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Editorial

Low-Dose Radiation Therapy to Treat COVID-19: Results of the First Phase of Clinical Trials

Ghaznavi H*
Department of Radiology, Faculty of Paramedical Sciences, Kurdistan University of Medical Sciences, Sanandaj, Iran

***Corresponding author:** Hamid Ghaznavi, Department of Radiology, Faculty of Paramedical Sciences, Kurdistan University of Medical Sciences, Sanandaj, Iran

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Using low-dose radiation therapy (LDRT) to treat inflammation, pneumonia, and coronavirus disease 2019 (COVID-19) has been investigated. Results have revealed that LDRT can improve inflammation in different line cells, animals, and humans. It was demonstrated that LDRT with a single dose (0.3-1 Gy) to the lungs could treat pneumonia resulting from COVID-19 by avoiding normal tissue toxicities. These suggested values of doses are obtained from the historical use of ionizing radiation for pneumonia [1].

A clinical study recently treated five patients with COVID-19 in the age range of 64-96 years; the lungs of these patients were exposed to 1.5 Gy of radiation in one fraction. Results showed that their respiratory conditions were quickly improved in four patients in the first 24 hours of exposure. The results of blood tests and imaging also confirmed the positive effect of LDRT on COVID-19 treatment [2]. Short course results of another study carried out on five patients with COVID-19 aged over 60 years, who underwent national COVID-19 therapy protocols, showed that using 0.5 Gy of radiation in one fraction led to the improvement of four patients in the first few days after exposure. Apart from that, they were discharged from the hospital with an average of 6 days, and no radiation toxicity was observed in them [3]. Another clinical investigation has used LDRT on nine patients to treat COVID-19. In this study, patients received 1 Gy to total lungs, and the $SatO_2/FiO_2$ index of these patients was evaluated. Results showed that this index significantly improved 72 hours and one week after LDRT, and inflammation of the lungs decreased one week after radiation therapy. Compared to patients who did not receive LDRT, the median days of hospitalization of patients who received LDRT was reduced by approximately one-fifth. Among these patients, seven were discharged, and two patients died [4].

The incidence of cancers such as lung, esophagus, and breast is one of the controversial subjects surrounding the use of LDRT in COVID-19 treatment. According to the Biological Effects of Ionization Radiation VII (BEIR VII) model, the risk of lung cancer was estimated for patients with COVID-19 whose lungs were irradiated to 0.5 Gy. The incidence of lung cancer can increase by 0.84% and 2.3% for males and females aged above 60 years, respectively. On the other hand, for young patients aged 25 years, the incidence of lung cancer was estimated at 1.1% and 3% for males and females, respectively [5]. According to this model, with an increase in the dose received by the lungs, the risk of lung cancer increases linearly; therefore, the incidence of lung cancer for patients whose whole lung receives a dose of 1.5 Gy will be three times for those who have received a dose of 0.5 Gy [6]. Based on these results, exposure of the lungs to the dose in the range 0.5-1.5 Gy can increase the risk of lung cancer up to 9% and 7% for female patients and 3.3% and 2.5% for male patients aged 25 and 65, respectively. Of course, it should be noted that smoking should be considered in estimating the risk of lung cancer in addition to the radiation factor. Besides the lungs, the heart and esophagus may also be exposed to radiation, increasing the risk of esophageal cancer and heart disease. Nevertheless, blood factors, smoking, and a history of heart disease can be influential in the incidence of heart disease in addition to radiation [7,8].

Results of these clinical trials have shown that the recommended dose (0.5-1.5 Gy) can increase lung cancer up to 9%. As one of the possible effects of ionizing radiation is carcinogenicity, no threshold has been defined for its occurrence, but another issue in radiobiology is the risk-benefit of ionizing radiation. As no radiation toxicities were reported in the said clinical studies, it seems that LDRT is safe; however, more clinical studies are needed to prove this claim. We should not hastily recommend the use of LDRT as an adjuvant treatment for COVID-19. To make a definite comment and evaluate the feasibility and efficacy of LDRT to treat COVID-19, we need more clinical studies with many patients.

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