

Review Article

Diagnostic Measures in Childhood Tuberculosis: A Short Review

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Abstract

The trends of incidence, morbidity and mortality of tuberculosis in children have always remained unclear because of lack of a definitive diagnostic tool in mostly cases. The diagnosis of tuberculosis in children remains a major challenge as it is seldom confirmed and is mostly based on clinical signs, symptoms and special investigations e. g. TST, chest X-ray and sputum smear microscopy. Sputum smear microscopy is positive in less than 10-15% of children with TB and culture yields are nearly about 30-40%. In low burden countries, the triad of (a) known contact with an infectious source case, (b) a positive tuberculin skin test and (c) a suggestive CXR is usually used to establish a diagnosis of childhood TB. The research on childhood tuberculosis is often neglected due to technical difficulties like slow growth in culture, the difficulty of obtaining specimens and the diverse and relatively nonspecific clinical presentation of tuberculosis in this age group. The complexity in making an exact diagnosis of tuberculosis in children have led to the development of several diagnostic approaches like point scoring systems, diagnostic classifications and diagnostic algorithms. The aim of this study was to review and analyse the different diagnostic approaches to childhood tuberculosis. In this paper, the mostly used techniques like culture methods as well as the non-culture methods including serology, biochemistry and polymerase chain reaction and DNA fingerprinting for the diagnosis of tuberculosis will be discussed.

Keywords: Diagnostic measures, Childhood, Tuberculosis

1. Introduction

There are several diagnostic methods and techniques for diagnosing a child with TB in resource poor settings but few are validated (Shingadia and Novelli, 2003). The tuberculosis in children is diagnosed by clinical symptoms, contact history, tuberculin skin testing and chest radiography. The key features that suggest a case of childhood TB may include chronic symptoms like prolonged cough, failure to thrive and enlarged cervical lymph nodes, a positive tuberculin skin test and chest X-ray suggestive of TB. The presence of three or more of the above mentioned symptoms should strongly suggest a diagnosis of TB (WHO, 2006).

2. Contact with an adult index case

A child should be suspected to be infected by *Mycobacterium tuberculosis* if a close contact exists between the child and the person with TB. A contact is defined as a situation where “children living in the same household or in regular contact with a person with highly infectious smear positive tuberculosis” (Enarson et al., 2005). The child with TB disease usually presents with vague symptoms and signs which resemble other chronic disease (Gie, 2003).

3. Sputum smear microscopy

It is a specific, cost effective, fairly quick and reliable test for the diagnosis of the most infectious forms of adult pulmonary tuberculosis. It can be performed conveniently in a peripheral laboratory with a person trained on standard procedure provided with a light microscope and reagents. The diagnosis of tuberculosis

in children is difficult because the disease is often non-specific (Osborne, 1995). The bacterial population is either too small to be detected under the microscope or is not collected in lung cavities from which it is expelled in sputum. The children under 5 years of age rarely expectorate sputum. The limited resources, training of personnel, lack of time and priority, bacteriological diagnosis of TB in children are the reasons behind the increasing cases of TB (Nelson and Wells, 2004).

4.4. Chest Radiography

Chest radiography (CXR) is one of the mostly used investigations while investigating the child TB suspect. A study of chest radiography derived some TB signs like lymphadenopathy and lung parenchymal changes (Shingadia and Novelli, 2003).

5. Tuberculin Skin Test

A positive tuberculin skin reaction is an indication of past or present primary infection with *Mycobacterium Tuberculosis* (Shingadia and Novelli, 2003). A negative TST doesn't rule out TB disease. Several factors contribute to false negative reactions of TST which can include; TST performed immediately after infection, overwhelming TB, children with debilitating or immunosuppressive illness, malnutrition and viral/bacterial infection. The Mantoux method is recommended TST test which is mostly used in developing countries. (WHO, 2006). The two common techniques recently used for carrying out TST are the intracutaneous Mantoux test and the multi-puncture method such as Heaf and Tine tests (Shingadia and Novelli, 2003).

6. Scoring Chart

The main objective of scoring chart is to simplify and standardize the scoring of clinical characteristics and investigations results for making the diagnosis of childhood TB. In the chart the conditions are listed in the rows while the individual score to these conditions are put in the columns. The score to any specific condition ranges from 0 to 5 and is determined on the behalf of a pre-decided scale. One of the important limitations in the scoring system is the poor symptom definitions (Hesseling et al., 2002).

7. Serology

Serological tests have included enzyme linked immunosorbent assays for the detection of antibodies to purified protein derivative *M. Tuberculosis* antigen 5, *M. Tuberculosis* strain H37 RV and adsorbed mycobacterial sonicates (Hussey et al., 1991; Alde et al., 1989).

8. Biochemistry

Biochemical tests have included detection of tuberculostearic acid in the cerebrospinal fluid and serum gluteraldehyde (Grange, 1990).

9. Polymerase Chain Reaction and DNA Fingerprinting

The specimen used for the polymerase chain reaction include sputum, bronchial or gastric washings, pleural, pericardial and peritoneal effusions, cerebrospinal fluid, blood, tissue biopsies or aspirates, saliva, stool and urine (Wilson et al., 1993). These both methods are widely used for the diagnosis of tuberculosis in children.

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