



ELSEVIER

BIAA
British Infection Association

www.elsevierhealth.com/journals/jinf

A systematic approach to diagnosing intra-thoracic tuberculosis in children

Carlos M. Perez-Velez^{a,b,c}, Claudia L. Roya-Pabon^{a,d}, Ben J. Marais^{e,*}

^a Grupo Tuberculosis Valle-Colorado (GTVC), Medellin, Antioquia, Colombia

^b Tuberculosis Clinic, Pima County Health Department, Tucson, Arizona, USA

^c Division of Infectious Diseases, College of Medicine, University of Arizona, Tucson, Arizona, USA

^d Division of Pediatric Pulmonology, Department of Pediatrics, Faculty of Medicine, University of Antioquia, Medellin, Antioquia, Colombia

^e The Children's Hospital at Westmead and the Marie Bashir Institute for Infectious Diseases and Biosecurity (MBI), Sydney Medical School, University of Sydney, Sydney, Australia

Available online 23 June 2017

KEYWORDS

Latent tuberculosis;
Diagnostic algorithm;
Diagnostic techniques;
Specimen collection;
Risk factors

Summary Children suffer a huge and often underappreciated burden of disease in tuberculosis (TB) endemic countries. Major hurdles include limited awareness among health care workers, poor integration of TB into maternal and child health approaches, diagnostic difficulties and a lack of child-friendly treatment options. Accurate disease diagnosis is particularly difficult in young and vulnerable children who tend to develop paucibacillary disease and are unable to produce an expectorated sputum sample. In addition, access to chest radiography is problematic in resource-limited settings. Differentiating between TB exposure and *M. tuberculosis* infection, and especially between *M. tuberculosis* infection and TB disease is crucial to guide clinical management. TB represents a dynamic continuum from well-contained "latent" infection to incipient and ultimately severe disease. The clinical spectrum of disease in children is broad and can be confused with a myriad of common infections. We provide a pragmatic 4-step approach to diagnose intra-thoracic TB in children and demonstrate how classifying clinical, radiological and laboratory findings into recognised clinical syndromes may provide a more refined diagnostic approach, even in resource-limited settings.

© 2017 The British Infection Association. Published by Elsevier Ltd. All rights reserved.

Introduction

Historically, global tuberculosis (TB) control programs focussed exclusively on adults with sputum smear-positive

TB,¹ since this was considered the most cost-effective method to contain the TB epidemic. Unfortunately this approach excluded children from treatment as recognised by the United Nations Secretary-General's Special Envoy

* Corresponding author. Clinical School, The Children's Hospital at Westmead, Locked Bag 4001, Westmead, New South Wales, 2145 Sydney, Australia. Tel.: +61 3 9345 4788; fax: +61 3 9345 6667.

E-mail address: ben.marais@health.nsw.gov.au (B.J. Marais).

on TB dr. Eric Goosby, who recently stated: “Far too long, children with TB have remained in the shadows”.² In response to this important recognition, the World Health Organization (WHO) launched the Child TB Roadmap,³ which emphasised the need to address persistent policy-practice gaps that can be closed using existing tools and called for increased investment to develop better tools for TB diagnosis, treatment and prevention.⁴ Major hurdles to improve TB case management in children include limited awareness among health care workers, poor integration of TB into maternal and child health approaches, diagnostic difficulties, and a lack of child-friendly treatment options. The inability to establish an accurate TB diagnosis is often perceived as the major barrier to improved service delivery. We review recent progress in the diagnosis of childhood intra-thoracic TB and outline a systematic diagnostic approach.

Spectrum of disease

It is now recognised that TB represents a dynamic continuum of states that include exposure, infection, subclinical or incipient disease, non-severe disease and severe disease. As an archetypical human intracellular pathogen, *M. tuberculosis* has established a “delicately balanced” host-pathogen relationship. Understanding that TB represents a continuum of states where the dichotomous distinction between infection and disease is often blurred, has important implications for the management of children.

Following infection, young children have a high risk to progress to TB disease. Without BCG vaccination, approximately 30–40% of infants who become infected with *M. tuberculosis* will progress to intrathoracic TB and 10–20% will develop disseminated disease. TB disease risk declines to a nadir around 5–10 years of age, whereafter the risk to develop adult-type TB starts to increase.⁵ The bimodal age-related risk profile is associated with a broad spectrum of disease, and an interesting phenotypic switch from lymph node involvement and disseminated disease to adult-type cavitary lung disease that occurs around puberty.⁶ Figure 1 provides a pictorial overview of the intrathoracic disease spectrum observed in childhood TB.

Diagnostic approach

Making a clinical TB diagnosis requires consideration of 1) findings (clinical, radiological, endoscopic, laboratory) suggestive of disease, 2) findings supportive of TB as the etiology, 3) risk factors for progression to disease and 4) findings on clinical follow-up. Table 1 summarises current approaches in diagnosing TB exposure, infection and disease in children, together with recent advances and future prospects. Table 2 provides an overview of this systematic 4-step approach.

STEP 1 – Findings suggestive of TB disease?

Symptoms

Symptoms and signs of intra-thoracic TB are often non-specific. Systemic symptoms and signs include fever (sometimes with night sweats), failure to thrive or weight loss (crossing centile lines during the past 3–6 months,

or having lost more than 10% of body weight over any time interval) and unusual fatigue or lethargy. Well-characterised symptoms have increased specificity, but sensitivity may be reduced in very young (<3 years of age) or immunocompromised children who could present with acute disease onset.⁷ For example, while typical respiratory symptoms include a persistent, non-remitting cough of more than 2 weeks duration, young children may present with a more acute cough or wheeze. In young children, airway compression resulting from enlarged intrathoracic lymph nodes may primarily present with wheezing that is unresponsive to bronchodilators.

Physical signs

With intra-thoracic TB the physical signs on chest examination if usually minimal. Children rarely have signs of acute respiratory distress or lobar consolidation. In fact, with parenchymal disease, the discrepancy observed between the relatively mild clinical and severe radiological signs of disease is often a pointer towards a TB diagnosis. Unilateral stony dull percussion in a child who is not acutely ill indicates a pleural effusion, which is likely to be tuberculous in TB endemic areas. A common extrathoracic manifestation of TB include unilateral, nonpainful, matted lymph node masses in the cervical or supraclavicular regions, which is suggestive of peripheral TB adenitis.⁸

Imaging

Chest radiography is often the most useful diagnostic modality. Other imaging modalities, such as high-resolution computed tomography (CT) and ultrasonography, provides added value in particular scenarios. The spectrum of radiological abnormalities is very broad (Figure 1) and signs can be non-specific;^{9,10} however, certain radiological patterns are highly suggestive of TB; especially when accompanied by findings supportive of a TB etiology such as recent TB exposure or proof of *M. tuberculosis* infection. With routine chest radiography, a lateral projection is useful for detecting enlarged hilar lymph nodes that may be obscured by the thymic shadow or other anatomical structures on the frontal view.¹¹ Chest CT provides more detailed assessment of lung pathology in children with complicated TB on chest radiograph.¹² It could also assist diagnosis in children with persistent symptoms in whom the chest radiograph is uninformative. Ultrasonography is particularly useful to evaluate pleural or pericardial fluid collections and intra-abdominal lymph nodes in children suspected of abdominal TB.¹³ It has also been used to detect intra-thoracic lymphadenopathy, although this application has not been validated. Bronchoscopy may be useful to assist diagnosis and management in complicated cases with tracheobronchial disease,¹⁴ but is not routinely indicated.

Laboratory tests

General laboratory tests are rarely informative and cannot confirm a TB etiology. The most common non-specific findings on full blood count are mild anemia, neutrophilia, and monocytosis.¹⁵ Body fluid (e.g. pleural, pericardial or cerebrospinal fluid) cell counts and chemistry can be highly

Download English Version:

<https://daneshyari.com/en/article/5668787>

Download Persian Version:

<https://daneshyari.com/article/5668787>

[Daneshyari.com](https://daneshyari.com)