Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Radiotherapy and Oncology 147 (2020) 222–223

Contents lists available at ScienceDirect

Radiotherapy and Oncology

journal homepage: www.thegreenjournal.com

COVID-19 Rapid Letter

RILI model and the Covid-19 pneumonia: The radiation oncologist point of view ☆

To the Editor

With regard to the letter written by Kirkby C, investigating a hypothetical benefit of the whole lung low dose radiotherapy (LDRT) to treat COVID-19 pneumonia, several considerations should be examined in light of the recent advances in the pathophysiology of COVID-19 pneumonia provided by autopsies [1].

As a result, a massive lung parenchyma destruction by the virus, macrophages invasion, so lymphocytes and thrombotic features with disseminated life-threatening coagulation disorder have been reported [2].

The Radiotherapy community could contribute to this issue starting from the well established interactions of the immediate cellular-immune system triggered by ionizing radiation as it occurs in the Radiation Induced lung Injury (RILI) model in order to understand the processes and management of this life-threatening disease [3]. While the hypothetical benefit from LDRT in palliation symptoms could raise some doubts and disappointed expectations.

Symptoms, radiological CT findings of the chest and histological features occurring in COVID-19 pneumonia seem to mimic the RILI model in all phases of its course. As in the RILI, a wide variety of CT findings have been reported in COVID-19 pneumonia: ground glass opacities, consolidation, linear opacities and a crazy-paving pattern to the whited out lung according to the severity of lung parenchyma involvement [4].

By postmortem autopsies in affected patients, destruction of lung alveolar structure with exfoliated pneumocystis I-II, giant macrophages, fibrinous exudate in alveolar cavity, thrombosis in micro vessels, pulmonary tissue hemorrhage and interstitial fibrosis as the result of the direct virus injury have been assessed [5]. Why use the RILI model for this concern?

As the virus, radiation disrupts epithelial and endothelial integrity leading to edema, recruitment of leukocytes, resident activated platelets, immature mesenchymal and endothelial cells, neoangiogenesis, and a cascade of a self-sustaining cycle of inflammation through three main phases of pulmonary radiation response which mimic the COVID-19 pneumonia process [6].

Following radiation exposure, an increased capillary permeability occurs contributing to pulmonary edema. In turn, damage to type I and II pneumocytes leads to loss of surfactant and transudation of serum proteins into the alveoli. Later, cytokines (e.g. Il-1, IL-6, IFNγ, TNF), growth factors (VEGF, FGF) released from damaged lung cells attract inflammatory cells like activated macrophages, resident platelets and mesenchymal lung cells to the alveoli and pulmonary interstitium, inducing an acute pneumonitis which could evolve into ARDS syndrome or fibrosis [7]. Applying this model to explain the COVID-19 pneumonia development, a targeted therapy and tailored gentler ventilation protocols could be useful to minimize the severity of respiratory failure, as reported in RILI.

In the management of RILI, recently drugs directed against the neutrophilis or coagulant activated macrophages and platelets such as sivelestat sodium, nebulized heparin, anti-Cox2, multikinase inhibitors have been tested with promising results [8,9]. The hypothesis of the potential benefit of LDRT in COVID-19 pneumonia is a fascinating theory but it arises by empirical experiences of the past, while the RILI model has certain established mechanisms and current solutions that can draw the whole medical community's attention to the fight against COVID-19 pneumonia.

Conflict of interest

The authors declare no conflict of interest.

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https://doi.org/10.1016/j.radonc.2020.04.027
0167-8140/

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Received 16 April 2020
Accepted 18 April 2020

Available online 7 May 2020