
CASE REPORT

Technetium-99m Filtrated Sulfur Colloid Lymphoscintigraphy for Assessment of the Site of Lymphatic Leakage in Chylothorax Post-oesophagectomy

RKL Lee, K Wang

Department of Imaging and Interventional Radiology, Prince of Wales Hospital, Shatin, Hong Kong

ABSTRACT

Lymphoscintigraphy is useful for assessment of lymphatic leakage after oesophagectomy. This report is of accurate assessment of the site of thoracic lymphatic leakage after oesophagectomy in a 55-year-old patient by using technetium-99m-filtrated sulfur colloid lymphoscintigraphy.

Key Words: Chylothorax; Esophagectomy; Lymphoscintigraphy; Lymph; Technetium Tc 99m sulfur colloid

中文摘要

濾後99m Tc-硫膠體淋巴閃爍顯像用作檢視食管癌切除術後乳糜胸的淋巴漏位置

李嘉樂、王琪

淋巴閃爍顯像對於食管癌切除術後淋巴漏的評估是有用的。本文報告一名55歲食管切除術後出現胸部淋巴漏的患者，使用濾後99m-Tc硫膠體淋巴閃爍顯像對淋巴漏的部位作出了準確的評估。

INTRODUCTION

Lymphoscintigraphy is useful for assessment of lymphatic-related conditions such as lymphatic leakage (chylothorax, chyloperitoneum, or chyluria), lymphangiomatosis, and lymphangiectasia. Contrast lymphography is considered to be the gold standard assessment, but this method is invasive, technically difficult, limited to visualisation of retroperitoneal lymph drainage, and necessitates high radiation exposure. We report an accurate assessment of the site of thoracic lymphatic leakage after oesophagectomy by

using technetium-99m (^{99m}Tc)-filtrated sulfur colloid lymphoscintigraphy.

CASE REPORT

A 55-year-old man was diagnosed with carcinoma of the oesophagus and underwent subsequent robotic-assisted three-stage oesophagectomy on 13 April 2011. He gradually developed increasing bilateral pleural effusions (Figure 1a). The left pleural effusion was clear fluid and was successfully treated by pigtail pleural drainage (Figures 1b and 1c). Right pleural drainage

*Correspondence: Dr Ryan KL Lee, Department of Imaging and Interventional Radiology, Prince of Wales Hospital, Shatin, New Territories, Hong Kong.
Tel: (852) 2632 1247; Email: leekalok2909@gmail.com*

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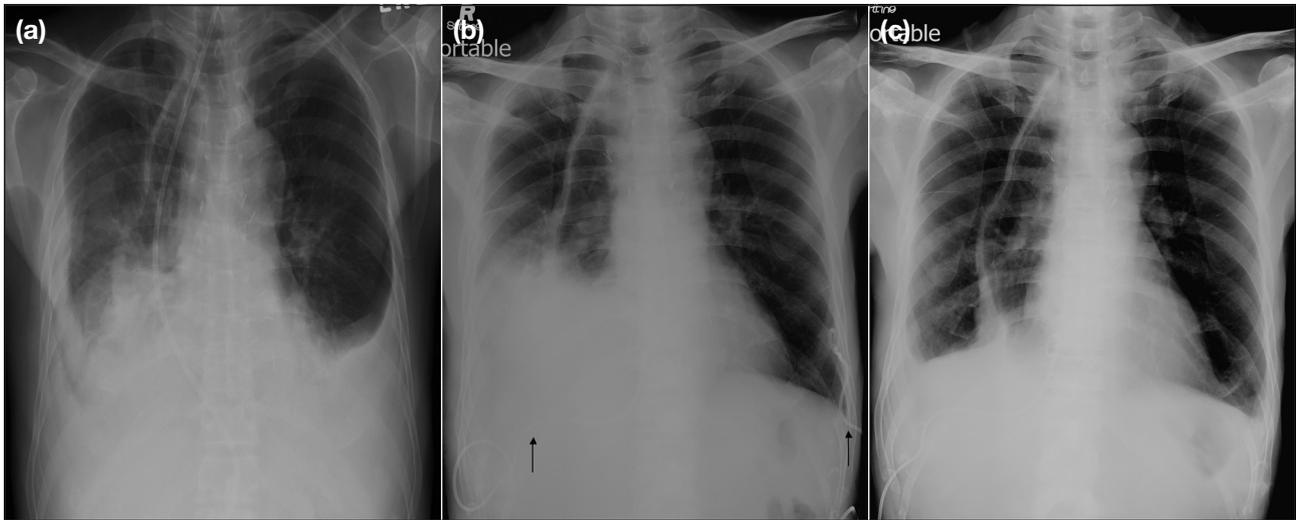


Figure 1. Chest radiographs showing (a) increasing bilateral pleural effusion 3 weeks after oesophagectomy — a nasogastric tube is present within the pulled intrathoracic stomach; (b) bilateral pleural drainage tubes (black arrows) are inserted, the left pleural effusion is largely drained, but the right pleural effusion persists despite a draining catheter in situ; and (c) the left pleural effusion has resolved and the left pleural draining tube has been removed, but there is persistent right pleural effusion even with the draining catheter in situ.

was also performed, but there was persistent high daily output from the right pleural drainage catheter (2–3 l/day) [Figure 1c]. The right pleural fluid was pink and milky in appearance. There was also progressive decrease of the serum albumin level from 32 g/l to 19 g/l (reference range, 35–50 g/l). The clinical signs were suspicious of right chylothorax related to lymphatic duct damage from previous surgery. Laboratory analysis of the right pleural fluid showed exudative fluid with presence of triglycerides and cholesterol.

Lymphatic scintigraphy was performed on 30 May 2011. The ^{99m}Tc -filtrated sulphur colloid was prepared according to the manufacturer’s instructions for Pharmeducence, Bedford, New England, US; a routine quality control procedure was performed by using the kit provided by the same manufacturer (Pharmeducence, Bedford, New England, US). The sulfur colloid was then filtered through 0.2 μm filters. ^{99m}Tc -filtrated sulphur colloid 2 mCi was injected intradermally into the first web space of both feet. Static planar imaging (Hawkeye 4 Gamma Camera; General Electric, Haifa, Israel) of the whole body was performed at 45 minutes and of the thorax and abdomen at 2 hours (Figure 2a). Single-photon emission computed tomography/computed tomography (SPECT/CT) of the thorax was done at 2 hours by low-dose CT (Infinia Hawkeye 4; General Electric, Haifa, Israel). SPECT studies were performed using a 64 x 64 matrix, collecting images

every 6° (for 360°). The acquisition time was 40 seconds per image. The data were auto-processed by a Xeleris 2 Functional Imaging Workstation (Volumetrix for Hawkeye) to provide SPECT/CT fusion images. At 2 hours, SPECT study showed that there was abnormal accumulation of the tracer in the right thoracic region (Figure 2a). SPECT/CT confirmed the accumulated tracer located within the right pleural cavity (Figure 2b). The imaging features were compatible with lymphatic leakage into the right pleural cavity. A leakage point was demonstrated in the right hilum and linear activity was identified radiating from the right hilum to the right pleural cavity, which was suggestive of the path of the lymphatic leakage from the right hilum to the right pleural cavity (Figure 2c).

Surgical ligation of the thoracic duct performed on 8 June 2011 confirmed that there was lymphatic leakage in the right hilar region. Ligation of the thoracic duct was performed. The output from the right pleural drainage was markedly decreased and the drain was removed 10 days later. No re-accumulation of the pleural effusion was identified at follow-up 4 months later.

DISCUSSION

Chylothorax can be congenital, traumatic or obstructive.¹ Traumatic chylothorax due to thoracic duct injury after oesophagectomy is uncommon, occurring in less than

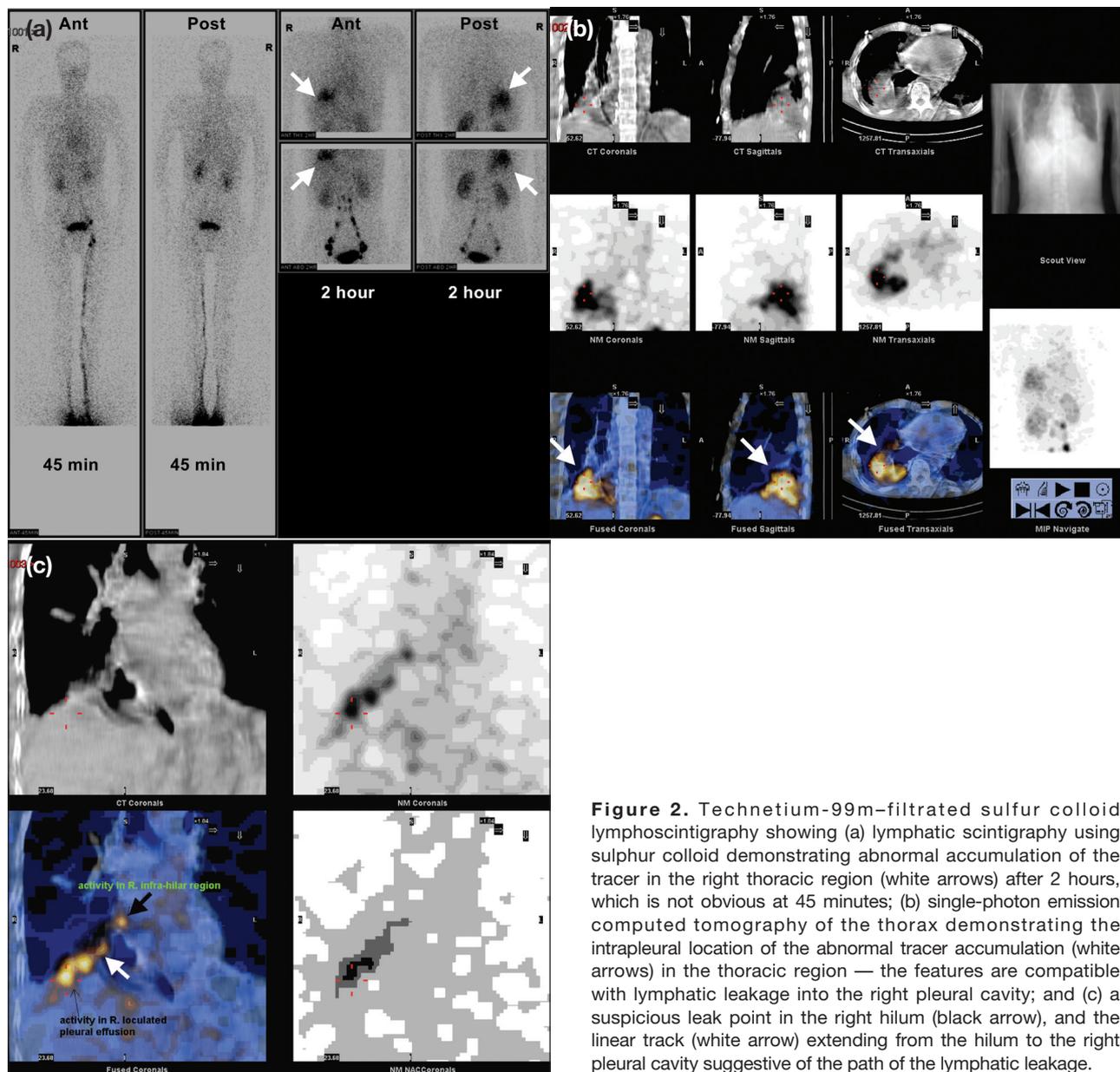


Figure 2. Technetium-99m-filtrated sulfur colloid lymphoscintigraphy showing (a) lymphatic scintigraphy using sulphur colloid demonstrating abnormal accumulation of the tracer in the right thoracic region (white arrows) after 2 hours, which is not obvious at 45 minutes; (b) single-photon emission computed tomography of the thorax demonstrating the intrapleural location of the abnormal tracer accumulation (white arrows) in the thoracic region — the features are compatible with lymphatic leakage into the right pleural cavity; and (c) a suspicious leak point in the right hilum (black arrow), and the linear track (white arrow) extending from the hilum to the right pleural cavity suggestive of the path of the lymphatic leakage.

2% of patients.² The thoracic duct originates from the cisterna chyli, enters the thorax through the aortic hiatus along the right side of the aorta, crosses the posterior surface of the aorta to the left at the T5 vertebral level, and joins the venous system at the left jugulosubclavian junction.^{1,3} As a result, injury above the T5-6 vertebral level leads to left-sided pleural effusion, while injury below the T5-6 vertebral level results in right-sided pleural effusion. There are several anatomical variations of the thoracic duct as follows: partially doubled, opening in the left venous system; double throughout its entire course on both sides of the aorta, opening in

the venous system of the corresponding side; and on the right side of the aorta along its entire length, opening in the right venous system.¹⁻³ The thoracic duct may also lie on the left side of the aorta along its entire length, and open in the left venous system in 4% of cases.¹⁻³

Lymphoscintigraphy for assessment of the thoracic duct or lymphatic leakage has been previously performed using aurum-198 (Gold-198), iodine-131 triolein, serum albumin, ^{99m}Tc dextran, nanocolloid, oral iodine-123 long-chain fatty acid derivative iodophenyl pentadecanoic acid, or oral iodine-123 heptadecanoic

acid.³⁻¹⁰ In a recent report, the diagnosis of thoracic lymphatic leakage was successfully diagnosed by ^{99m}Tc–filtrated sulfur colloid lymphoscintigraphy.⁴ The use of ^{99m}Tc–filtrated sulfur colloid lymphoscintigraphy for this patient also successfully confirmed the diagnosis of the thoracic lymphatic leakage into the right pleural cavity and the exact site and path of the leakage. Although a proportion of the radiopharmaceutical was trapped in the iliac and inguinal lymph nodes, there was sufficient tracer in the thoracic duct to demonstrate the site of the leakage. The addition of SPECT/CT was helpful to localise the exact site and path of the thoracic lymphatic leakage, which guided the subsequent surgical treatment and ligation of the thoracic duct.

When comparing the use of ^{99m}Tc–filtrated sulfur colloid lymphoscintigraphy with the gold standard contrast lymphography, lymphoscintigraphy is less invasive, less technically difficult, provides better visualisation of the thoracic lymph drainage, and has lower radiation exposure.

To conclude, this patient demonstrates that ^{99m}Tc–filtrated sulfur colloid lymphoscintigraphy with SPECT/CT is an easy and accurate method to diagnose thoracic lymphatic leakage and its exact site in patients with chylothorax after oesophagectomy. The surgically

induced lymphatic leakage was localised precisely before intervention.

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