Egyptian Journal of Chest Diseases and Tuberculosis (2015) 64, 681–688

HOSTED BY

The Egyptian Society of Chest Diseases and Tuberculosis

Egyptian Journal of Chest Diseases and Tuberculosis

www.elsevier.com/locate/ejcdt
www.sciencedirect.com

ORIGINAL ARTICLE

Comparison of the 2-step tuberculin skin test and QuantiFERON-TB Gold in-Tube test in the screening of latent tuberculosis infection in cancer patients

Hala A. Mohammad [a,*], Mona A. Esmail [b], Mohammad T. Abdelftah [a], Wael Soliman [c], Abdelfatah mohammad [d], Emad esmail [e]

[a] *Chest Department, Faculty of Medicine, Minia University, Egypt*
[b] *Microbiology and Immunology Department, Faculty of Medicine Minia University, Egypt*
[c] *Tropical Medicine, Faculty of Medicine Minia University, Egypt*
[d] *Internal Medicine Department, Faculty of Medicine Minia University, Egypt*
[e] *Minia Oncology Institute, Egypt*

Received 11 March 2015; accepted 31 March 2015
Available online 7 May 2015

KEYWORDS

Tuberculin skin test;
QuantiFERON-TB Gold-in-Tube;
Cancer patients

Abstract Interferon-γ release assay (IGRA) may improve the diagnostic accuracy for latent tuberculosis infection (LTBI). The aim of this study was to compare the performance of the QuantiFERON-TB Gold-in-Tube (QFT-GIT), with the tuberculin skin test (TST) (one and two step TST) in detection of LTBI in immunocompromised cancer patients.

The study was carried out on 50 patients and 20 healthy subjects as a control group. Patients with active TB or AIDS were excluded. A TSTI was only positive in 2 patients (4%). The TSTII (booster

Abbreviations: QFT-GIT, QuantiFERON TB-Gold In-Tube; TST, tuberculin skin test; TSTII, 2-step TST; TSTI, first tuberculin skin test; HM, hematologic malignancy; TB, tuberculosis; LTBI, latent tuberculosis infection; BCG, bacillus Calmette-Guérin; IFN, interferon; IGRA, interferon-gamma release assay; QFT-IT, QuantiFERON-TB Gold in-Tube; QTF TB GIT, QuantiFERON TB-Gold in-Tube; QFT, Quantiferon; PPD, purified protein derivative; IGRAs, interferon-gamma release assays; T-SPOT.TB, Elispot; ELISA, enzyme-linked immunosorbent assay; QFT-TB, QuantiFERON TB-Gold In-Tube; HIV, human immunodeficiency virus type I; DM, Diabetes mellitus; QFT-GOLD, QuantiFERON TB-Gold In-Tube; HB, hemoglobin

* Corresponding author at: Minia University Hospital, Egypt. Tel.: +20 01019617612.
E-mail address: hala_awatef@yahoo.com (H.A. Mohammad).

Peer review under responsibility of The Egyptian Society of Chest Diseases and Tuberculosis.

http://dx.doi.org/10.1016/j.ejcdt.2015.03.032

phenomena) was positive in 8 patients (16%) after 3–4 weeks. Ten patients (20%) had positive Quantiferon test while the test was indeterminate in 14 patients (28%).

Hematological malignancy group (HMgroup) had significantly more positive TSTII results followed by the breast cancer group ($p = 0.01$). Similarly, QFT-GIT positive values were significantly more frequent in the HM group. This study suggests that the QFT-GIT test maintains its sensitivity and performance in immunocompromised cancer patients, identifying a large number of truly infected patients being anergy to the tuberculin skin test.

Introduction

Tuberculosis (TB) is an important cause of morbidity and mortality worldwide [1]. Governmental and non-governmental organization efforts and investments have resulted in a steady decline in disease incidence and mortality in the last decades [2]. One third of the world population, however, has latent tuberculosis (TB) infection (LTBI), and to reach the United Nations Millennium Goals of eliminating the disease by 2050, it is its necessary to couple diagnosis and treatment of active disease with new approaches to reduce this vast reservoir of LTBI, sufficient for generating new TB cases for many decades even if transmission was suppressed [3]. Thus, in addition to rapid, accurate, and inexpensive detection of active TB, the detection and treatment of LTBI is also an important strategy for TB control [1].

The specificity of the tuberculin skin test (TST) is limited by cross-reactivity of the purified protein derivative (PPD) with bacilli Calmette–Guerin (BCG) vaccine and with most nontuberculous mycobacteria (NTM). Its sensitivity is also low in immunocompromised patients, in whom the risk of progression to TB is high. Despite these limitations, TST is routinely used in hospital clinical practice to screen for latent TB infection [2].

Interferon-Gamma Release Assays (IGRAs) were designed to detect the immune response to specific *Mycobacterium tuberculosis* antigens, which are not present in BCG or other nontuberculous mycobacteria. Two tests are commercially available; one is based on the Elispot (T-SPOT.TB, Oxford Immunotec, UK) and the other on the enzyme-linked immunosorbent assays (ELISA) technique (QuantiFERON-TB Gold-in-Tube, Cellestis, Australia, (QFT-GIT). Both tests are based on the principle that the T cells of an individual who have acquired TB infection will respond by secreting the cytokine interferon-gamma (IFN-γ) when restimulated with *M. tuberculosis* antigens [4]. The US Food and Drug Administration has approved the QFT-TB test and is evaluating the T-SPOT.TB test, which has been approved for use in Europe. However, the performance of IGRA in various categories of immunosuppressed patients is largely unknown and has been identified as a priority area for research [5].

Aim of the work

The aim of the study is to diagnose LTBI in immunocompromised cancer patients in a hospital-based population by performance of the Quantiferon TB test compared with TST.

Patients and methods

The study was done on patients with malignancy receiving chemotherapy in EL-Minia Oncology institute. All patients attending oncology institute outpatient clinics were enrolled consecutively. Patients with HIV and active tuberculosis were excluded. The research protocol was approved by the local ethics committee.

All participants and the control group were screened for LTBI and TB disease at baseline. All patients were asked about risk factors for TB including immunosuppressive treatments, such as systemic immunosuppressive drugs and radiotherapy, DM, and close contact to tuberculous case.

A history of previous TB disease, recent household exposure to an infectious TB source case and/or symptoms, including cough for at least 2 weeks not responding to antibiotic treatment or progressive loss of weight was recorded. A complete physical examination was completed.

The diagnosis of TB disease was confirmed by attaining acid-fast staining and positive culture of sputum, bronchoalveolar lavage fluid (BALF) or pleural fluid samples found to be positive for MTB microbiologically. Information regarding any previous Mantoux TST results and BCG vaccination, as well as information about laboratory findings, including complete blood picture (Lymphocyte counts and hemoglobin levels) and lastly CXR findings were also recorded for all patients at the time of enrollment. Blood samples for QuantiFERON TB test will be collected before administration of the Mantoux TST.

The Mantoux TST

It was performed according to the Mantoux technique. 0.1 mL of tuberculin PPD will be injected intradermally into the volar aspect of the forearm, and the transverse induration diameter was measured 48–72 h later. The TST results were interpreted according to the level of risk, as reported in current guidelines [6]. TST was performed using 5 international units of purified protein derivative (Biocine Test; Chiron; Siena, Italy). A TST result was considered positive if the skin induration was $\geqslant 10$ mm. If the result for the first test was negative, the test was administered again one-to-three weeks later (the 2-step TST), and that result was considered definitive. If the second test is negative this means the individual is not infected.