Pediatric Tuberculosis

Satellite Conference and Live Webcast
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Why is Pediatric Tuberculosis a Major Concern

• Prevention of pediatric tuberculosis is an indicator of the success of a tuberculosis program
• Early identification and treatment of infected children reduces the risk of progression to disease

Why is Pediatric Tuberculosis a Major Concern

• Increased foreign born patients or first generation patients of foreign born parents represent an important population of at risk patients

By the Numbers - TB in Patients Less Than 5 Years of Age

• Infants and children infected between birth through 4 years of age have a 25% risk of progression to disease
• Infants infected under one year of age have up to 40% risk of disease
• 25 - 35% of young children develop extrapulmonary disease

Risk for Disease in Children After Infection

• Miliary or meningeal 0.5 - 3%
• Pulmonary 75%
• Lymphatic 12 - 15%
• Bone and joint 1%
• Renal 1%
Risk for Disease in Children After Infection

- Other sites of infection including skin, genitourinary, gastrointestinal, upper respiratory

Risk Factors for Pediatric Tuberculosis

- Exposure to high risk adults
- Born in high risk country or parents born in high risk country
- Low income
- Homeless
- Intravenous drug use (adolescents)
- Correctional / juvenile facility

Risk Factors for Progression

- Infection under five years of age
- Adolescent / young adult
- Co infection with HIV
- Conversion of PPD within two years
- Immunodeficiency

Other Concerns About Progression of TB in Children

- Diabetes
- Chronic renal failure
- Malnutrition
- Immunodeficiency - Cancers, congenital deficiencies, treatment for conditions such as JRA, Crohn’s such as TNF alpha inhibitors (examples - adalimumab, infliximab)

The PPD is Old But NOT GOLD

- Can be useful if positive in exposed infant or child
- Infants cannot mount a good response to PPD under at least 16 weeks of age and some experts recommend up to 24 weeks of age

The PPD is Old But NOT GOLD

- Caution if negative in exposed infant or child
  - Between 10 - 40% of children with documented tuberculosis do not have an initial reactive PPD
Which Children Should Receive a PPD

- Contacts to known or suspected cases
- Children with abnormal radiographic findings and suggestive clinical histories / high risk groups

Which Children Should Receive a PPD

- Immigrants or adoptees from Asia, Middle East, Africa, Latin America, former Eastern Block / Soviet countries
- Children with travel histories to high risk countries or exposure to people from high risk countries

A Word about “Screening PPDs” in Some Children

- Initial TST should be done on children who
  - Are immunosuppressed
  - Are going to be on prolonged steroid therapy
  - Are going to receive tumor necrosis factor alpha antagonists

A Word about “Screening PPDs” in Some Children

- Are going to be placed on immunosuppressive therapy for illnesses such as JRA

IGRAs and Pediatrics

- Becoming increasingly useful in children with recommended age now as low as two years

Hispanic Child 19 Months of Age

- Left upper lobe consolidation
- Left hilar adenopathy
African American Child  
Age 9 Months  
• 2.7 cm round opacity right hilum

Parallel Cases of Pediatric Tuberculosis
Hispanic Child  
19 months  
• Asymptomatic  
• 18mm PPD  
• Identified within 3 days  
• Gastric aspirate x3  
• Positive smear and culture for M. Tb  
• HIV negative

African American Child  
9 months  
• Asymptomatic  
• 15mm PPD  
• Identified within 3 days  
• Gastric aspirate x3  
• Negative smear and culture  
• HIV negative

Parallel Cases of Pediatric Tuberculosis
Hispanic Child  
19 months  
• LP - negative smear / culture  
• Therapy I - Started with four drugs - Index case culture pansensitive  
• Treated standard therapy and resolved without complications

African American Child  
9 months  
• LP - negative smear / culture  
• Therapy I - Started with four drugs - Index case culture pansensitive  
• Treated standard therapy and resolved without complications

Pearls of Management in Pediatric Tuberculosis
• Directly observed therapy is a must in treatment of disease  
• Cultural competency plays a great role in successful treatment  
• Prepare the parents / caregivers for the long treatment journey ahead  
• Be creative regarding administration of medications

Therapy of Pediatric Tuberculosis
• Standard Therapy for drug sensitive tuberculosis with INH, RIF, PZA and EMB  
• Special consideration for Alternative Regimens if suspicion of multi-drug resistant organism

Roles of Specific TB Drugs
• INH - Bactericidal and prevents emergence of resistance to other drugs  
• Rifampin - Bactericidal and prevents emergence of resistance to other drugs

From Advanced Concepts in Pediatric TB – Dr. Jeffrey Starke
Roles of Specific TB Drugs

- **EMB** - Bacteriostatic at lower doses and prevents emergence of resistance to other drugs
- **PZA** - Allows for shorter duration of therapy

From Advanced Concepts in Pediatric TB – Dr. Jeffrey Starke

Drug Side Effects and Concerns

- **INH** - Peripheral neuropathy; seizures in overdose; hepatotoxicity; B6 prevents neuropathy and is only treatment for INH seizures but does not effect hepatotoxicity
- **Rifampin** - Inactivates oral contraceptives; Many drug interactions; hepatotoxicity; orange urine occurs in all patients

Drug Side Effects and Concerns

- **PZA** - Can increase uric acid with resultant gout symptoms; rash; pruritis; hepatotoxicity and associated with this more in pediatrics than INH
- **EMB** - Optic neuritis; red-green color blindness; has very poor CNS penetration and not used for meningitis

Medication Side Effects in Children

- Overall, 5% risk of adverse effects
- Most are minor - abdominal pain without elevated LFTs
- 3.3% incidence of increased LFTs with INH and Rifampin together (usually asymptomatic)
- Peripheral neuropathy rare

Follow up, Therapeutic Agents, and Words of Wisdom

- If pulmonary disease, obtain CXR after 1 - 2 months of therapy, or as clinically indicated, and perhaps, at closing of case
- Monitoring in patients with severe disease or conditions which may affect LFTs
- Ophthalmologic monitoring with use of EMB
- Corticosteroids are useful with TB meningitis and some other presentations as recommended by expert guidance
How to Give TB Medications to Children

- Discuss with parents / caregivers the importance of TB therapy and the risks of poor compliance
- Have a friendly, positive, age appropriate approach to the child
- Recognize that there will be challenges but they can be resolved

Administration of Pediatric Tuberculosis Drugs

- Standard therapy drugs present less problems than second line drugs
- Avoid the use, if possible, of liquid INH due to diarrhea from sorbitol or Rifampin due to large volume of liquid

References

- Pediatrics in Review: Pediatric Tuberculosis. Andrea T. Cruz, M.D., and Jeffrey R. Starke, M.D., DOI: 10.1542/pir.31-1-13