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Perspective

Circulating RNA as Radiological Biomarkers: The New Prospect in Oncogenic Tumour Radiation

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DESCRIPTION

According to World Health Organisation (WHO) data, among the top 20 variables that endanger human life and health, cancer is the most serious. Surgery, radiation, chemotherapy, and immunotherapy are the treatment options for cancer. Radiation therapy is a critical treatment to reduce tumour burden and increase patient survival for the majority of highly metastatic and recurring cancers. Despite the significant advances gained in clinical therapy, radioresistance—whose causes have not yet been fully understood—remains an unavoidable obstacle to successful treatment. Additionally, therapeutic applications and radiosensitization techniques based on molecular processes and targets are currently insufficient. Circular RNAs (circRNAs) are thought to have a significant role in radiation resistance and susceptibility, tumour growth, and other biological processes. In this review, the causes of tumour radiation resistance brought on by circRNAs are outlined, and the molecular processes and targets of action are made clear. The potential use of circRNAs as radiation clinical indicators, laying the theoretical groundwork for circRNA-based radiotherapy approaches for cancer were also assessed.

One of the traditional forms of cancer treatment is radiation therapy. More than 50% of oncology patients receive it, and it may be used alone or in conjunction with chemotherapy and immunotherapy. One of the worst causes of cell death is radiation-induced DNA double-strand breaks. When exposed to radiation, cells either produce excessive free radicals that directly damage DNA or DNA double strands break immediately. Additionally, radiation can simultaneously cause alterations in the cell cycle, apoptosis, and autophagy, which can affect the proliferation, invasion, and other characteristics of tumour cells.

But there are still some inescapable issues with radiation, such as how to manage side effects and use precise radiotherapy techniques. Radiation tolerance is one of these issues, which is a frequent and connected phenomena that hinders treatment effectiveness and leads to tumour recrudescence or a bad prognosis following irradiation. Therefore, it is crucial to understand the processes underlying radiation resistance, identify patients who will respond well to radiotherapy, and develop tactics for doing so. CircRNAs, a naturally occurring phenomenon of many, ubiquitous single-stranded RNAs, were at first thought to be ineffective byproducts of splicing in the 1970s.

High-throughput RNA sequencing has since extensively explained their structures and activities. A tiny percentage of circRNAs are found in the nucleus, where they interfere with the transcription of parental genes *via* RNA polymerase II or U1 Small Nuclear Ribonucleoprotein (snRNP). CircRNAs have a varied distribution. CircRNAs are carried into the cytoplasm by the nuclear proteins UAP56 and URH49, where they serve as Competitive Endogenous RNAs (ceRNAs) by sponging miRNAs.

CircRNAs have become one of the primary regulators of human illnesses, according to mounting data. CircRNAs are associated with radiosensitivity and radiation resistance in tumours. Apoptosis, autophagy, DNA Damage Repair (DDR), the Epithelial-Mesenchymal Transition (EMT), apoptosis, the cell cycle, and metabolism are just a few of the cellular processes that are affected by radiation to control the radiotherapy response.

Dysregulated circRNAs have been linked to chemotherapy, according to earlier research, with promising therapeutic applications. CircRNAs are now only being used in radiation in a restricted way.

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