

ROLE OF MANTOUX TEST IN THE DIAGNOSIS OF TUBERCULOSIS

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CASE SCENARIO

A 45-year-old patient from rural community presented with cough of three months associated with weight loss and excessive tiredness. He had no significant past medical history. On examination of the chest, coarse crepitations were heard on the right apical region. His haemoglobin is 9 gm%, total white is $10 \times 10^9/L$ and the erythrocyte sedimentation rate (ESR) is 90 mm/hour. His chest radiograph showed right upper zone opacity. Mantoux test was performed on his forearm (Figure 1).

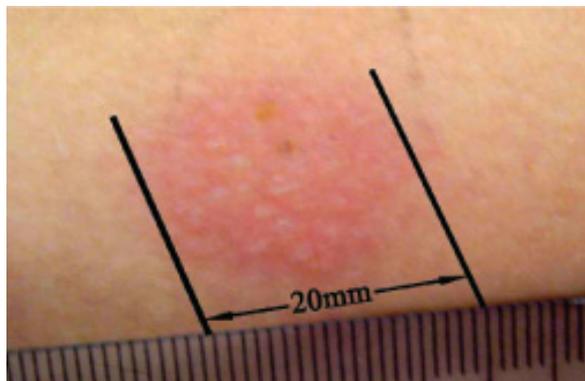


Figure 1: Skin manifestations after 72 hours of a test performed

QUESTION

1. Is there a role of Mantoux test in the diagnosis of tuberculosis?
2. What is the sensitivity and specificity of Mantoux test?
3. What is the cut-off measurement of Mantoux reading to be considered as positive for tuberculosis?

COMMENTARY

Mantoux test is one of the common investigations in patients who are suspected of having tuberculosis. It is low in cost and can be easily performed in most chest physician outpatient clinics. However, there remain some doubts regarding the sensitivity, specificity and the effect of previous Bacillus Calmette-Guerin (BCG) vaccine on cut-off measurement of positive Mantoux reading.

Mantoux test is performed by injecting a standard dose of 5 Tuberculin units (0.1 ml) into the skin intradermally.¹ The result should be read between 48-72 hours after the test and the indurated area is measured in millimeter units.¹ The skin reaction following Mantoux test is a form of cell mediated delayed hypersensitivity (Type IV) reaction of the skin. These reactions are mediated by skin macrophages, monocytes and T cells. T cells which are sensitized by prior tuberculous infection migrate to the test site and release lymphokines. The lymphokines then induce inflammatory process, which include erythema, oedema, fibrine deposits and macrophages migration to the sites.^{1,2} The whole process take place up to 72 hours and the reaction is completed by formation of skin induration. Some may have more severe reaction manifest with vesiculation and skin necrosis. Conditions reported to be associated with reduced Mantoux reactivity include elderly patients, severe hypoalbuminaemia and disseminated tuberculosis (TB).³

Past study conducted in Malaysia showed the sensitivity of Mantoux test in active tuberculosis is 86%.⁴ The false-positive result was as high as 42% in this study.⁴ In another local study, the false-positive rate was 43% in normal person, 60% in non-TB pulmonary diseases. In contrast, those with confirmed pulmonary TB, false-negative rate was 20.5% and 11.7% in those with TB lymphadenitis.⁵ The positive predictive value of the Mantoux tests was 19.9%, while the negative predictive value is 95.4%.⁵

In a meta-analysis of 26 published papers on Mantoux test, it was found that patients who had received BCG vaccination were more likely to have a positive result. The relative risk was 2.12 (95% CI:1.50 to 3.00); as compared to those without BCG vaccine. The effect of BCG on Mantoux test was less after 15 years of vaccination. A cut-off measurement of skin indurations of >15 mm are more likely to be the result of tuberculous infection than due to previous BCG vaccination.⁶

In another local study involving healthcare workers in hospital, previous exposure to tuberculin was a significant risk factor for a positive Mantoux at either 10 mm or 15 mm or greater as a positive cut-off. A Mantoux cut-off point of 15 mm or more may correlate better with *Mycobacterium tuberculosis* infection than a cut-off 10 mm in settings with a high prevalence of BCG vaccination.⁷

In another review, it was reported that the effect of BCG received in infancy on Mantoux reading is minimal, especially after 10 years of vaccination. BCG received after infancy produces more frequent, more persistent and larger reactions.⁸ Similar findings is found in another study where BCG vaccination was not an important cause of false-positive Mantoux, except in communities with a low prevalence of active TB.⁹ Sensitivity and specificity of Mantoux in extrapulmonary tuberculosis has been reported as 47% and 86% respectively.¹⁰

Study in children showed that Mantoux of 10 mm or greater were associated with higher incidence of developing active tuberculosis in the future. If the children were started with isoniazid, they were substantially less likely to develop tuberculosis. It was reported that Mantoux is useful for those who had latent tuberculous infection and would most likely benefit from treatment of it.¹¹

In the Malaysian Clinical Practice Guidelines for the control and management of tuberculosis 2006, it was stated that Mantoux test has some role especially in paediatric cases and extrapulmonary tuberculosis.¹² A reading of more than 10 mm is considered positive in both children and adults. A measurement of less than 10 mm however does not exclude tuberculosis.¹² A positive Mantoux merely indicate exposure to *Mycobacterium tuberculosis* and not necessary indicate active disease.¹²

CONCLUSION

Mantoux test is a sensitive but non-specific in the diagnosis of active tuberculosis. The positive cut-off of 10 mm in a person without BCG and 15 mm with previous BCG is appropriate. The interpretation of Mantoux needs to be correlated to the patient's clinical context. Mantoux test may have a role in assisting extrapulmonary tuberculosis and latent tuberculosis in children.

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