Efficacy of 18F-fluorodeoxyglucose positron emission tomography/computed tomography in evaluating lung cancer recurrence

Eficácia da tomografia por emissão de pósitrons com 18F fluordesoxiglicose com tomografia computadorizada na avaliação de recidiva de câncer de pulmão

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To the Editor:

For patients with non-small cell lung cancer (NSCLC) classified as stage I using the tumor-node-metastasis (TNM) staging system (T1N0M0 or T2N0M0), the standard treatment is complete resection of the affected lobes and associated lymph nodes. However, lung cancer is usually inoperable in elderly patients, mostly because of their poor performance status. In general, resection of these early-stage tumors, typically by lobectomy, has been associated with three-year and five-year survival rates ranging from 60% to 80%.[1,2] Unfortunately, significant complications have been associated with lobectomy in elderly patients or in those with medical comorbidities, such as limited pulmonary reserve and cardiovascular disease.[3-6] With the popularization of CT screening, lung cancers have been increasingly detected at an early stage.[7] Stereotactic radiation therapy (SRT) has become one of the standard treatment options for patients with stage I lung cancer, mainly in patients with inoperable NSCLC.[7,8] Following irradiation, radiation pneumonitis frequently occurs. On chest X-rays or chest CT scans, physicians often have difficulty in distinguishing between the recurrence of lung cancer and radiation pneumonitis. Another tool that has been used in the detection of lung cancer recurrence is 18F-fluorodeoxyglucose positron emission tomography/CT (FDG-PET/CT). We have found significantly elevated standardized uptake values (SUVs) in patients with recurrent lung cancer, compared with those who had no disease progression. To our knowledge, this is the first report demonstrating the efficacy of FDG-PET/CT in patients with post-SRT recurrence of lung cancer. Here, we report the cases of two such patients.

We retrospectively reviewed the cases of all patients receiving SRT for the treatment of lung cancer at the Kameda Medical Center, in Kamogawa, Japan, between April of 2005 and March of 2011. The characteristics of the patients are shown in Table 1. There were a total of 28 patients (20 males and 8 females). The median age was 77 years (range, 59-88 years). All of the patients were classified as having stage IA lung cancer. Comparing the pre-SRT and post-SRT values, we found that there was a significant decrease in the SUV for the primary lesion (8.0 vs. 2.2; $p < 0.001$). During the follow-up period, 2 of the patients experienced recurrence, as evidenced by the finding that their SUVs had increased significantly over the values obtained in the immediate post-SRT period (Table 2). In those 2 patients, there was subsequent clinical and pathological confirmation of the recurrence of the lung cancer.

The first patient was a 69-year-old man with stage IA NSCLC who was submitted to SRT. The tumor was inoperable because of the poor heath status of the patient. The total SRT was 50 Gy in five doses. Prior to SRT, FDG-PET/CT revealed an SUV of 12.6 and a tumor with a diameter of 21 mm. After SRT, the SUV decreased to 4.78, although the size of the tumor increased to 29 mm due to radiation pneumonitis. The radiated lesion could not be appropriately evaluated, because of the scar produced by irradiation. Therefore, we performed FDG-PET/CT every four months. During the follow-up period, the SUV rose to 18.44 and transbronchial lung biopsy was performed. The biopsy confirmed the suspicion of the recurrence of adenocarcinoma.

The second patient was a 76-year-old man who was diagnosed as having stage IA squamous cell lung carcinoma. He suffered from COPD and had a history of heavy smoking. Although he was, at his level of pulmonary function, a candidate

Table 1 - Characteristics of the 28 cases studied.[a]

Variable	Results
Age, years	77 (59-88)
Gender[b]	
Male	20 (71.4)
Female	8 (28.6)
Histology[b]	
Adenocarcinoma	11 (39.3)
Squamous cell carcinoma	5 (17.9)
Large cell carcinoma	1 (3.6)
Unknown	11 (39.3)
Size of primary cancer, mm	19.2 (6.0-34.0)
Standardized uptake value	
Before SRT	7.18 (1.58-19.7)
After SRT	2.55 (0.00-5.87)

SRT: stereotactic radiation therapy. [a]Values expressed as mean (range), except where otherwise indicated. [b]Values expressed as n (%).

Table 2 - Mean standardized uptake values before and after stereotactic radiation therapy for the 28 cases studied, as well as for the 2 patients experiencing recurrence of the cancer during the follow-up period.

Variable	Standardized uptake value
Before SRT	7.18
After SRT	2.55*
Follow-up (recurrent cancer)	22.30*

SRT: stereotactic radiation therapy. *$p < 0.01$ (unpaired or paired t-test).

for surgical treatment, he was submitted to SRT. Before and after SRT, the SUV was 8.48 and 3.49, respectively, and the size of the tumor increased from 25 mm before SRT to 59 mm after. During the follow-up period, the SUV increased to 26.06, revealing recurrence of the tumor.

It has been reported that FDG-PET/CT has a therapeutic impact in 60% of lung cancer patients, approximately 30% of the cases being upstaged, 10% being downstaged, and up to 40% requiring a change in the chemotherapy regimen.[9,10] In addition, the effectiveness of chemotherapy can be determined by measuring the SUV.[9,10] Therefore, FDG-PET/CT is a useful tool in the diagnosis and management of lung cancer.

The use of SRT has been shown to be efficacious for the treatment inoperable early-stage NSCLC in elderly patients.[8] A standard follow-up protocol for patients with early-stage NSCLC submitted to SRT has yet to be established. Third-line chemotherapy can also be efficacious in elderly patients, depending on their condition.

Here, we have reported two cases of recurrent cancer that were successfully diagnosed by FDG-PET/CT, thereby demonstrating that it can be a useful tool in the follow-up of patients having undergone SRT. Additional cases should be examined in order to corroborate our findings.

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