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Cavitation of Tumoral Mass after Radiotherapy in a Patient with Pancoast Tumor

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Abstract

Radiation-induced lung diseases are common after radiotherapy of the chest wall or intrathoracic organs. The damage of radiations is ground-glass opacity, consolidation, fibrosis, traction bronchiectasis, and volume loss. Development of pleural fluid or a new mass is rarely seen. A solid lesion was detected in the computed thoracic tomography of 53 year-old male patient. The lesion was at the apex of the right lung, 66x61 mm in size and invading the trachea, esophagus and right subclavian artery. Weekly chemotherapy and radiotherapy were applied concurrently, and the tumor was quickly disappeared, leaving its place to an unexpected cavitary lesion. The case has been reported because of its rarity in the literature.

Keywords: Cavity, lung cancer, pancoast, radiotherapy

Özet

Toraks içi organlara ya da toraks duvarına uygulanan radyoterapi sonrasında radyasyona bağlı akciğer hastalıkları sık görülür. Radyasyona bağlı gelişen hasarlar arasında buzlu cam opasitesi, konsolidasyon, fibrozis, traksiyon bronşektazisi ve volüm kaybı yer alır. Nadir olarak plevral sıvı ya da yeniden kitle oluşumu görülebilir. Elli üç yaşındaki erkek olguda, toraksın bilgisayarlı tomografisinde sağ akciğer apeksinde 66x61 mm boyutlarında, trakea, özefagus ve sağ subklaviyen arteri invaze eden solid lezyon saptanmış ve uygulanan eş zamanlı haftalık kemoterapi ve konformal radyoterapi sonrasında lezyonun hızlıca yok olup yerini tamamen kaviter lezyona bıraktığı izlenmiştir. Literatürde nadir rastlanması nedeniyel bu olgu sunulmuştur.

Anahtar Kelimeler: Akciğer kanseri, kavite, pancoast, radyoterapi

INTRODUCTION

Radiation-induced lung diseases after radiation therapy to the thoracic wall or lungs are common. Lungs are one of the most sensitive organs against ionizing radiation. Radiologic findings are usually localized to the lung tissue in the radiation field. Radiation-induced damage varies depending on the dose of radiation, type of radiation, type of fractionation, size of port, and concomitant or previous chemotherapy. In the acute phase, ground-glass opacity or consolidation may occur, whereas in the chronic phase, typically fibrosis, traction bronchiectasis, or volume loss can be seen. Rarely, pleural fluid or development of a new mass is also reported (1, 2). Herein, we report a case where the tumor tissue disappeared and was replaced by a cavity after conformal radiotherapy with simultaneous chemotherapy.

CASE PRESENTATION

A 53-year-old male patient with complaints of right shoulder and neck pain, fever, weight loss, and appetite loss for about 2 months was admitted to our hospital. He had a smoking history of 40 packs-year. In the physical examination, the vital signs were normal, but there were rhonchi in the right subscapular area by auscultation. The postero-anterior (PA) chest radiography revealed homogeneous density in the right upper zone (Figure 1). Thorax computed tomography (CT) was performed, and a solid 66x61-mm mass in the right lung apex extending to the trachea, esophagus, and the right subclavian artery was seen (Figure 2). Spicular extensions from mass to the adjacent lung parenchyma and hypodense areas inside the mass compatible with necrosis were also present. In the bronchoscopy, the right upper lobe bronchus was narrowed with no visible endobronchial lesion. Histopatholog-

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Figure 1. Initial chest X-ray showing homogenous density in the right upper zone.

Figure 2. Initial thorax CT showing mass lesion size of 66x61 mm in the right upper lobe

ical evaluation of CT-guided transthoracic biopsy showed squamous cell carcinoma. In the magnetic resonance imaging of the brachial plexus, the mass was invading T2, T3, and the inferior vertebrae and brachial plexus. In the whole-body 18F-FDG PET-CT scan, the mass in the apex of the right lung, right hilar, and mediastinal lymph nodes showed increased FDG uptake. Because the tumor was inoperable, initial treatment with weekly carboplatin and paclitaxel chemotherapy was given simultaneously with daily 200 cGy, total of 6000cGy, three-dimensional conformal radiotherapy on the right lung lesion area and lymph nodes for a period of 4 weeks. Then, chemotherapy was continued for 8 more weeks. About 10 days after the last regimen of chemotherapy, he developed fever, cough, and dyspnea. In the physical examination, the temperature was 38.5°C, oxygen saturation was 95%, and in the lung auscultation, there were decreased breath sounds on the apical region and rhonchi in the right scapula. In the chest x-ray, there was a big cavity in the right upper zone. Thorax CT scan revealed a cavitary lesion with almost the same volume of mass of approximately 56x71 mm in the same place (Figure 3). There

Figure 3. Thorax CT showing a cavitary lesion size of 56x71 mm and ground-glass opacity in the right upper lobe (coronal reformatting)

were consolidated areas with air bronchograms, septal thickening, and fibrotic shrinkage in the posterior segment of right upper lobe, superior-posterior, and lateral segments of lower lobe. There was no residual mass. Because of a preliminary diagnosis of radiation pneumonitis, systemic steroids and non-specific antibiotic therapy were started. Bronchoscopic examination could not be performed due to the poor general health of the patient. Cultures of the sputum and acido-resistant bacillus examinations were negative. Based on the improvement on the chest X-ray, antibiotic therapy was discontinued, and steroid therapy was tapered down gradually (Figure 4). In the control CT, the radiation pneumonitis was completely healed by fibrosis, and there was no change in the size of the cavity 2 months after the therapy. The patient's consent was taken for the case report.

DISCUSSION

Cavity in the lung develops by several mechanisms, which are central necrosis of a mass as a result of rapid tumor growth exceeding the amount of blood supply, causing development of a cavity, or a cavity may develop secondary to abscess formation behind an obstructive lesion. In addition to these, lung metastasis, infections, non-infectious inflammatory diseases, chemotherapeutics, and radiotherapy may be responsible from the development of cavity. Radiation-induced cavity development is rarely reported in the literature. It usually develops in a fibrosis area after a superimposed infection, and septations can be present in the cavity (3, 4). A combination of factors, such as chemotherapy, surgery, and infections, contributes to this complication (5).

But, in our case, the expected fibrosis reaction against radiotherapy was not sufficiently developed. Fibrosis was only localized to the parenchyma of radiation pneumonitis, and the tumor area was completely replaced by an unexpected large cavitary lesion after the treatments. This cavity did not contain any septation or findings of an infection. Additionally, there was no sign of tumor lysis syndrome in the case.

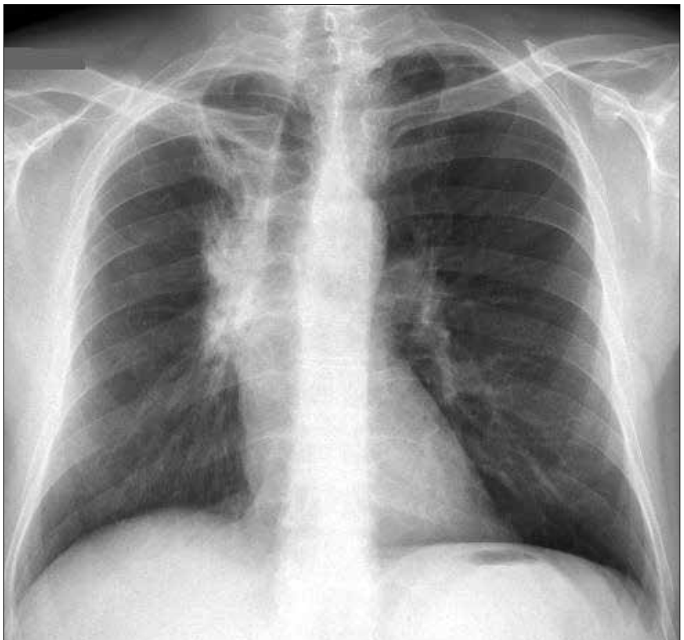

Figure 4. Chest X-ray showing cavity and right hilar widening after treatment

It has been reported that radiation-induced lung diseases may occur 20%-63% after thoracic radiotherapy (6). Development of a cavity is also very rarely seen as secondary to necrosis 6-12 weeks after radiotherapy. It has been reported that cavity formation can cause late complications, such as spontaneous pneumothorax, superinfection, or bronchopleural fistula (2, 7). In this case, both a cavitary lesion and radiation pneumonitis developed concomitantly about 10 weeks after radiotherapy.

Several other factors can also influence the development of lung damage after radiotherapy. The patient's age, previous or concomitant chemotherapy, and techniques of radiotherapy can alter the toxic effects of radiation. The three most important influential technical factors of radiotherapy are the volume of the lung exposed to radiation, total radiation dose, and fractionation. While radiation pneumonitis is very unusual when the total dose is less than 20 Gy, it almost invariably develops when the total dose is above 40 Gy (2). In our case, although the mass tended to become a cavity, we think that this process gained speed because of the conformal radiotherapy technique, and then, an exaggerated reaction was developed.

The clinical picture of radiation pneumonitis is generally less symptomatic than infectious diseases. The presence of radiological findings outside the field of radiotherapy will also support infectious processes. Development of a cavity in the radiation-induced fibrotic lung area usually suggests an infectious process; however, it can also rarely develop secondary to radiotherapy itself, as seen in this case (2, 8). We excluded the infections with sputum cultures and acido-resistant bacillus examinations.

Time of initiation and accomplishment of radiotherapy, amount of dose used, dose application area, and review of radiologic findings initially are helpful in the differential diagnosis. However, the diagnosis can still be difficult in some cases. In such cases, evaluating the response to the given treatment will help in the differential diagnosis (2). In recent years, with the new development of radiotherapy applications with three-dimensional conformal radiotherapy, intensity-modulated radiotherapy, and stereotactic radiotherapy, there is a possibility of using smaller areas of treatment fields, causing less toxicity (9, 10). Three-dimensional conformal radiotherapy protects normal tissue better; so, higher doses can be used. Three-dimensional localization of the tumor and radiation-sensitive tissues can be protected by a CT-simulator device developed specifically for radiation therapy. Using this method in conjunction with chemotherapy may keep the side effects within the tolerance limits (11). Implementation of new techniques may also result in milder side effects of radiotherapy or the development of atypical radiologic findings. Some of the atypical findings are late development of or increase in the amount of pleural fluid, consolidation, and radiation-induced fibrosis causing bronchial occlusion (2, 11). As reported in our case, replacement of the mass with a cavity may be considered an addition to these findings.

Cavitation is a known complication of lung cancers, especially in squamous cell lung cancer. In our case, the mass also contained an area of a small cavity and necrosis before the treatment. Ten weeks after the treatment with three-dimensional conformal radiotherapy and simultaneous chemotherapy apparent cavitation and radiation pneumonitis were seen in the CT scan. But, the radiologic view of cavitation was not similar to an infectious process or to expected development of radiation-induced cavity. A meaningful clinical recovery was seen after corticosteroid therapy started for radiation pneumonitis, with improvement in the radiologic and laboratory findings. Follow-up chest CT scans showed that the radiation pneumonitis area converted to fibrosis, but no significant change was observed in the size or appearance of the cavity in the repeated scans. It is known that cavity related to the radiotherapy may develop in the fibrosis area or secondary to superinfections. In our case, exceptionally, the tumor completely left its place to a cavity with an approximate size. This may be a result of conformal radiotherapy, which protected the surrounding tissue and exposed the tumor area to higher doses of radiotherapy. In conclusion, we report a cavitary lesion as an atypical finding of radiation-induced lung disease after conformal radiotherapy. Knowing the spectrum of atypical findings is important in the management of patients after radiotherapy.

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