

How Does Radiation Effect the Endocrine System?

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ABSTRACT

A literature study of radiation effect on endocrine system is described. Endocrine disorders are common to people who they are exposed to radiation, it develops of hormone dysfunction and neoplasms in the irradiated gland and require long-term follow-up. Herein we discuss effects of radiation on the endocrine system.

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Introduction

Endocrine glands are susceptible to irreversible damage by natural radiation and radiation exposure in diagnosis and medical treatment procedures¹. The pituitary and thyroid are most likely to be affected². In addition to the endocrine effects, the increased rates of birth defects and carcinomas may also be increased in the population exposed to excessive radiation leads to cancers such as leukemia and melanoma³. With the advancements in radiation treatments, survival rates are improving for patients with cancer and tumors. Consequently, the number of cancer survivors at risk for late consequences of treatment is expanding⁴. Endocrine disorders are extremely prevalent among these people. In order to prevent further morbidity and deterioration in the quality of life, it is vital to recognize and promptly treat these.

What is the Endocrine System?

The endocrine system⁵, often known as the hormone system, is present in mammals, birds, fish, and many more. You can break them down into lymphatic glands, the hormones produced by the glands and secreted into the blood or the intercellular fluid, and hormone-recognition and response receptors located in various cell types and organ systems.

Effects of Radiation on the Endocrine System

Below are some probable effects of radiation on the endocrine system.

Hormonal Deficiencies

Radiation or radiotherapy is known to produce hormone shortage in some patients, with adolescents being particularly

susceptible to this potential adverse effect⁶. The effect of radiation exposure on the development of hormone deficit in patients treated for brain tumors has been examined in detail by researchers at the University of Cincinnati. The study analyzed data from 189 patients treated with proton therapy at Massachusetts General, with an average follow-up of 4.4 years. While the results support the efficacy of sophisticated radiation technologies such as proton therapy in treating brain cancers, they also shed light on how radiation causes hormone shortages by affecting the endocrine system.

**Figure 1.**

These data will help physicians predict the risk of hormone deficiencies in patients receiving radiotherapy for brain tumors

based on patient age and radiation dose. Physicians can use this understanding to guide their treatment planning.

Thyroid Dysfunction

In recent years, there has been a growing emphasis on endocrine dysfunction, particularly thyroid malfunction following radiation exposure. Thyroid dysfunction may be related to dyslipidemia, which has been shown to be a risk factor for ischemic heart disease and all-cause death.

Regarding this aspect, the relationship between changes in thyroid function and radiation exposure may be significant, given that radiation is related to increased thyroid dysfunction and mortality.

Researchers investigated the probable association between changes in radiation exposure and endocrine function, such as thyroid function and glucose metabolism. Research suggests that thyroid dysfunction resulting from radiation exposure may be connected with changes in body mass index (BMI), weight, and even induced obesity and metabolic implications, such as diabetes.

Effects on Growth Hormones

Research indicates that cranial radiation can disrupt hypothalamic-pituitary function, most commonly impacting growth hormone status in the body. The growth hormone stimulates the growth of all bodily tissues, including bone.

A deficiency in growth hormone affects the growing height in children. However, greater radiation doses may result in more extensive hypothalamic-pituitary damage. To enhance final height, gonadotropin-releasing hormone analogs are currently used to treat early puberty caused by cranial irradiation. Growth therapy in adulthood can also increase the quality of life.

Conclusion

These are some ways in which radiation exposure may affect the endocrine system. However, further studies and the latest advancements and geared towards minimizing these adverse effects.

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Conflicts of interest

There is no conflict of interest to note.

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