Annals of Nuclear Medicine
https://doi.org/10.1007/s12149-017-1220-1

ORIGINAL ARTICLE

Diagnostic value of ^{99m}Tc-ethambutol scintigraphy in tuberculosis: compared to microbiological and histopathological tests

A. H. S. Kartamihardja[1] · Y. Kurniawati[2] · R. Gunawan[3]

Received: 16 October 2017 / Accepted: 20 November 2017

Abstract

Objective Tuberculosis (TB) still remains the world's endemic infection. TB affects the lungs and any part of the body other than the lung. The diagnosis of TB has not changed much over the decades. Ethambutol is one of the first line treatments for TB. It can be labeled using ^{99m}Tc. ^{99m}Tc-ethambutol will be accumulated in the site of TB lesion and can be imaged using gamma camera. The aim of this study was to evaluate the diagnostic value of ^{99m}Tc-ethambutol scintigraphy in detecting and localizing of TB.

Methods Retrospective cross-sectional study was done. Subjects were patients suspected of having TB infection. Whole body and SPECT-CT imaging at the suspected area was done 1 and 4 h after injection of 370–555 MBq ^{99m}Tc-ethambutol. ^{99m}Tc-ethambutol scintigraphy was analyzed visually. The results were compared with that of histopathological or microbiological tests. Statistical analysis was done to determine the sensitivity, specificity, PPV, NPV and accuracy.

Results One hundred and sixty-eight subjects were involved in this study. There were 110 men and 58 women with mean age of 34.52 ± 11.94 years. There were concordance results in 156 (92.86%) and discordant in 12 (7.14%) subjects between ^{99m}Tc-ethambutol scintigraphy and histopathological or microbiological result. The sensitivity, specificity, PPV, NPV and accuracy of ^{99m}Tc-ethambutol scintigraphy in the diagnosis of pulmonary TB were 93.9, 85.7, 93.9, 85.7 and 91.4%, respectively, for extra-pulmonary TB 95.5, 77.8, 97.9, 63.6, and 85.1%, respectively, and for total tuberculosis 94.9, 83.3, 96.3, 78.1 and 92.8%, respectively. There was no side effect observed in this study.

Conclusion ^{99m}Tc-ethambutol scintigraphy is a useful diagnostic imaging technique to detect and localize intra- and extra-pulmonary TB. It is safe to be performed even in pediatric patient. Consuming ethambutol less than 2 weeks did not influence the result.

Keywords Pulmonary · Extra-pulmonary tuberculosis · SPECT/CT imaging · ^{99m}Tc-ethambutol

Introduction

Tuberculosis (TB) is an infectious disease caused by the bacillus *Mycobacterium tuberculosis*. TB is not only typically affecting the lungs known as pulmonary TB, but also affects any part of the body as single or multiple sites known as extra-pulmonary TB [1–3]. Tuberculous bacillus causes a focal infection in the site where it is deposited after inhalation [4]. TB remained one of the top 10 causes of death worldwide. It still remains the world's endemic infection although between 2000 and 2015 the number of deaths fell by 22%. The TB epidemic is larger than previously estimated. There were an estimated 10.4 million incident TB cases worldwide in 2015, while the rate of decline incidence from 2014 to 2015 remained at only 1.5% although the treatment averted a million deaths. This condition could be due to persisting gaps between treatment and diagnostic modalities. According to WHO report, one-third of pulmonary TB was undiagnosed or delayed diagnosed caused continued transmission in communities [1].

The diagnosis of TB remained unchanged for many decades and it probably would have no progress. The ultimate

✉ A. H. S. Kartamihardja
husseinsundawa@yahoo.com

1 Department of Nuclear Medicine and Molecular Medicine, Dr. Hasan Sadikin General Hospital, Faculty of Medicine Universitas Padjadjaran, Bandung, Indonesia

2 Faculty of Medicine, Universitas Andalas Padang, Padang, Indonesia

3 National Nuclear Energy Agency of Indonesian, Jakarta, Indonesia

Published online: 05 December 2017