Case Presentation

Tuberculosis in an Adoptee

Case History:
A 6-year-old girl presented to her pediatrician with decreased hearing acuity found by routine elementary-age screening. She had been adopted from a Korean orphanage at 9 months of age and had a history of poor growth there. She had scarlet fever and pneumonia prior to the age of 4, but no other recent significant illnesses since adoption. Adoption records did not indicate vaccination with BCG and she had no vaccination scar. She had four documented Tine tests (multi-puncture test for TB infection) during the adoption process, all of which were negative. She had a Tine test at a community hospital prior to presenting to her physician, results of which are unknown.

In response to her abnormal hearing test, she underwent bilateral irrigations to remove wax. Smears and cultures of the drainage fluid were negative. For the next two years she continued to suffer recurrent mild to moderate hearing loss, and was finally referred to an otolaryngologist, who performed bilateral myringotomy and placement of tympanostomy tubes four years after first presenting with hearing problems. Mucopurulent fluid was noted in the middle ear. Because of persistent drainage, cortisporin drops were begun. Tobradex drops were begun 2 weeks later. After one month on treatment, drainage had subsided in the right ear with cortisporin and Tobradex drops and suctioning; drainage persisted in the left ear. Audiology testing showed progressive hearing loss and testing 2 months later revealed hearing loss with very viscid mucus or possible scar bands. Treatment with topical and oral antibiotics continued. However, hearing loss and drainage persisted, despite intermittent treatment with topical tobramycin, gentamicin and amoxicillin. An allergist diagnosed allergic rhinitis and atopic dermatitis, and an antihistamine was administered. Hearing loss persisted, and otorrhea continued in the right ear.

Six months later (December), right tympanomastoidectomy and ossiculoplasty with tympanic membrane reconstruction and left ear exploration were performed. Postoperative diagnoses were right chronic otorrhea and mastoiditis, right hearing loss and incus erosion, and left hearing loss with middle-ear granulomas. All cultures were negative for bacteria, acid-fast bacilli and fungus. The pathology report mentioned granulation tissue. A left tympanomastoidectomy was performed 4 months later and a ventilating tube was placed. Biopsy of the left ear was reported as cholesteatoma. Further consultation demonstrated no evidence of immune deficiency or autoimmune disease.

In April of the next year, earaches and hearing loss were still reported. The middle ear tubes were completely crust covered, and were replaced. The middle ear fluid grew acid-fast bacilli. A TST gave a reading of 20 mm induration. Chest radiograph demonstrated a 3 cm extrapleural paraspinal cold abscess in the left lung apex and calcified lesions of healed primary tuberculosis cervical spine x-ray demonstrated tuberculous spondylitis at C7 and T1 with spine compression and marked gibbus formation. Isoniazid, rifampin, pyrazinamide and ethambutol were initiated on May 18. The initial culture of ear drainage eventually grew pansensitive *Mycobacterium tuberculosis*. Marked improvement in the appearance of the ears was found. A hearing aid greatly improved her ability to function in school. A pediatric orthopedist recommended surgical stabilization of the spinal deformities.

Teaching Points:
- TB is the most prevalent infectious disease in the world. In the United States, TB screening and treatment of foreign-individuals has been a key strategy in the prevention and control
of TB in the United States for the last several decades. Adopted children from TB endemic countries are of particular concern, since children are more likely to be adopted from resource-poor, state-run orphanages that employ low-income workers at greater risk for active TB. All adopted children should undergo Tuberculin skin testing (TSTs) by the Mantoux method. Because of the risk for recent exposure to an adult with active TB in institutional settings in their country of origin, consider repeating the TST in 2 – 3 months. Children with a TST induration $\geq 10$ mm should be considered positive. Clinicians may want to consider TST indurations $\geq 5$ mm positive depending on the circumstances of adoption and the likelihood of recent exposure to an active case of TB. (Mandalakas, Kirchner et al. 2007) (Barnett 2005). In this case, the child was not screened for TB properly until she was already exhibiting signs of disease many years later. Unfortunately, adequate TST screening and latent TB infection treatment with Isoniazid for 9 months would have likely prevented disease and subsequent hearing loss in this child.

- Children, particularly those less than 4 years of age, are more likely to have extrapulmonary disease. Adopted children should receive a chest x-ray (CXR) and thorough medical examination to rule out dissemination. When reading chest radiographs, special attention to recognizing the typical presentations of pediatric TB is needed (i.e. intrathoracic adenopathy, mid- and lower lung zone infiltrates and the absence of cavitation). (CDC, American Thoracic Society et al. 2003). Aural TB is uncommon (< 1% of all reported TB cases annually) and difficult to diagnose. Aural TB typically presents as any other suppurative otitis media, but should be suspected in the presence of granulation tissue, hearing loss, disseminated disease, and particularly in patients with risk factors for TB and/or a positive TST. Up to 50% of aural TB patients will have evidence of pulmonary disease on chest x-ray and 10% may have bony sequestrum (Nalini and Vinayak 2006). In this case, the adoptee had signs and symptoms of aural TB for three and a half years until diagnosis, illustrating the difficulties in diagnosing extrapulmonary TB in children, particularly in the absence of an accurate TST result.

- It should be noted that malnourishment is quite prevalent among adoptees. Mandalakas et al found 5% of adopted children had signs of acute malnutrition and 28% had chronic malnutrition. Malnutrition in children can cause a false-negative TST, so clinicians should exercise caution in interpreting a TSTs in an at-risk and malnourished child. TSTs may be repeated after the child’s nutrition status has improved. (Mandalakas, Kirchner et al. 2007) Secondly, if the child is diagnosed and treated for active TB, weight gain should be watched carefully, as lack of weight gain is a significant risk factor for relapse and treatment failure in adults (Khan, Sterling et al. 2006). It is possible that the child described in this study with a history of “poor growth” was suffering from chronic malnutrition, further exacerbating the inherent inaccuracies of TSTs, leading to false negative results. Tuberculin skin testing is often falsely negative on malnourished person. A Tine test on any child is more likely to give false negative result. Tine tests should not be used.

- While the child in this case did not have a history or evidence of BCG vaccination, BCG vaccinations are common in TB endemic countries. BCGs are typically given at birth, and may or may not leave a scar as evidence of vaccination. *Mycobacteria bovis* can cross react with the TST and cause a false-positive result in some cases. Blood assay tests, such as QuantiFERON-Gold (QFT), do help control for cross reaction with BCG; however, current recommendations are to use and interpret QFT results in children with caution as there are no data on QFT sensitivity in persons <17 years old (Mazurek, Villarino et al. 2003). If a TST is used to screen adoptees for TB, the TST should be interpreted according to guidelines, regardless of whether or not the child has been vaccinated with BCG.
Epidemiological studies of disease incidence consistently show immigrants with latent TB infection from high-incidence to low incidence areas are at increased risk for progressing to active TB disease within the first 2 years of arrival. While this phenomenon is not completely understood, TB epidemiologists theorize that immigration-related stress, malnutrition, and targeted screening all contribute to increased incidence among this risk group (Cohen and Murray 2005). It is likely that the patient was infected with TB in her country of origin. There were no adults identified as the child’s source of disease and she subsequently progressed to TB disease after arrival.

References:


