Detection of TB antigen by rapid test kit

MJAFI 2011;67:196–197

Tuberculosis is a communicable disease which at time is difficult to diagnose. Many rapid tests have been developed based on different principles to detect antibodies or antigen in the sample. These rapid tests have shown varying degrees of sensitivity and specificity. In general, immunodiagnostic tests detecting antibodies can provide indirect evidence of current and past infections in organism of interest. With the exception of the tuberculin skin test (TST), immunodiagnostic tests have not been widely used for chronic TB infections because of the low sensitivity and specificity. Many antigens such as lipoarabinomman, cord factor, A60, 38 kDa, and 16 kDa have been used for antibody detection kits. The results for such immunodiagnostic tests varied markedly with sensitivity ranging from 15.7% to 89.2% and specificity from 50% to 100%.

Demonstration of intact *Mycobacterium tuberculosis* or its breakdown products in the body fluid is a definite indication of the presence of the pathogen and has been the basis of antigen-based assay. Using a variety of methods, for example, RIA, EIA, haemagglutination, and latex agglutination, antigen has been demonstrated in sputum, CSF, pleural fluid, and ascetic fluid from the patients having tuberculosis.[1,2] Kadival et al (1982) standardised RIA using immunoreactive fraction of sonicate antigens of H37 RV obtained by sephrose 6B chromatography. The sensitivity of the assay was 1×10^3 organism/mL. Target antigens vary markedly depending on the nature of the clinical samples and test format. ELISA techniques like sandwich ELISA (sELISA) and dot-ELISA have been used for the antigen detection. Lipoarabinomannan (LAM) has been most frequently used as the target antigen, and its monoclonal and polyclonal antibodies have been used to detect antigen in sputum samples.[3] The problem with using LAM as target antigen is the non-specificity due to the presence of antigen in other mycobacterial species. Other antigens such as whole cells, culture filtrate protein (CFP), PPD, 65 kDa, and 14 kDa have been used. The sensitivity varied from 50% to 90% and specificity from 80% to 100%.[4] Culture confirmation using LJ medium has the inherent disadvantage of the time required to observe the growth. This on many occasions can delay the start of treatment and may even allow the disease to cause more damage and even spread to other organs. Detection of TB antigen using specific antigen detection kit can provide a direct evidence of the infection and help in early start of the treatment. The limitation of antigen detection is the low sensitivity due to the scarcity of the TB antigen in clinical samples such as CSF, pleural fluid, blood, and urine.

We evaluated a commercially available TB antigen detection kit manufactured by BioMed Industries, J Mitra, Parwanoo, Himachal Pradesh, India. Three different categories of samples (BAL, pleural fluid and sputum) were screened for TB antigen, and the results were compared with TB PCR. Some known AFB-positive sputum samples were also screened by the TB antigen detection kit as positive control. The samples were collected from Respiratory Disease OPD and patients admitted in Army Hospital, Delhi Cantonment. A total of 2272 samples were processed for TB PCR during the period from March 2007 to November 2008; 401 (17.64%) samples were found positive by PCR. Of the 401 PCR-positive samples, 38 (9.47%) were found positive by rapid kit. The PCR-positive sputum samples gave maximum positivity (13.28%). TB antigen was negative in 363 of 401 (90.52%) cases; 122 known AFB-positive sputum samples were also screened by the rapid kit and only 47 (38.52) were found positive. TB PCR has sensitivity and specificities in the range of 60% to 100%.[5] Overall TB PCR percentage positivity in our samples was low (17.64%). Further, samples that had bacterial load (+++ and ++++) showed 100% positivity while for lower bacterial load (+ to ++) it was only 12.06% and 42.85%, respectively. Overall positivity was 38.52%. The smear sensitivity is usually influenced by a variety of factors including types of specimen and species of infecting mycobacterium.[6] Thus, sensitivity of the rapid kit (13.28%) is even below the AFB smear examination. TB antigen in sputum detection using ELISA-based techniques (sELISA and dot-ELISA) had better sensitivity and specificity that varied from 71% to 91%. The detection of TB antigen using sELISA in CSF has shown sensitivity as high as 90% positivity,[7] 24 kDa and 19 kDa antigen are being found positive by immunoblotting in sera of many sputum-negative patients. In one recent study the detection of antigen like lipoarabinomannan in urine has not shown encouraging results.[8] The data from our study shows that rapid test kit used for antigen detection does not possess higher sensitivity and specificity than AFB smear examination and PCR. Further refinement and development of more sensitive and specific rapid antigen detection kits in future remains a possibility.

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