

Hypervascular pulmonary nodule

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Section: Chest imaging

Area of Interest: Lung

Procedure: Staging

Procedure: Contrast agent-intravenous

Procedure: Computer Applications-3D

Imaging Technique: CT

Imaging Technique: PET-CT

Special Focus: Metastases Case Type: Clinical Cases

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Patient: 61 years, male

Clinical History:

A 61-year old man had his left kidney transplanted in 1999 due to nephropathy and underwent right nephrectomy in 2006 due to kidney neoplasia, from which he fully recovered. During a follow-up abdominal magnetic resonance (MR) in 2015 a pulmonary nodule in right inferior lobe was detected, therefore computed tomography (CT) examination was requested.

Imaging Findings:

CT detected a well-defined pulmonary nodule of 1.3 cm in the posterior-basal segment of the right inferior lobe (Figure 1). Neither calcifications nor fat were found within the lesion. No pathological lymphnodes were detected. PET-CT performed after 4 months showed low to mild metabolic activity of the nodule (SUV 1.5) (Figure 2).

A follow-up CT, performed with intravenous contrast medium after 3 months, highlighted a slight dimensional increase (2 cm) of the nodule which showed intense arterial contrast enhancement (Figure 3).

During a third follow-up CT, the radiologist was asked a differential diagnosis between a pulmonary nodule or a pulmonary arterio-venous malformation (PAVM). A third differential diagnosis, carcinoid, was taken into account, due to CT morphological and contrast enhancement characteristics (Figure 4). Moreover the nodule showed volumetrical increase, from 1.8 cm³ to 4.5 cm³ (Figure 5).

Atypical resection of the right inferior lobe led to the diagnosis of metastasis from clear-cell renal carcinoma (RCC), positive to CD10 antigen.

Discussion:

RCC tends to metastasize to the lungs in 70-76% of patients, lymphnodes in 50%, skeleton in 40% and to the liver in 20% [1, 2]. The majority (78%) of recurrent RCC occurs within the first 5 years post-operatively, although recurrences have been reported as late as 30 years following nephrectomy [3].

There are many different types of hypervascular pulmonary nodules, both benign and malignant, which show low uptake of FDG at PET-examination, and RCC is one of that. Nodular enhancement of less than 15 HU after contrast material administration is strongly predictive of a benign lesion, whereas enhancement of more than 20 HU typically indicates malignancy (sensitivity, 98%; specificity, 73%; accuracy, 85%) [4].

Among benign conditions PAVM, that are an abnormal communication between the pulmonary artery and the pulmonary vein, are often unilateral, with predilection towards the lower lobes (50-70%). On non-contrast CT these lesions are either homogeneous, well-circumscribed, non-calcified nodules measuring up to several centimeters in diameter or present as serpiginous masses connected with blood vessels. Contrast injection demonstrates

enhancement of the feeding artery, the aneurysmal part, and the draining vein on early-phase sequences [5]. Malignancies such as prostate cancer, renal cell carcinoma, low malignant potential and early-stage ovary carcinoma, bronchioalveolar cell carcinoma and carcinoid tumors are several examples of tumors that have demonstrated low 18F-FDG uptake [6, 7, 8]. Carcinoids have high attenuation, enhance significantly on contrast enhanced CT, and show direct or indirect airway involvement on thin-section analysis; this value clearly reflects the hypervascularity seen pathologically in these lesions, even those presenting as incidental pulmonary nodules; calcification may be present, less common in small and peripheral lesions [9]. There is a higher false-negative rate of FDG PET for carcinoid tumors (~ 25%) [10] than for malignant nodules resulting from bronchogenic carcinoma. In our present case, among all these differential diagnosis, carcinoid was first taken into account, whilst the hypothesis of late pulmonary metastasis from RCC recurring after 10 years was not immediately thought of. When the radiologic features of a pulmonary nodule are not diagnostic, transthoracic needle aspiration biopsy, bronchoscopy, video-assisted thoracoscopic surgery, or thoracotomy may be performed [11].

Differential Diagnosis List: Late pulmonary metastasis from RCC., Carcinoid, Pulmonary Arteriovenous Malformations, Metastases of clear-cell renal carcinoma

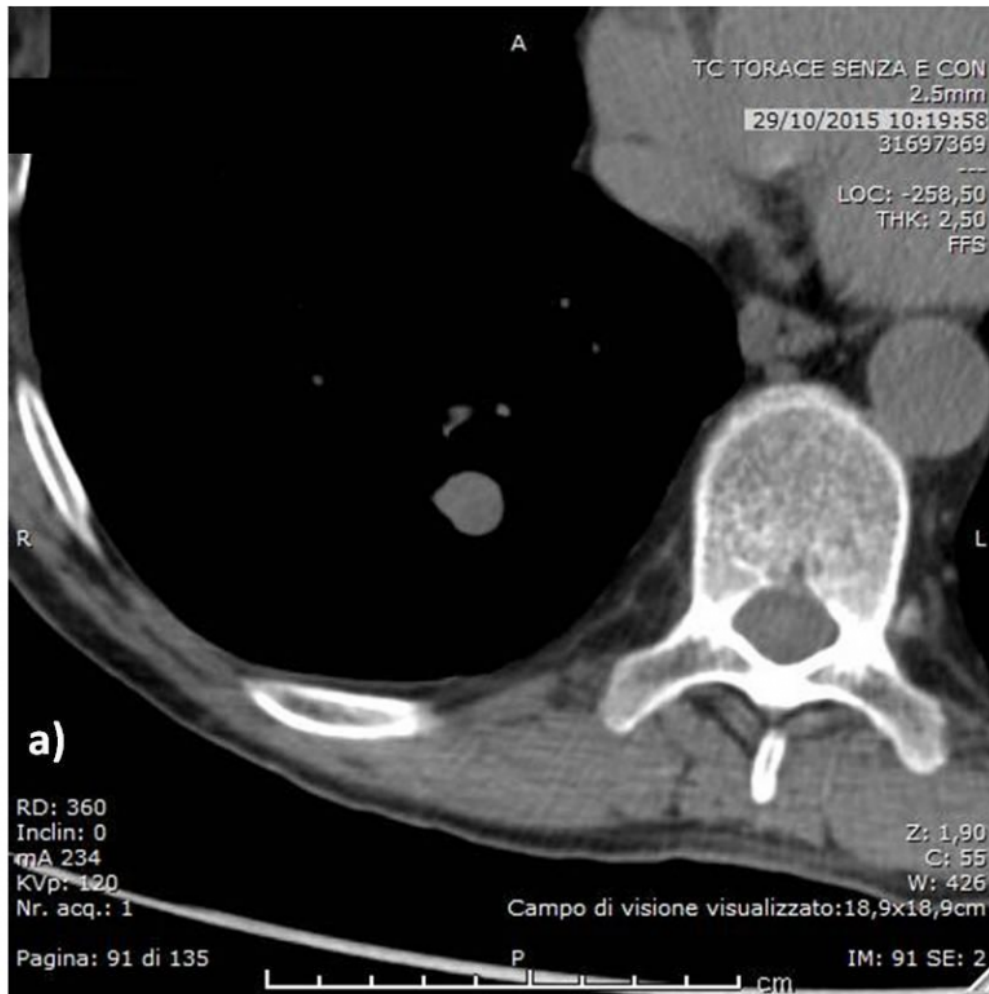
Final Diagnosis: Late pulmonary metastasis from RCC.

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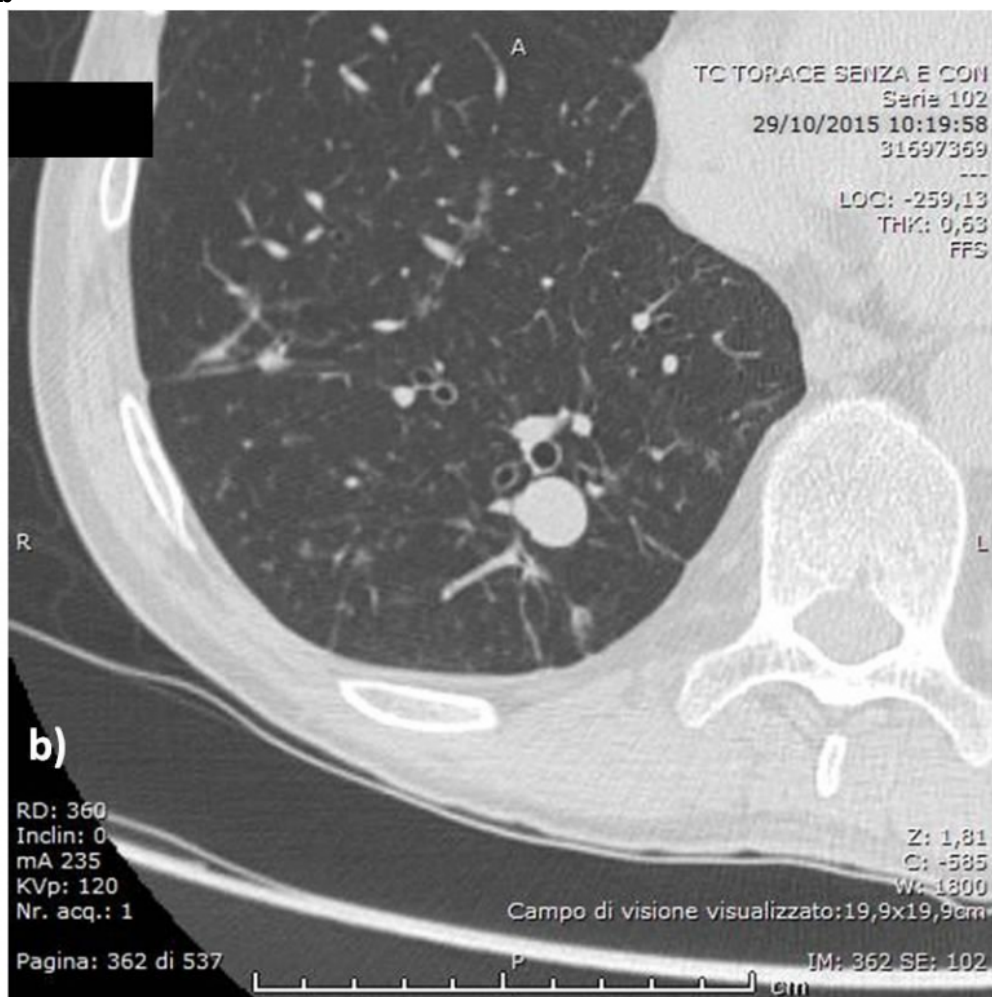
Figure 1

a



Description: a) soft tissue window **Origin:** University of Modena, Department of Radiology, Modena, Italy

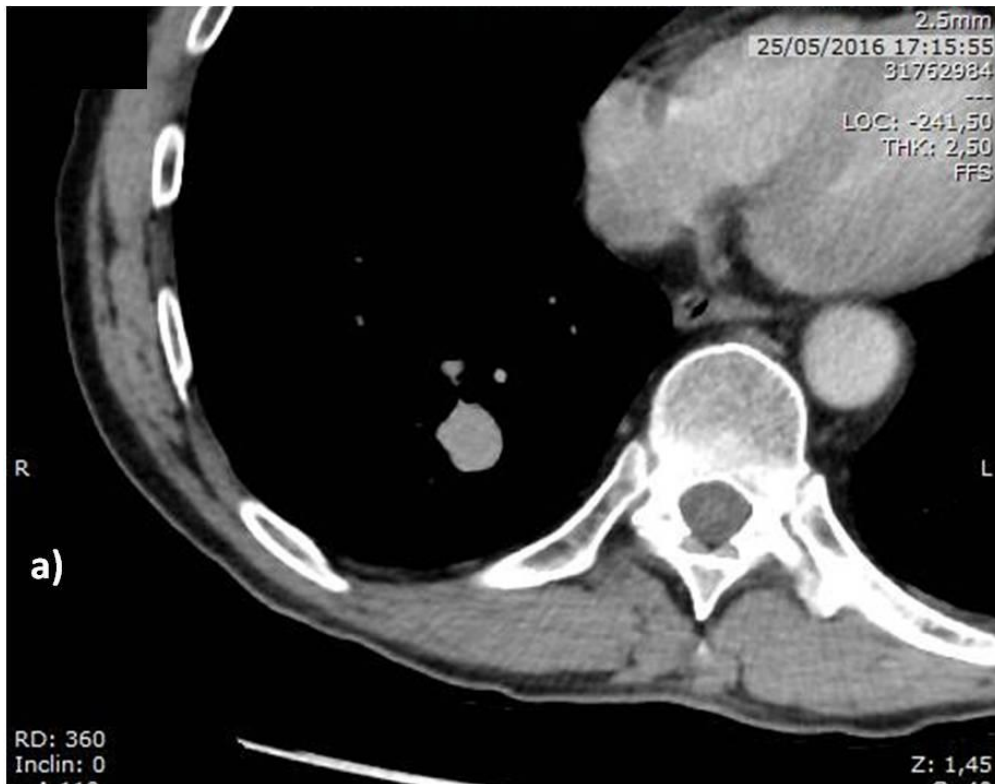
b



Description: b) lung window **Origin:** University of Modena, Department of Radiology, Modena, Italy

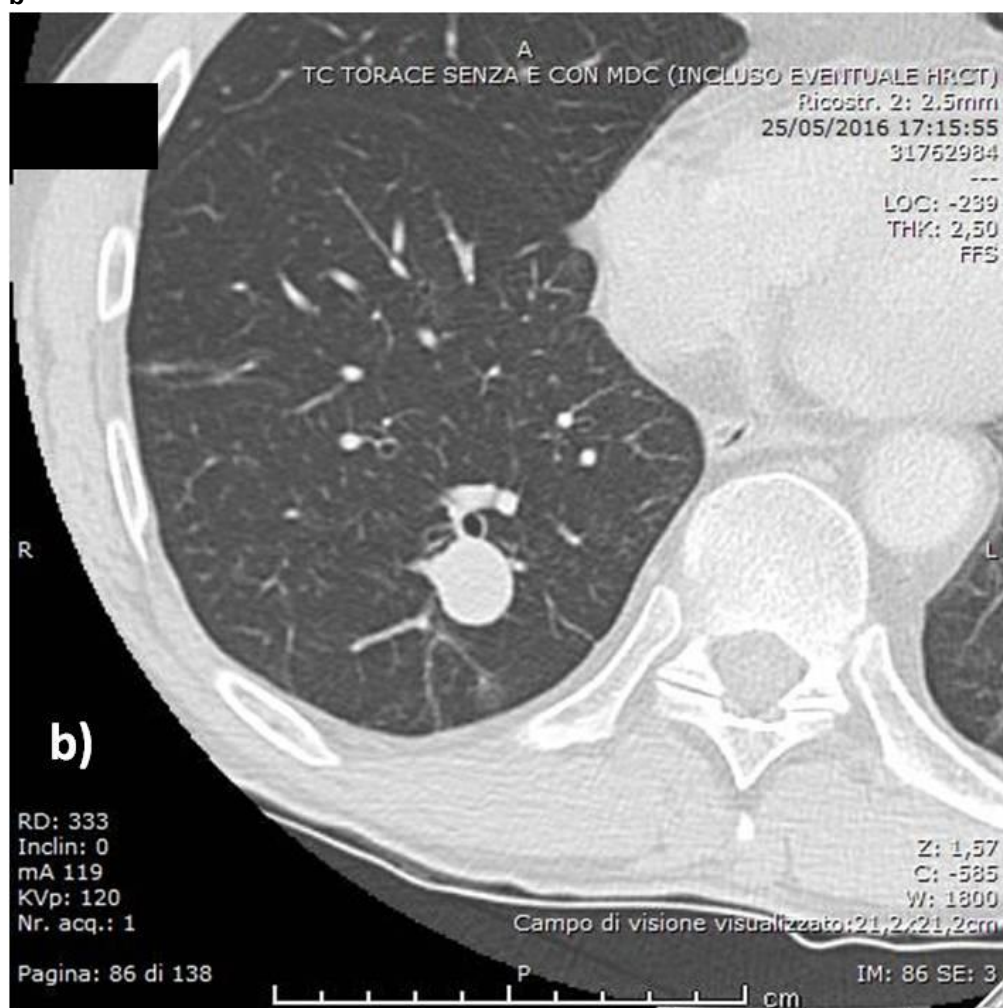
Figure 2

a



Description: a) soft tissue window **Origin:** University of Modena, Department of Radiology, Modena, Italy

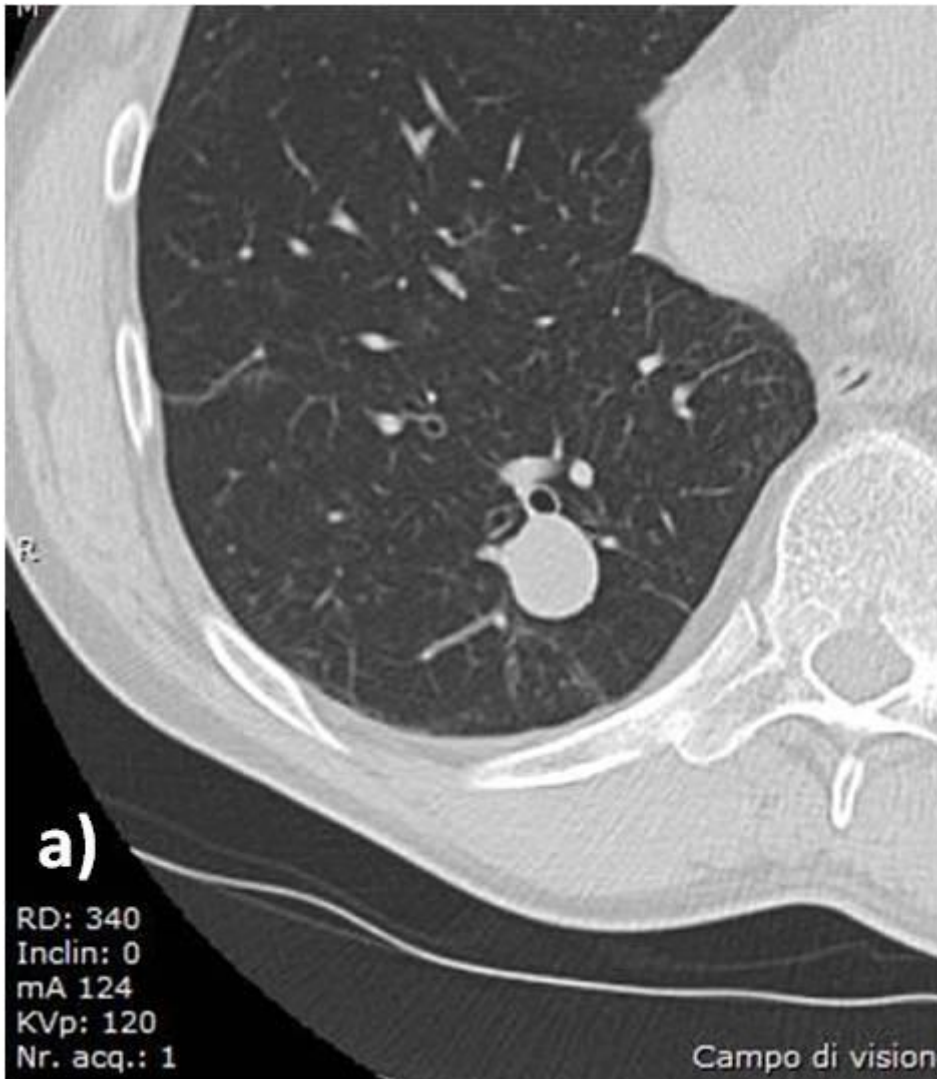
b



Description: b) lung window **Origin:** University of Modena, Department of Radiology, Modena, Italy

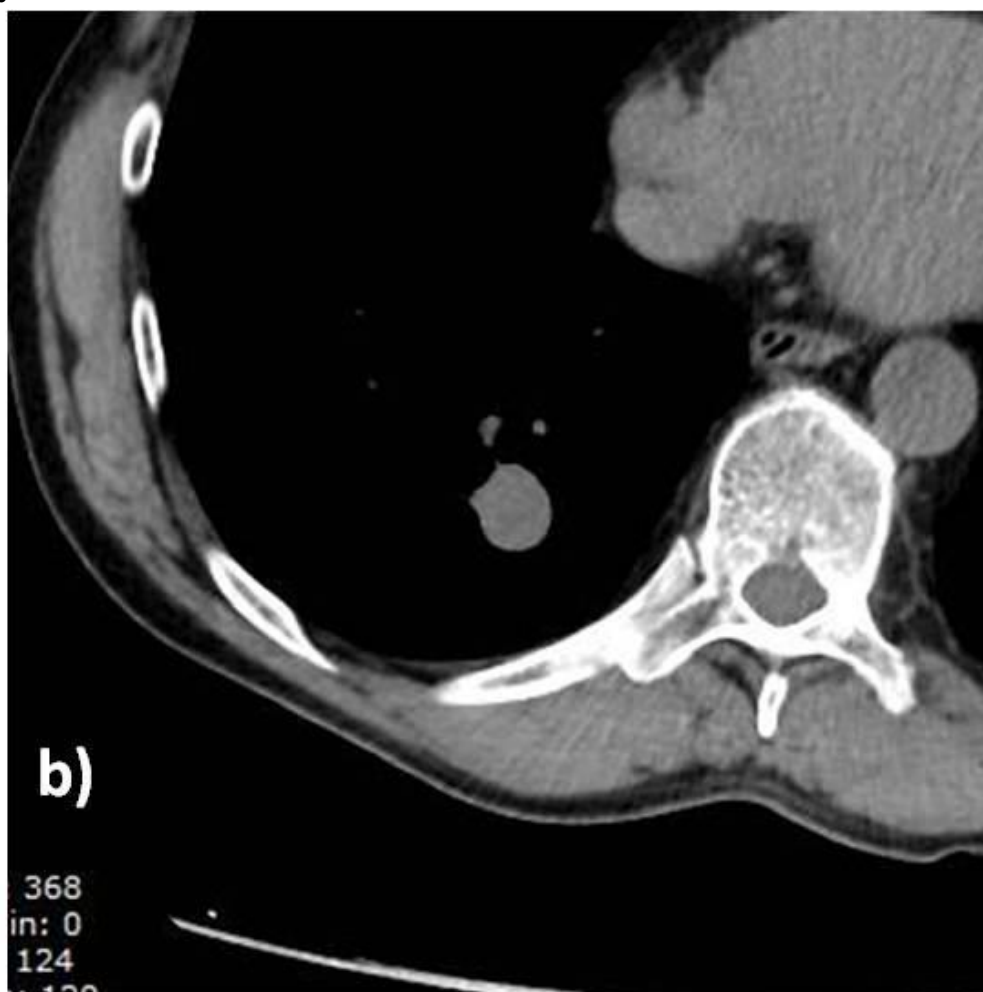
Figure 3

a



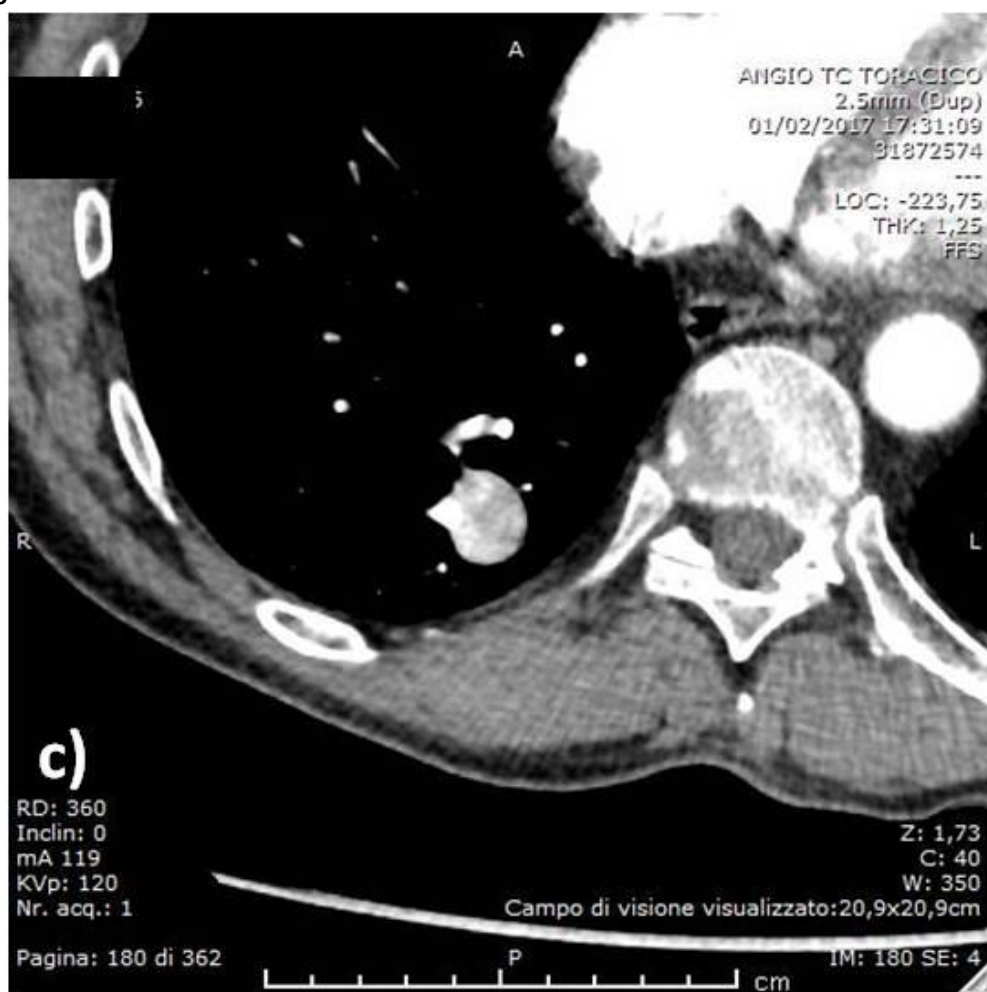
Description: a) lung window **Origin:** University of Modena, Department of Radiology, Modena, Italy

b



Description: b) soft tissue window (basal acquisition) **Origin:** University of Modena, Department of Radiology, Modena, Italy

c



Description: c) soft tissue window (acquisition after medium contrast material injection) **Origin:** University of Modena, Department of Radiology, Modena, Italy

Figure 4

a



Description: a) maximum volume of the nodule in 2015 : 1.8 cm³ **Origin:** University of Modena, Department of Radiology, Modena, Italy

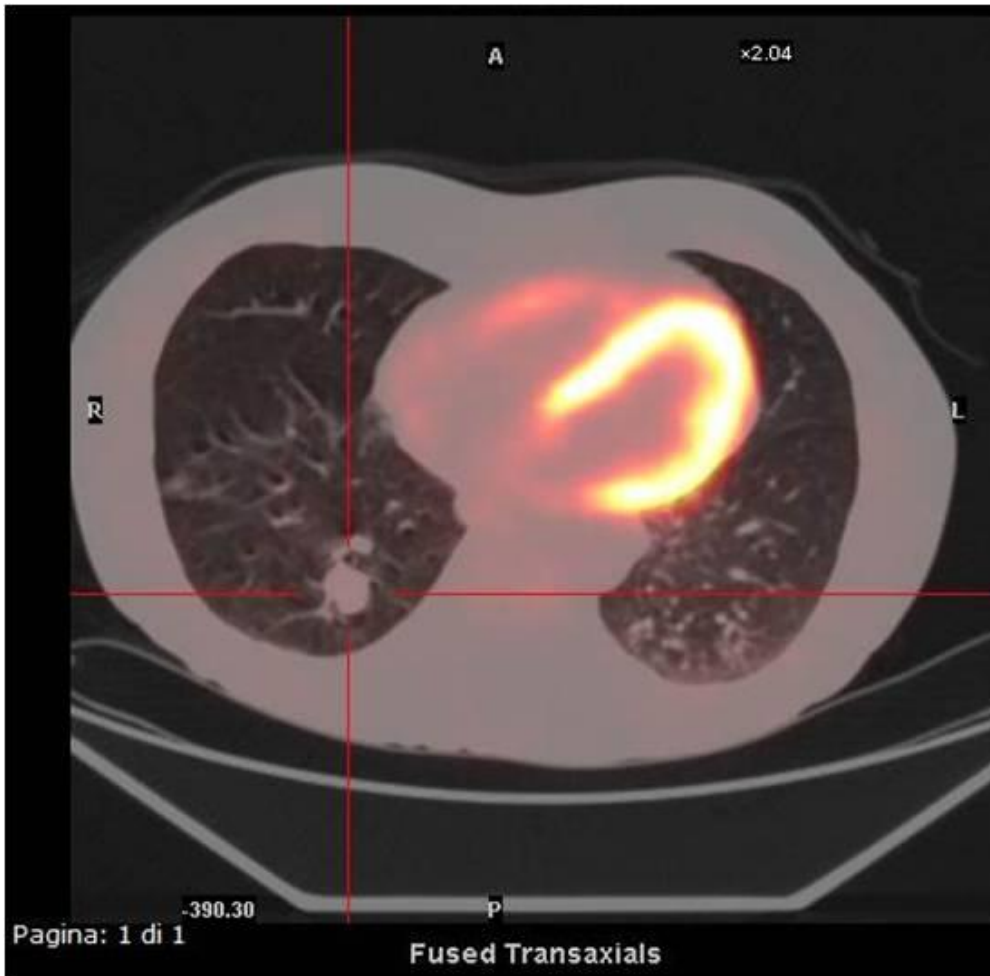
b



Description: b) CT 3D-reconstruction in 2017 shows volumetrical increase of about 2.7 cm³**Origin:** University of Modena, Department of Radiology, Modena, Italy

Figure 5

a



Description: On PET-examination the nodule showed low uptake of FDG (SUV 1.5). **Origin:** University of Modena, Department of Radiology, Modena, Italy