

Radiation Fibrosis : Differentiation from True Hilar Mass on Plain Chest Film¹

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Purpose: Radiation-induced fibrotic mass might masquerade as a true hilar tumor mass on a plain chest radiograph. We attempted to differentiate radiation fibrosis from a true hilar tumor using only a plain radiograph.

Materials and Methods: Plain chest radiographs were obtained from seven patients who had developed radiation fibrosis simulating hilar mass after radiation therapy for lung cancer, and from 19 patients with lung cancer, a comparison group, who had not received radiation therapy. They were reviewed for the obliteration of the overlapped mediastinal and hilar anatomical silhouettes by the mass: pulmonary artery, heart or aorta border, and paraspinal line.

Results: All seven patients with radiation-induced fibrotic mass (bilateral lesion in two patients) showed obliteration of all three overlapped anatomical silhouettes of the mediastinum and hilum on chest radiographs. In the comparison group of 19 patients with a true hilar mass, there was, however, no case which demonstrated obliteration of all landmarks.

Conclusion: Obliteration of all anatomical landmarks at the hilum and mediastinum may be a helpful clue in the differential diagnosis of radiation-induced fibrotic mass from true hilar mass on a plain radiograph, particularly when clinical information on previous radiation therapy is unavailable.

Index Words: Lung, fibrosis
Radiation, injurious effects
Lung neoplasms
Lung, radiography

INTRODUCTION

Radiation-induced fibrosis of the lung shows a variable appearance on chest radiographs. Radiation fibrosis may appear as a mass shadow on a plain radiograph when it occurs at the hilar area (Fig. 1) and it may be difficult to differentiate from untreated hilar lung cancer on a plain film, especially in patients without clinical information on previous radiation therapy.

There are many published reviews dealing with radiation fibrosis, but the differentiation of radiation-induced fibrotic mass from true hilar mass on a plain radio-

graph is not considered in those papers (1-7).

In this study, we aimed to differentiate between radiation-induced fibrotic mass and a true hilar tumor, using only a chest radiograph.

MATERIAL and METHODS

The study group consisted of seven patients (six men and one woman) who were suffering from severe pulmonary fibrosis following radiation therapy for lung cancer at our hospital between 1990-1992. Their mean age was 61.3 years (range, 47-70). Lung cancer had been histopathologically confirmed by bronchoscopic biopsy (n=4) and postoperative pathology (n=3). Squamous cell carcinoma (n=5), small cell carcinoma (n=1), and adenocarcinoma (n=1) were present. All patients were treated with a total dose of 3000-6000 cGy, with 10-37 fractionations.

The comparison group consisted of 19 patients with hilar tumor (11 men and eight women aged 30-81

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years ; mean age 59) who had not been treated by radiation. They had also been histopathologically confirmed as cases of adenocarcinoma(n=8), squamous cell carcinoma(n=5), and poorly differentiated malignant tumor(n=1). Five patients were clinically and radiologically diagnosed as having lung cancer. Patients with lobar collapse caused by tumor mass were excluded.

All chest radiographs were evaluated for the presence or obliteration of the overlapped major anatomical silhouette of the mediastinum and hilum by the mass : pulmonary artery, heart or ascending aorta border, and paraspinal line on the right side and pulmonary artery, heart border, and descending aorta on the left.

RESULTS

Two patients had bilaterally involved radiation fibrosis, so a total of nine cases were obtained from seven patients. All nine cases with fibrotic mass demonstrated obliteration of all overlapping anatomical landmarks(Fig. 2, Table 1). On chest radiographs before radiation therapy, lung masses obliterated none or only one of the anatomical landmarks(Fig. 1a).

Of 19 true hilar tumors, three demonstrated obliteration of two landmarks(Fig. 3) and in three cases, one landmark was obliterated(Fig. 4). In eight of the remaining cases, all anatomical landmarks were preserved. In the five remaining cases, the tumors abutted onto only one of three anatomical landmarks and obliteration of that landmark was evaluated ; three of these

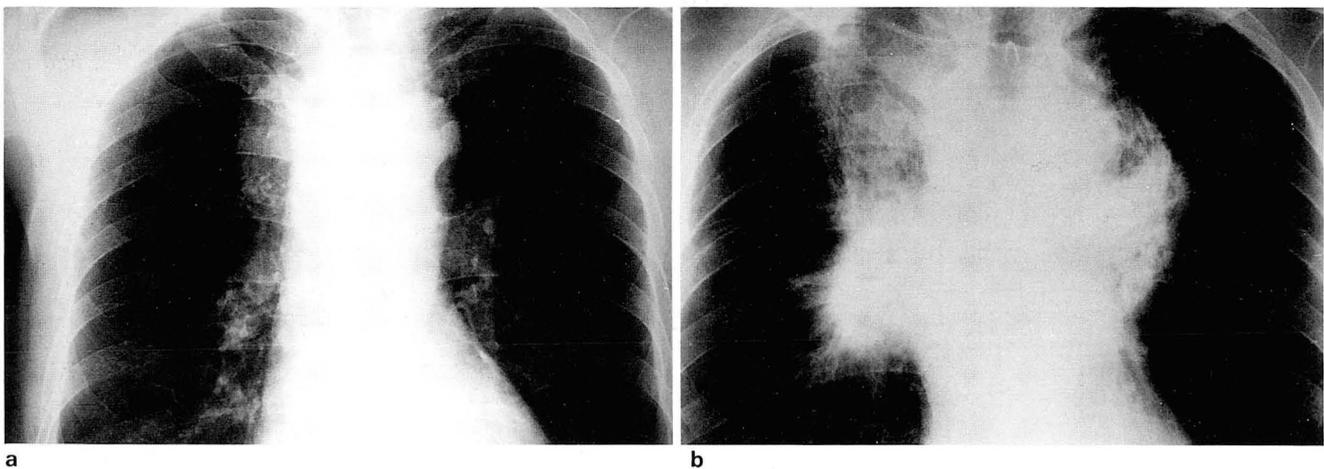


Fig. 1. 69-year-old man with postradiation fibrosis.

a. Radiograph before radiation therapy shows a large mass in right suprahilar area.

b. Irregular and spiculated mass-like lesions were developed at both hilar region after radiation therapy(4860 cGy).

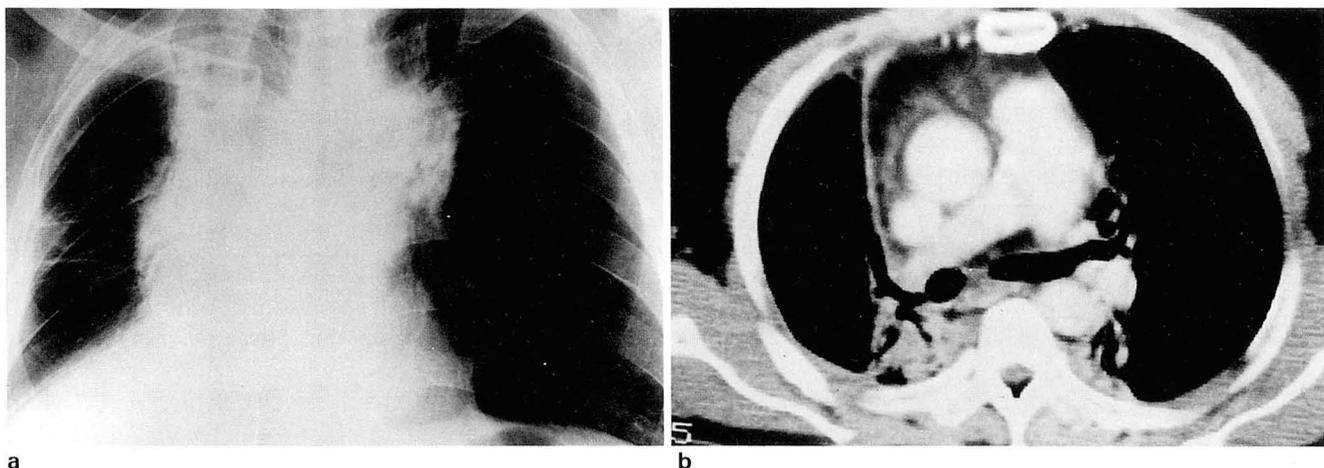


Fig. 2. 55-year-old man with radiation fibrosis. He received total 6040 cGy radiation for bronchogenic carcinoma

a. Total obliteration of anatomical landmarks around a mass-like lesion is well demonstrated.

b. CT scan demonstrates fibrosis and bronchiectasis in the field of previous radiation.

tumors showed obliteration of one anatomical landmark and the other two showed no obliteration. Thus, among 19 true hilar tumors, there was no instance in which all three anatomical landmarks were obliterated (Table 1).

DISCUSSION

Radiation-induced fibrosis of the lung is a well known late sequela of radiation treatment. It follows the acute pneumonic changes which are manifested roentgenographically as consolidation of lung parenchyma(8), and the fibrosis becomes stable in 9 to 12 months, following completion of radiotherapy(1). This late or fibrotic stage of irradiation damage is characterized pathologically by parenchymal fibrosis that may be so severe that the underlying architecture is difficult to identify(9). Roentgenographically the affected lung shows a severe loss of volume with obliteration of all normal architectural markings, and the per-

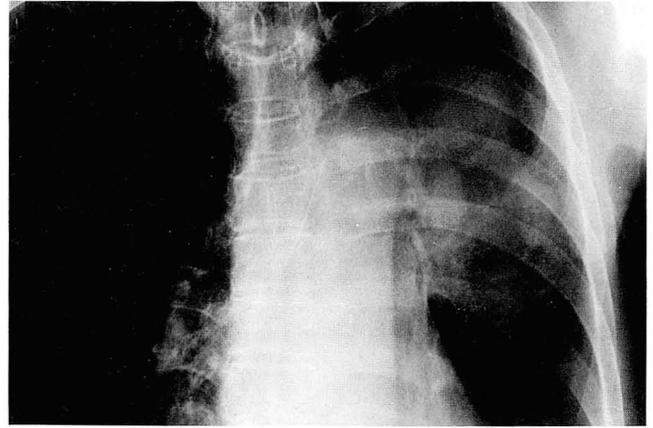


Fig. 3. 69-year-old woman with bronchogenic carcinoma involving the superior segment of the left lower lobe, who had not been treated by radiation.

Only a short segment of the proximal descending aorta and pulmonary artery are partly obliterated by the mass. The descending aorta and left pulmonary artery shadows are well visualized through a large tumor mass.

Table 1. Obliteration of Anatomical Landmarks in the Fibrotic Masses

Case	Structure	Obliteration of silhouette		
		Pulmonary Artery	Heart Border	Paraspinal line(R) or Descending Aorta(L)
1		+	+	+
2		+	+	+
3		+	+	+
4		+	+	+
5		+	+	+
6		+	+	+
7		+	+	+
8		+	+	+
9		+	+	+
10		-	+	+
11		-	-	-
12		-	-	-
13		+	-	+
14		-	-	-
15		-	+	+
16		-	-	-
17		-	-	-
18		-	+	-
19		-	-	+
20		-	-	-
21		-	-	-
22		-	+	-
23		-	-	-
24		-	*	*
25		+	*	*
26		+	*	*
27		-	*	*
28		*	+	*

Case 1-9: Fibrotic masses

Case 10-28: True hilar masses

* indicate that masses did not abut on these landmarks.

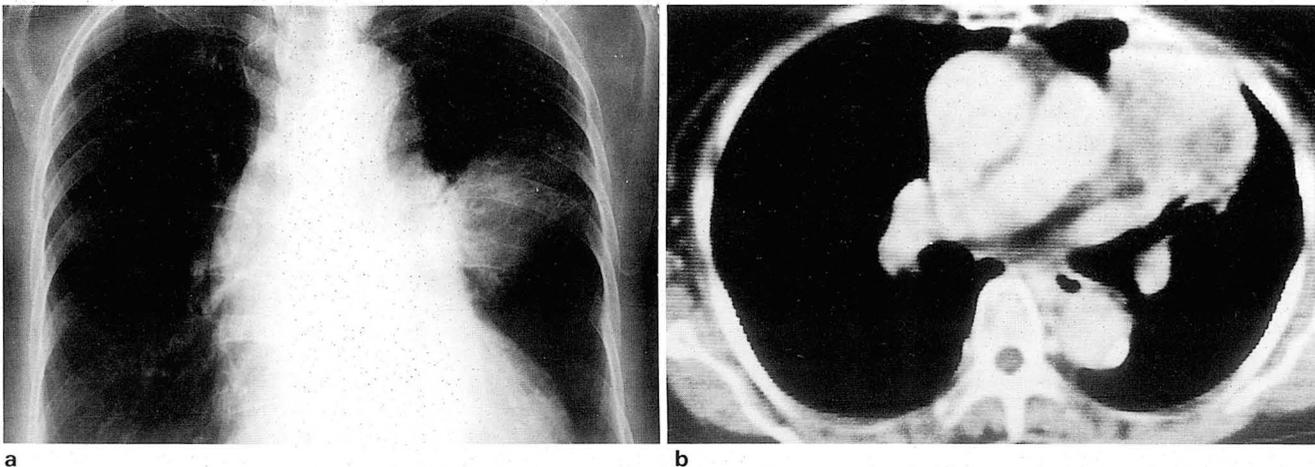


Fig. 4. 69-year-old women with bronchogenic carcinoma

a. Chest radiograph shows a mass in the left lower lobe with obliteration of the silhouette of the pulmonary outflow tract. But Silhouettes of the descending aorta and heart border are preserved.

b. CT scan demonstrates a large mass abutting pulmonary outflow trac in anterior segment of left upper lobe.

ipheral parenchyma is characteristically airless and opaque as a result of replacement by fibrosis(9). At times, the differentiation between radiation fibrosis and perihilar true neoplastic mass, such as bronchogenic carcinoma remains uncertain on a plain radiograph, because radiation-induced fibrosis may masquerade as a true neoplastic mass in the perihilar region, especially when clinical information on prior radiation therapy is not provided(2).

In our study, the obliteration of all normal anatomical landmarks in the hilar region was found only in cases of radiation-induced fibrosis. It may be a clue for the differentiation of radiation fibrosis and hilar neoplasms on a plain radiograph. We thought that the obliteration of all anatomical landmarks secondary to radiation is due to pulmonary damage through the entire pathway of radiation from the porta to the exit. After resolution of radiation-induced acute consolidation of lung parenchyma in the medial part of the lung, the fibrosis could eventually obliterate silhouettes of all mediastinal structures from the most anteriorly located cardiac border through the hilar pulmonary vessels to the most posteriorly located descending aortic border or paraspinal line.

In contrast to the obliteration of all major landmarks in nine fibrotic masses, of 19 cases involving true hilar tumors, there was none in which all landmarks were obliterated. All true hilar tumors were central bronchogenic carcinomas without lobar collapse and they obliterated only the medially contacting structures. It may be very difficult for a tumor to abut the entire an-

terior cardiac border, central pulmonary artery, and posterior aorta contiguously without lobar collapses.

In conclusion, the total obliteration of mediastinal and hilar landmarks by a hilar mass may be a clue in the differentiation of radiation-induced fibrotic mass and a true hilar tumor which has not received radiation treatment.

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방사선섬유증에 의한 종괴: 단순 흉부사진상 종양종괴와의 감별¹

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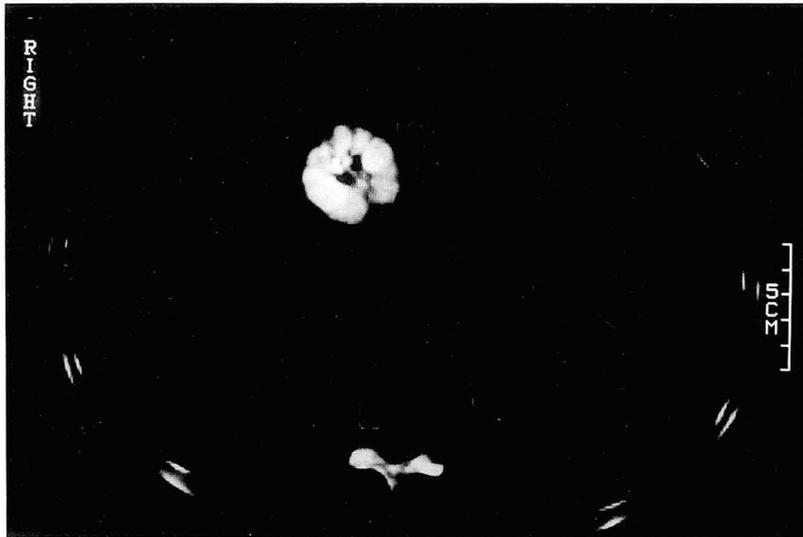
목 적: 단순 흉부사진상 방사선 치료에 의해 유발된 폐문의 섬유성 종괴가 종양 종괴로 오인되는 경우가 있다. 이에 저자들은 섬유성 종괴와 종양 종괴를 단순 흉부사진에서 구별할 수 있는 소견에 대해 알아보고자 하였다.

대상 및 방법: 폐암으로 방사선치료를 받은 후 섬유성 종괴를 보인 환자 7명과 변연부 폐허탈이 없는 폐문부 폐암환자 19명의 단순 흉부사진 소견을 비교하였다.

결 과: 7명의 환자에서 9개의 섬유성 종괴를 보였고 모두 인접한 해부학적 구조물인 폐동맥, 대동맥 혹은 심장음영, 하행 대동맥 혹은 측방척추선의 모든 인접 종격동 구조물의 음영소실을 동반하였으나 19명의 폐암환자의 경우 일부 종격동 구조물의 소실만이 보였다.

결 론: 단순 흉부사진상 종괴에 인접한 모든 종격동 구조물의 음영소실은 방사선 치료후 발생한 섬유성 종괴에서 흔히 볼 수 있는 소견으로 종양 종괴와의 감별에 도움을 줄 수 있는 소견이다. 이런 소견은 방사선 치료의 과거력이 확실하지 않은 경우에 특히 도움이 될 것으로 생각된다.

제목 : Brain CT in the liver



내 용 : 간동맥 조영 CT (CT during Hepatic Arteriography) 사진에서 강한 조영증강을 보인 간종괴를 window width 804, level 839로 조절하였음.

제출자 : 고려대학교 구로병원 진단방사선과
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