

Case report

Suture and stapler granulomas: a word of caution[☆]

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Abstract

Newly detected lung nodules during the postoperative follow-up course of a patient who has undergone pulmonary resection, is frequently a diagnostic dilemma. It is crucial to determine if the tumor is a recurrent tumor, a second primary tumor or a benign lesion. Currently, positron emission tomography seems to have replaced most of the invasive diagnostic interventions. In this study, three cases with false-positive nodules interpreted as recurrent malignancy on PET scans are presented. They were eventually found out to be foreign body hyper-reaction granulomas. © 2007 European Association for Cardio-Thoracic Surgery. Published by Elsevier B.V. All rights reserved.

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1. Introduction

Detection of new solitary pulmonary nodules (SPNs) during follow-up of a patient with prior lung resection for malignancies commonly bears a diagnostic challenge. Most of these nodules are presumed as recurrences or new cancers [1]. However, it is not uncommon to detect inflammatory nodules secondary to surgical trauma or infection in these situations [2,3].

Positron emission tomography (PET) is being used extensively for clinical characterization of SPNs, especially to differentiate benign and malignant lesions [4]. Unfortunately, PET is associated with a high false positive rate in case of inflammatory lesions, which can lead to unnecessary surgical interventions [3]. There is a single report on PET positive inflammatory nodules that develop secondary to stapler or suture material reactions [2]. In this study, we report three patients with pulmonary nodules all of which were detected during the follow-up of a previous lung resection. Although the lesions of all patients were deemed as malignant, based on PET scans they were eventually diagnosed as suture and stapler granulomas.

2. Patients and methods

The characteristics of three patients including age, gender, interval between initial and second operation or

radiological detection, location of the lesion, fine needle aspiration biopsy (FNAB) results, type of operation and final pathological diagnoses are shown in Table 1.

Patient 1 had a metabolically active right upper lobe nodule with a maximum standard uptake value (SUV_{max}) of 3.5 (with minimum and maximum uptake values of 0.86 and 4.87) on PET scan (Fig. 1A). This nodule was noticed at the 15th year on the same localization of a wedge resection, which showed strands of non-absorbable heavy suture material when the nodule was sectioned in the operating room.

Patient 2 had a history of resection for endometrial adenocarcinoma and subsequent upper lobe lung resection for a metastatic lesion. Middle lobe was divided from the upper lobe using linear staplers. Follow-up CTscan revealed a solitary pulmonary nodule adjacent to the stapler line in the right middle lobe, which was metabolically active (SUV_{max}: 3.5, with minimum and maximum uptake values of 1.64 and 17.7) on PET scan. The final diagnosis after surgical resection was in accordance with stapler granuloma.

Patient 3 had multiple primary lung cancers, which were resected with sequential bilateral upper lobectomies. A wedge resection of a fibrotic nodule in the right lower lobe was performed during a right upper lobectomy. Eight months later, a metabolically active nodule on PET scan, which had a SUV_{max} of 3.0 was detected in the right lower lobe (Fig. 1B and C). FNAB showed dysplastic cells, which were diagnosed as non-small cell lung carcinoma. The lesion was taken out through a thoracotomy and was eventually diagnosed as an inflammatory nodule at the site of prior suturing.

All three patients underwent surgical exploration. Patient 1 had postoperative delirium secondary to alcoholism, which was controlled with medical management. Patient 2 had an

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Table 1
Patient characteristics

Age, gender	Interval ^a	Primary operation and diagnosis	Site	PET (SUV _{max})	FNAB result	Operation	Pathologic/ clinical result
42, M	15 years	Bilateral apical bullectomy (pneumothorax)	RUL	Malignant uptake (4.8)	Inflammation, tumor negative	Thoracotomy, wedge resection	Suture granuloma
60, F	4 months	Upper lobectomy (metastatic adenocarcinoma)	RML	Malignant uptake (3.5)	Not performed	Thoracotomy, wedge resection	Stapler granuloma
47, M	8 months	Bilateral upper lobectomy and RLL wedge resection (adenocarcinoma)	RLL	Malignant uptake (3.0)	Non-small cell lung cancer	Thoracotomy, wedge resection	Suture granuloma

RUL, right upper lobe; RML, right middle lobe; RLL, right lower lobe; SUV_{max}, maximum standard uptake value; FNAB, fine needle aspiration biopsy.

^a The time interval between primary operation and the radiological diagnosis of the lesion.

uneventful postoperative course. Patient 3 had an intraoperative air embolism secondary to subdiaphragmatic catheter placement and iatrogenic pneumoperitoneum. She was kept intubated for 8 days and was discharged without any sequela on the 28th day of the post-operative period.

3. Discussion

SPNs arising during postoperative follow-up of malignancy resections are commonly diagnosed as recurrences or new cancers. This is strongly supported by a recent study showing that 80 and 60% of the solitary lung lesions were malignant in patients with previously known lung cancer or other organ malignancy respectively. The size was also an important factor in that study with only 30% of the lesions less than 1 cm in diameter resulting in a benign diagnosis [1].

Most of these nodules are clinically evaluated with CT and PET scans to diagnose the character of the lesions. In many studies, the sensitivity, specificity, and accuracy of PET in the diagnosis of SPNs were shown to be 90% or higher [5,6]. PET has a sensitivity and specificity of 95 and 80% in the detection of malignant solitary pulmonary nodules, compared to

50–60% with CT [3–6]. The specificity of PET for the diagnosis of benign lesions has been clinically important, but in slow-growing malignancies, such as bronchoalveolar carcinoma or carcinoid tumors, false-negative results can take place [7]. On the contrary, false positive results are common in inflammatory lesions, especially in countries with high tuberculosis prevalence [8]. There is a single report showing the role of PET in suture granulomas [2].

Standard uptake values have been considered to be important in differentiating benign and malignant lesions, however this is not always reliable as in cases of carcinoid and tuberculosis [8,9]. Our patients had SUV values above the cut-off value of 3.0 which suggests malignancy. Patient 1 had a PET positive lesion 15 years following his initial surgery. Thus, chronicity of the inflammatory lesion is not always correlated with low SUV uptake.

Our current follow-up strategy following lung resection for malignancies includes chest CT scan every 6 months in the first 2 years and then yearly afterwards. Patient 1 who was initially operated at a different center was followed outside and eventually referred to our center for his recurrent nodule. Based on our experience with these patients, we suggest close follow-up of postoperative nodules with borderline SUV values (3.0–5.0) using chest CT scans (CT scan every 2 months for the first 6 months period, then once a year for 2 years). There is no evidence-based guideline about the follow-up procedure for the postoperative nodules following lung resection. However, false-positive interpretations of PET scans lead to unnecessary surgical explorations as in our cases.

The locations of the lesions mentioned in this study were either adjacent to or on the suture sites or stapler lines. Foreign body reaction to suture materials is well known with non-absorbable suture materials such as silk and other polyfilament sutures. However, foreign body reaction to staplers is a very rare occurrence due to the inert nature of titanium used in modern stapler technology [10].

In conclusion, a more conservative stance can be taken in the management of post-operative solitary lesions with borderline SUV values on PET scans that are in close proximity with the primary surgical site.

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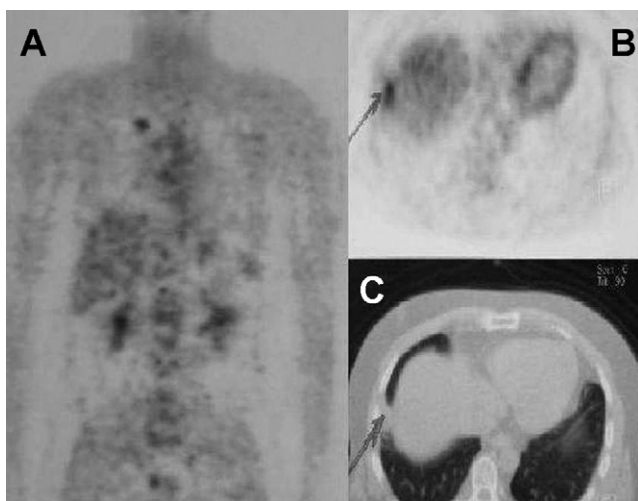


Fig. 1. (A) Uptake suggestive of malignancy in the previous bullectomy site of patient 1. (B–C) PET and CT scans of the right lower lobe nodule of patient 3.

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