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## Letter to the Editor

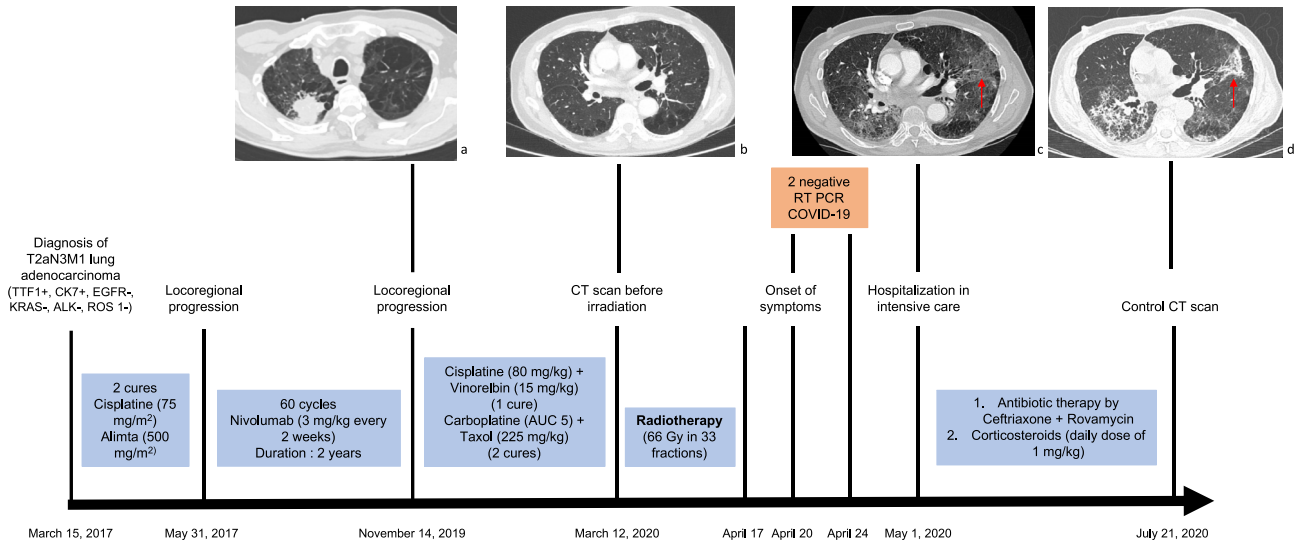
### Treatment and outcome of a patient with radiation-induced organizing pneumonia in the context of coronavirus disease 2019 (COVID-19)



Radiation induced pneumonia is one of the main critical acute toxicities of thoracic radiation therapy (RT), and is characterized by: parenchymal damage within the radiation field, the severity of which is correlated to the dose received [1]. In a very small number of cases, thoracic RT can induce diffuse interstitial pneumonitis, outside the radiation field, known as radiation-induced organizing pneumonia (RIOP) [2]. We report the exceptional case of a RIOP that occurred early after the end of thoracic irradiation and whose diagnosis was particularly challenging in the context of COVID-19, which can also be responsible for diffuse interstitial pneumonitis [3].

A 64-year-old patient with no history other than emphysema and smoking was diagnosed with a right lung adenocarcinoma,

with mediastinal lymph nodes and bone metastasis. The patient was first treated with chemotherapy and then, after relapse, with immunotherapy for two years. After this, locoregional disease progression was observed in the upper right lobe. The patient received three cycles of chemotherapy with poor tolerance. Thoracic and lymph node irradiation (66 Gy in 33 fractions), including a large target volume (PTV = 667 cm<sup>3</sup>) was then performed. Mean dose received in right lung (Dmean right lung) was 31.4 Gy, Dmean left lung was 17 Gy, Dmean both lungs without PTV was 17.6 Gy. In April 2020, ten days after the end of RT, during COVID-19 pandemic period, the patient was admitted to intensive care for acute respiratory failure. The blood analysis of the patient showed a biological inflammatory syndrome without hyperleukocyte reaction. A CT scan of the patient's chest showed diffuse bilateral ground-glass opacities (GGO) outside radiation field and comparable to the COVID-19 acute scan results (Fig. 1). Given the epidemic context, the first proposed diagnosis was COVID pneumonia. However, two COVID-19 RT PCRs were negative. Fibroscopy with bronchoalveolar lavage revealed 200 cells/mm<sup>3</sup>, including 44% macro-



- Axial chest CT image of the primitive tumor (right superior lobe)
- Axial chest CT image before RT
- Axial chest CT image showing bilateral ground-glass opacities (GGO) outside radiation field, witness of the acute inflammatory phase (alveolitis, red arrow).
- Axial chest CT image showing the persistence of GGO and evolution towards consolidation on some areas (red arrow)

**Fig. 1.** Timeline of disease history. (a) Axial chest CT image of the primitive tumor (right superior lobe), (b) Axial chest CT image before RT (c) Axial chest CT image showing bilateral ground-glass opacities (GGO) outside radiation field, witness of the acute inflammatory phase (alveolitis, red arrow) (d) Axial chest CT image showing the persistence of GGO and evolution towards consolidation on some areas (red arrow). (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

phages, 40% lymphocytes, 10% neutrophils, and 6% eosinophils. No BAAR, aspergillus, CMV, mycoplasma, and a small amount of pneumocystis DNA were found in the bacteriological analysis. Without discussion for an infectious cause, the patient received corticosteroids and sulfamethoxazole. Improvement in clinical symptoms was seen within a week. Control CT scans, one and three months after the end of RT, showed disappearance of alveolar condensation images.

RIOP is a relatively rare syndrome. Most cases have been identified after postoperative RT for breast cancer [4,5]. A cohort study on RIOP after stereotactic ablative RT for lung cancer recently identified a 2 years incidence of 5.2% [6]. Several risk factors of RIOP have been recorded but most cases remain idiopathic [7]. As seen in our case report, a relatively large volume of irradiated lung and immunotherapy could be associated with an increase of RIOP incidence [8].

In front of interstitial lung disease in patients with cancer with a history of thoracic RT, RIOP must be considered in the many possible differential diagnoses. Currently it is sometimes difficult to make the right diagnosis between COVID 19 pneumonia and a potential RIOP because of the overlapping clinical and radiological characteristics.

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#### Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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