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Early detection of recurrent lung cancer: Enhancing-nodule in post-radiation fibrosis

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Abstract

Early detection of lung cancer recurrence on imaging is critical for better clinical prognosis. The 'enhancing nodule in post-radiation fibrosis sign' is an important sign which helps detect recurrent lung cancer early on CT chest.

Keywords

Lung cancer recurrence, early detection, post-treatment, nodule

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Introduction

Chemotherapy and radiotherapy remain the mainstay of non-small cell lung cancer treatment despite the advances in surgical management. It is important to differentiate expected post-treatment changes from lung cancer recurrence.[1]

Radiation-induced lung injury generally manifests with two distinct well-known clinical and pathologic phases: an early phase of transient radiation pneumonitis, which usually occurs within the first 6 months after completion of treatment and a later phase of chronic radiation fibrosis, which typically occurs at 6–12 months after completion of treatment.[1]

Case report

A 70-year-old male was referred for chest CT following an abnormal chest radiograph that showed a suspicious nodule. The subsequent contrast-enhanced chest CT scan revealed a 3.6 m lobulated enhancing mass in the superior segment of the left lower lobe. He underwent CT-guided trans-thoracic biopsy which revealed a stage T2a primary lung adenocarcinoma (Figure 1(a)). Subsequent EBUS confirmed nodal metastases in a station 4L node. A PET-CT scan did not show any distant metastasis. He received chemotherapy with sterotactic body radiotherapy (SBRT) to the tumour (Figure 1(b)) and underwent 3–6 monthly surveillance CT scans for the next 2 years which showed no signs of recurrence. A chest CT performed 3 years out from his initial treatment was reported to show stable post-radiation fibrosis. The enhancing-nodule in post-radiation fibrosis sign was not detected although in retrospect was present within the area of fibrosis (Figure1(c)). A repeat chest CT 6 months later for increasing symptoms showed enlargement in the enhancing nodule which was detected and a biopsy proved recurrence and the patient was recommenced on chemotherapy (Figure1(d)).

Discussion

Libshitz et al.[2] and Ikezoe et al.[3] were the first authors to classify the CT appearances of radiation-induced lung injury post-conventional radiation. Classifying such changes as early (<6 months) or late (6–12 months) phase with regard to the time interval after the end of treatment better corresponds to the clinical and pathologic aspects of radiation-induced lung abnormalities.

Our case report deals with recurrence of cancer in the late phase of radiation injury. Radiologic imaging manifestations of radiation fibrosis associated with the relatively newer methods of radiation therapy have been classified according to one of three patterns described as modified

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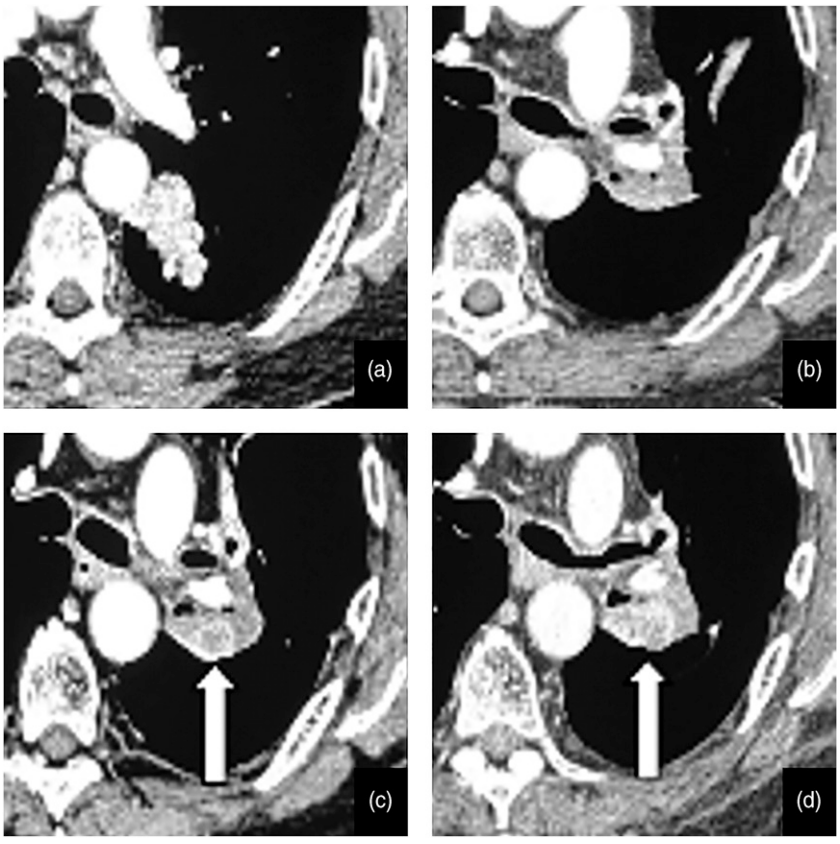

Figure 1. (a). Index scan demonstrating 3.6 cm lobulated enhancing mass in the superior segment of the left lower lobe. The mass was biopsy proven adenocarcinoma. (b). Follow-up scan post-chemo and radiotherapy after 3 years from index scan: Post-treatment fibrotic changes in the left hilum. No enhancing nodule within. (c). 6 months follow-up contrast-enhanced CT shows enhancing nodule measuring 1.8 cm within the post-treatment fibrotic changes, concerning for recurrence. This nodule was initially missed. (d). Interval increase in size of the enhancing nodule to 2.6 cm, in the 6 month-follow-up scan.

conventional, mass-like, or scar-like.[4] It is difficult to differentiate mass-like radiation fibrosis from residual or recurrent lung cancer; however, loss of volume of the consolidation on follow-up favours fibrosis.

Imaging features that raise the suspicion of local tumour recurrence include alteration in the contour and dimensions of the fibrotic area, with the appearance of a homogeneous opacity without air bronchograms and with convex borders in the irradiated lung.[5] Integrated PET/CT appears to provide higher accuracy than that available with CT alone for distinguishing residual or recurrent tumour from lung changes after radiation treatment in patients with non-small cell lung cancer.[6]

In our case report, we have identified an important sign to help detect recurrent lung cancer early on CT chest called the 'enhancing-nodule-in post-treatment fibrosis-sign'. It highlights the importance for chest radiologists to scrutinise areas of fibrosis for areas of enhancement within the fibrotic segment with great care. Our patient had fibrotic changes for several months post-treatment that did not show the sign; so, constant vigilance in interrogating areas of fibrosis for this sign is warranted. In conclusion, the enhancing-nodule sign is a useful sign to look for within areas of fibrosis for recurrent lung cancers and is best evaluated on soft tissue windows. The proposed sign can contribute to earlier detection of recurrent lung cancer. Of note, lung cancer can also be relatively hypoenhancing relative to adjacent fibrosis. While there have been studies discussing relative enhancement and iodine content as potential markers of recurrent lung cancer, such as status post-SBRT, this is an area that requires more research. This case report is therefore of interest in this developing field and useful to share.

Consent for publication

Patient's consent not required as patient identity is not disclosed or compromised.

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