIS
Clinical Presentations in Children

- Pulmonary TB
  - Mostly primary (not reactivation)
  - Uncomplicated
    - Unilateral adenopathy, cervical adenitis
    - Typical primary complex
      - Hilar, mediastinal adenopathy, lung opacity
  - Complicated
    - Lobar/segmental adenopathy, bronchial compression
    - → atelectasis
    - Unilateral hyperinflation
    - Cavitation (rare)
    - TB bronchopneumonia
- Adenopathy, cervical adenitis
- Meningitis, tuberculomas
- Disseminated TB
- TB effusions
  - Pericarditis, pleuritis, peritonitis
- Spinal TB
Presentations of TB in Children with HIV

• Depends on stage of HIV
• Early HIV infection
  – TB presentation same as in HIV negative child
• Late HIV infection
  – Disseminated TB common, eg., meningitis, miliary, TB adenopathy
• Older children with TB/HIV
  – Same presentation as in HIV+ adults
• TB/HIV co-infection have longer hospital stays, malnutrition, higher mortality
• High index of suspicion for TB in HIV+ child
• Isolate *M. tuberculosis* from expectorated sputum, lymph node, CSF, effusions, tissue
Diagnosis of TB in HIV-infected Children

- Children do not produce sputum,
  - sputum, gastric washings usually M. tb-negative

- Careful history
  - Chronic cough > 2-3 weeks
  - Fever > 14 days, excluded common causes
  - Weight loss, failure to thrive

- Contact
  - Older household, caregiver with smear-positive TB
  - Especially HIV-infected adults
Clinical Examination

• Uncommon, highly suggestive
  – Gibbus, vertebral TB
  – Painless, cervical adenopathy with fistula formation

• Meningitis, not responding to antibiotics

• Pleuritis

• Pericarditis

• Ascites

• Painless adenopathy without fistula

• Painless joint enlargement

• Tuberculin hypersensitivity
Mantoux Tuberculin Skin Test

• Mantoux is positive with TB infection
• Mantoux+ with suggestive clinical symptoms is diagnostic of tuberculosis disease
  – Usually, 5 tuberculin units of PPD, trained health care workers administer test
  – High risk cases: TST ≥ 5 mm
  – HIV+, close contacts to active TB, malnutrition, CXR suggestive of TB
  – All other children: TST ≥ 10 mm induration,
    • Without regard to BCG vaccination status
  – Negative Mantoux does not exclude active TB disease, especially in HIV-infected children
Bacteriologic Confirmation

• Bacteriologic diagnosis preferable, using available specimens, especially for
  – Suspected drug resistance
  – HIV infection
  – Complicated/ severe cases
  – Uncertain diagnosis
• Sputum in children > 10 years
• Gastric aspirates
• MTB-RIF Xpert rapid dx also applies to children
Investigations for Pulmonary and Extra Pulmonary TB

- **CXR changes of TB**
  - Persistent lung opacities
  - Collapse consolidation
  - Hilar/mediastinal adenopathy
  - Opacification does not improve after antibiotics
  - Pleural effusions

- **Histology, other special investigations (EPTB), CSF for TB meningitis**

- **PCR, interferon gamma release assay (IGRA), need more research for TB diagnosis in children**

- **CT, MRI’s, bronchoscopy not usually recommended in children**
HIV and TB Co-infections in Jamaican Children

- Significant increase in TB and TB/HIV co-infections at UHWI over four years
- 24 TB cases; All had BCG vaccine
- HIV–infected statistically more likely to be
  - Older
  - Have failure to thrive
  - Digital clubbing
  - Hepatomegaly
  - Splenomegaly
  - Generalized adenopathy
  - Negative Mantoux skin tests
- Appropriate in house-anti-TB Rxn, > 2 mos
- Death more likely and hospital stay longer in HIV infected vs., non-infected
- Household family members with active TB in 12 cases

TREATMENT
Treating Childhood TB/HIV

- New smear negative PTB and less severe EPTB
  - 2 mos INH, RIF PZA plus 4 mos INH, RIF

- New smear positive TB, new smear negative TB with extensive parenchymal involvement, Severe EPTB, or Severe concomitant HIV disease
  - 2 mos INH, RIF, PZA, ETH plus 4 mos INH, RIF

- Miliary TB and TB meningitis: use higher doses
  - 2 mos INH, RIF, PZA, STR plus 4 mos INH, RIF (WHO), or
  - 2 mos INH, RIF, PZA, STR (or ETH) plus 5-7 mos INH, RIF (AAP)

- Previously treated smear positive TB, with relapse, treatment after interruption, treatment failure
  - 2 mos INH, RIF, PZA, ETH, STR plus 5 mos INH, RIF, ETH

- MDR TB
  - Special regimens, after consultation
Management of HIV-related TB

• Cotrimoxazole prophylaxis
  – Daily, prolongs survival and reduces respiratory infections and hospitalizations
  – All HIV+ children with advanced immune-suppression should be placed on cotrimoxazole

• Antiretroviral therapy
  – In HIV+ child, priority is to commence anti-TB drugs
  – Many drug-drug interactions between ARV’s and RIF
  – Similar adverse reactions in anti-TB drugs and ARV’s
  – When to start, not optimally determined for children
  – Consider degree of immune-suppression and child’s progress during anti-TB Rxn
Timing of ART after anti-TB Treatment with Rifampin-containing regimen

• Extra Pulmonary TB
  – Start ART 2-8 wks after anti-TB treatment

• Pulmonary TB and lymph node TB
  – If clinical Mnx:
    • Start ART 2-8 wks after anti-TB Rxn or
    • Delay ART until anti-TB Rxn completed
  – CD4 values available
    • Severe/advanced immune deficiency
      – Start ART 2-8 wks after anti-TB Rxn
    • Mild or no immune deficiency
      – Delay ART until anti-TB Rxn is completed

• ART’s:
  – < 3 years -- Triple NRTI 1st line regimen d4T /AZT + 3TC+ ABC, or 2 NRTI’s + NVP
  – > 3 years: triple NRTI 1st line d4T/ AZT + 3TC +ABC, or standard 1st line 2 NRTI’s + EFV
Special Considerations

• Immune reconstitution
  – Exacerbation of symptoms, signs, CXR manifestations after anti-TB therapy
  – Self limited, consider steroids

• Steroids for TB meningitis, miliary TB, airway obstruction by TB lymph glands, pericarditis
  – Improves survival, reduces mortality
  – Taper the dose after 4 weeks
Adherence

• Educate children and caregivers about TB and importance of completing therapy
• Support for care giver/family, record doses on Rxn card
• Treatment should be free, give fixed dose drugs
• Hospitalise children with severe TB for intensive management
  – Meningitis
    • Local vasculitis, tuberculoma, raised ICP and hydrocephalous
  – Miliary TB
  – Respiratory distress
  – Spinal TB
  – Severe adverse events, eg., hepatotoxicity
  – Adherence questionable
Monitoring During Treatment

• Symptom assessment
• Adherence
• Adverse events, eg., LFT’s, haematology, rashes, IRIS
• Weight and medication adjustment for wt. gain
• Adherence and reviewing treatment card
• Followup sputum for AFB smear microscopy (if +)
  – Followup CXR’s not routine, slow recovery
  – Non-response → drug-resistance, complications, non-adherence, other?
Isoniazid-resistant Disseminated *M. tuberculosis* in a Jamaican Infant with HIV/AIDS

PREVENTION
Child Contact

• Newly infected children with TB at high risk for miliary TB, meningitis if no preventive Rxn
• Close contact screening and management, adults family member, day-care contact with infectious TB
• Mantoux skin test-positive children:
  – If well (no symptoms, Normal CXR and growth), give INH preventive therapy x 6 months
  – If unwell, evaluate and treat for TB, if present
• Mantoux skin test negative children:
  – If well, IPT x 2 months, repeat Mantoux skin test
  – If positive at 2 months, continue IPT for 6-9 months
  – If negative at 2 months, discontinue IPT
Tuberculosis, Scabies and Chicken Pox Outbreaks in an Orphanage for Children with HIV/AIDS in Jamaica

- Concurrent outbreaks of tuberculosis (N=4), chicken pox (N=15), scabies (N=14) among 24 children residing in an AIDS orphanage
- Emphasizes need for:
  - Immunizations
  - Screening of staff and clients
  - Infection control
  - Education

Epidemic Curve of the Chicken Pox Cases (n=15)

Intensive Case Finding and Prevention in Children with HIV – TB Screening

• Children living with HIV who do not have poor weight gain, fever, or current cough -- are unlikely to have active TB

• Children living with HIV who have poor weight gain, fever, or current cough, or contact history with a TB case – may have TB and should be evaluated for TB and other conditions. If the evaluation shows no TB, they should be offered IPT regardless of age.

– Strong Recommendation, low quality of evidence
INH Regimen and Duration

• Children living with HIV who are more than 12 months of age and who are unlikely to have active TB on symptom screening and have no contact with a TB case should have 6 months of IPT (10 mg/kg/day)

• In children living with HIV who are less than 12 months of age, only those who have contact with a TB case and who are evaluated for TB should receive 6 months of IPT, if the evaluation shows no TB disease
  – Strong recommendation, moderate evidence

• All children living with HIV who have successfully completed treatment for TB disease should receive INH for an additional 6 months
  – Conditional recommendation, moderate evidence
Three children with HIV infection developed BCG adenitis after initiation of highly active antiretroviral therapy (HAART).

All “rapid progressors” with severe HIV/AIDS

“Immune reconstitution syndrome”

BCG vaccination should continue, per WHO policy

BCG Vaccination in Children

• HIV-infected children who received BCG vaccine at risk for disseminated BCG disease
• Vaccinate:
  – HIV-uninfected children in high prevalence HIV+ populations
  – Infants born to women with unknown HIV status
  – HIV-exposed infants, asymptomatic, unknown HIV status
• Do not vaccinate:
  – Known HIV+ children, asymptomatic
  – Unknown HIV status in symptomatic children
  – Known HIV infected children, symptomatic
Are we going to see

THE END OF TB

in our lifetimes?

A call from the millennium children of the Eastern Mediterranean Region

Thank you