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Artigo

ENFISEMA PULMONAR INDUZIDO POR RADIOTERAPIA: UMA NOVA COMPLICAÇÃO

RADIOTHERAPY-INDUCED PULMONARY EMPHYSEMA: A NOVEL
COMPLICATION

ENFISEMA PULMONAR INDUCIDO POR RADIOTERAPIA: UNA
NUEVA COMPLICACIÓN

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RESUMO: A radioterapia tem desempenhado um papel crucial no tratamento do câncer de mama, com avanços significativos nas técnicas que melhoraram o controle do tumor e reduziram os danos aos órgãos vitais adjacentes. No entanto, o tratamento continua associado a uma toxicidade significativa, particularmente na área irradiada, causando danos diretos potenciais ao pulmão, coração e outras estruturas torácicas. Este relato de caso discute uma mulher de 64 anos com histórico de câncer de mama tratado com radioterapia, que posteriormente desenvolveu carcinoma ductal invasivo (estágio II) e foi submetida a mastectomia radical. Uma tomografia computadorizada de alta resolução revelou enfisema parasseptal localizado nas regiões irradiadas do pulmão. Este caso destaca um padrão novo de dano pulmonar crônico induzido por radiação, com enfisema nas áreas previamente submetidas à radioterapia mamária.

PALAVRAS-CHAVE: radioterapia, Câncer de Mama, dano pulmonar induzido por radiação, enfisema pulmonar, radiação torácica, tomografia computadorizada.



ABSTRACT: Radiotherapy has played a pivotal role in treating breast cancer, with advancements in techniques significantly improving tumor control while reducing harm to adjacent vital organs. However, the treatment remains associated with significant toxicity, particularly within the irradiated area, leading to potential direct damage to the lung, heart, and other thoracic structures. This case report discusses a 64-year-old woman with a history of breast cancer treated with radiotherapy, who later developed stage II invasive ductal carcinoma and underwent radical mastectomy. A high-resolution CT scan revealed paraseptal emphysema localized to the irradiated regions of the lung. This case highlights a novel chronic radiation-induced lung damage pattern, presenting with emphysema in areas previously subjected to breast radiotherapy.

KEYWORDS: radiotherapy, Breast Cancer, radiation-induced lung damage, pulmonary emphysema, thoracic radiation, computed tomography.

RESUMEN: La radioterapia ha desempeñado un papel fundamental en el tratamiento del cáncer de mama, con avances significativos en las técnicas que han mejorado el control tumoral y han reducido el daño a los órganos vitales adyacentes. Sin embargo, el tratamiento sigue estando asociado con una toxicidad significativa, particularmente en la zona irradiada, lo que provoca daños directos potenciales en los pulmones, el corazón y otras estructuras torácicas. Este informe de caso describe a una mujer de 64 años con antecedentes de cáncer de mama tratada con radioterapia, quien más tarde desarrolló carcinoma ductal invasivo (estadio II) y fue sometida a mastectomía radical. Una tomografía computarizada de alta resolución reveló enfisema paraseptal localizado en las regiones irradiadas del pulmón. Este caso destaca un patrón nuevo de daño pulmonar crónico inducido por radiación, con enfisema en áreas previamente sometidas a radioterapia mamaria.

PALABRAS CLAVE: radioterapia, Cáncer de Mama, daño pulmonar inducido por radiación, enfisema pulmonar, radiación torácica, tomografía computarizada.



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1. Introduction

Radiotherapy has long stood as a cornerstone of modern medical



approaches to treating breast cancer. Over recent years, significant advancements in techniques have been made. Presently, we are witnessing notable progress in enhancing tumor control while simultaneously safeguarding adjacent vital organs and mitigating potential side effects. (1)

Nonetheless, despite ongoing research endeavors, radiotherapy continues to entail a significant burden of toxicity, with side effects primarily associated with the irradiated area. Thoracic radiation therapy can result in a broad spectrum of direct damage to various structures including the lung parenchyma, pleura, heart, pericardium, major vessels, esophagus, and lymph nodes. Furthermore, there exists an elevated risk of developing secondary malignancies as a consequence of such treatment. (2)

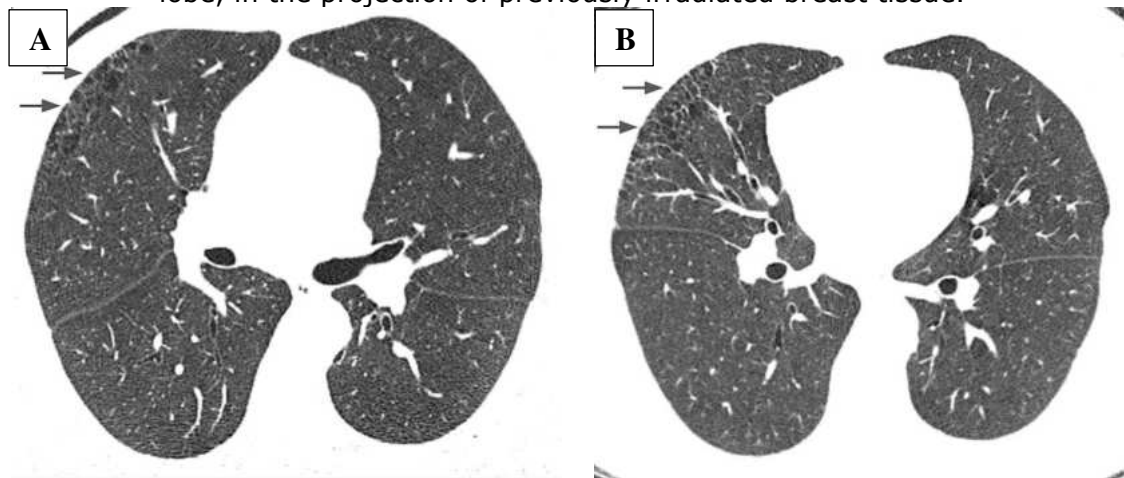
2. Case Report

A 64-year-old woman with a history of right breast cancer, underwent treatment including segmental mastectomy, chemotherapy, and radiotherapy 14 years ago.

Recently a palpable nodule was detected in the right breast and a core biopsy was performed. Histopathology examination revealed stage II invasive ductal carcinoma with a triple-negative profile. She was thus treated with radical mastectomy and adjuvant chemotherapy. A high-resolution computed tomography (HRCT) of the chest demonstrated paraseptal emphysema restricted to anterior segments of the upper lobe, middle lobe, and anterior segment of lower lobe of the right lung (Figures 1A, 1A, 3A and 3B). Minimum intensity projection (MinIP) of the lung parenchyma emphasizes the regions of paraseptal emphysema (Figures 2A, 2B and 4).

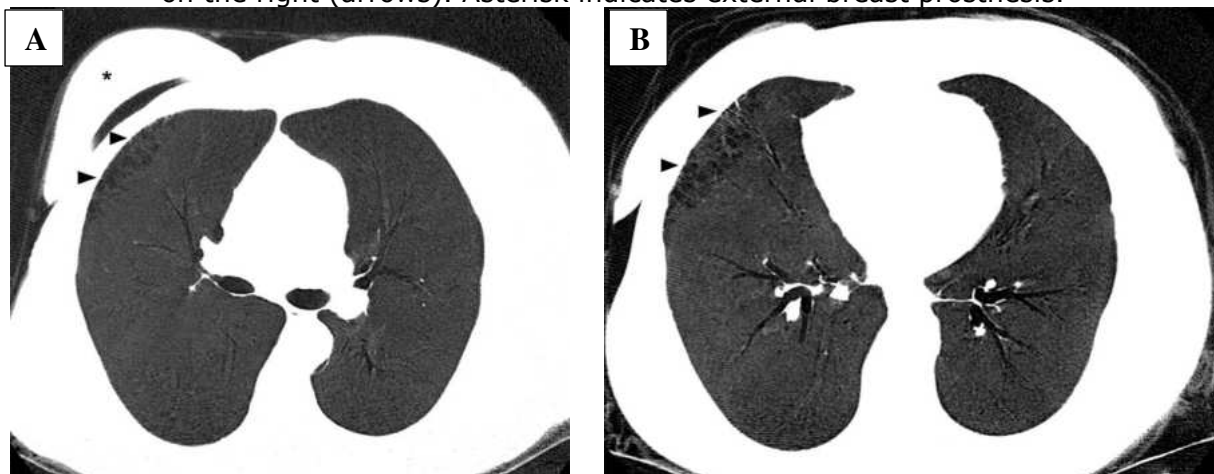


Figures 1A and 1B. Axial computed tomography (CT) sections showing an area of paraseptal emphysema restricted to the anterior segment of the upper lobe and middle lobe, in the projection of previously irradiated breast tissue.



Source: Authors.

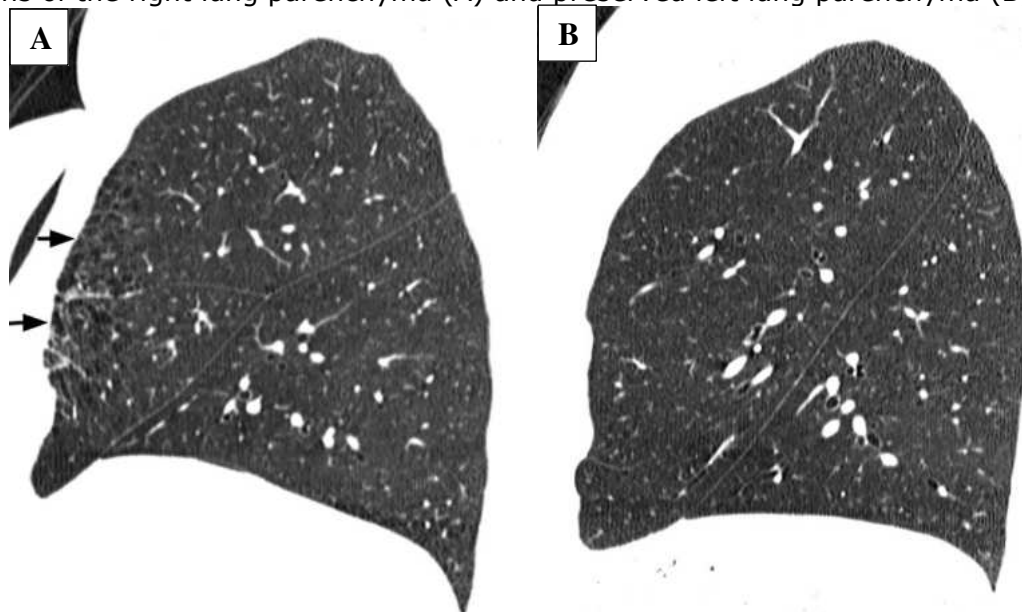
Figures 2A and 2B: Axial sections in MinIP highlighting the areas of paraseptal emphysema on the right (arrows). Asterisk indicates external breast prosthesis.



Source: Authors.



Figures 3A and 3B: Sagittal CT sections showing areas of emphysema in the anterior regions of the right lung parenchyma (A) and preserved left lung parenchyma (B).



Source: Authors.

Figure 4: Coronal CT section in MinIP of the lung parenchyma demonstrating the regions of paraseptal emphysema in the anterior segment of the right upper lobe and in the middle lobe of the right lung.



Source: Authors.



3. Discussion

Radiation-induced lung damage (RILD) is a well-known and common side effect of thoracic radiotherapy and is dose-related. Typically, RILD is not observed at doses below 20 Gy but may become apparent with higher than 40 Gy. The acute phase, known as Radiation Pneumonitis (RP), manifests approximately 4-12 weeks following the completion of radiotherapy, and the pulmonary parenchyma has the potential to regain its architecture and function depending on the severity of alveolar damage. However, RILD may progress into a chronic phase, called Radiation Fibrosis (RF), characterized by fibrotic changes that may take between nine months to two years to become evident in imaging studies. (2,3)

The radiological features of RILD are better detected in HRCT than in chest radiographs. During the RP phase, typical manifestations include ground-glass opacities, focal consolidation, and occasionally organizing pneumonia pattern. Another radiological finding is septal thickening which appears later and defines a "crazy paving" pattern. Uncommon HRCT patterns may present as consolidation surrounded by ground glass opacities ("halo sign") and ground-glass pattern surrounded by consolidation ("reverse halo sign") (4,5). In chronic phases, the usual manifestation involves traction bronchiectasis, volume loss, and scarring. One of the most distinctive features of radiation pneumonitis and fibrosis is the confinement of radiologic changes within the boundaries of the radiation field. (6).

4. Conclusion

In summary, we report a novel tomographic aspect of a chronic radiation-induced lung damage with emphysematous pattern restricted to the areas previously subjected to breast radiotherapy. This radiologic finding has not been described before.



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