Clinical Aspect of Injury-Related Radiation Exposure

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\textbf{A B S T R A C T}

Radiation exposure can occur due to a multitude of sources, such as environmental variables, occupational activities, medical treatments, inadvertent accidents, or deliberate actions. The purpose of this review was to provide a detailed analysis of the clinical aspects associated with radiation exposure resulting from injuries. Both non-ionizing and ionizing sources emit radiation. Nonionizing radiation pertains to radiation characterized by low energy levels, which might induce injuries associated with localized thermal harm. Nonionizing radiation encompasses several forms of electromagnetic radiation, such as microwaves, ultraviolet light, visible light, and radio waves. Ionizing radiation is distinguished by its elevated energy levels, which lead to numerous harmful effects on the human body. The main focus of the treatment is decontamination, relieving symptoms, providing supportive care, and offering psychosocial aid. Additionally, it also involves managing any coexisting diseases or injuries. Personalized supportive care is tailored based on the specific dosage, route of administration, and outcomes of exposure, as well as any concurrent conditions. In conclusion, the intensity of radiation damage is influenced by various factors such as the origin, kind, amount, duration, location, susceptibility of individuals, and the overall cumulative exposure.

1. Introduction

Radiation exposure can arise from various sources, including environmental factors, occupational activities, medical procedures, unintentional incidents, or deliberate actions. How bad the damage from radiation is depends on things like the type, amount, and length of time of radiation, as well as the organs that are exposed, the amount of DNA damage, and the metabolic and cellular functions.\textsuperscript{1-3} Additionally, the age, underlying health conditions, vulnerabilities, comorbidities, and cumulative exposures of the individual also play a role in determining the impact of radiation exposure. Radiation emanates from both non-ionizing and ionizing sources. Nonionizing radiation refers to radiation with low energy levels, which can cause injuries related to localized thermal damage. Examples of nonionizing radiation include microwaves, ultraviolet light, visible light, and radio waves. Ionizing radiation is characterized by its high energy levels, which result in many detrimental effects on the human body. Ionizing radiation encompasses both electromagnetic radiation, such as x-rays and gamma rays, as well as particulate radiation, which includes alpha or beta particles, neutrons, and protons.\textsuperscript{2-5} This review aimed to describe a clinical aspect of injury related radiation exposure.

Clinical finding

Exposure to radiation leads to both immediate and delayed consequences. Gathering a comprehensive record of the incident is crucial for evaluating the
extent of radiation exposure as well as any potential accompanying injuries or conditions. The acute impacts refer to the harm caused to cells that divide fast, such as the mucosa, skin, and bone marrow. Following exposure, individuals may have mucositis, nausea, vomiting, gastrointestinal edema and ulcers, skin burns, and bone marrow suppression, which can last for several hours to days. Delayed consequences encompass the development of cancerous tumors, anomalies in reproductive functions, as well as impairments in the functioning of the liver, kidneys, central nervous system, and immune system.  

Physicians should have comprehensive training to identify and manage acute radiation illness, commonly known as acute radiation syndrome. Acute radiation syndrome arises from exposure to substantial amounts of ionizing radiation within a brief timeframe. The onset of symptoms occurs within a timeframe ranging from a few hours to several days, depending on the administered dosage. The symptoms encompass anorexia, nausea, vomiting, weakness, weariness, lethargy, and, in certain instances, prostration. These symptoms may manifest alone or in conjunction with each other. Possible consequences include dehydration, anemia, and infection. Medical treatment for acute radiation exposure involves vigilant monitoring of gastrointestinal, cutaneous, hematologic, cardiac, and cerebrovascular symptoms and signs, both immediately after exposure and during the course of time.  

Radiation therapy exposure  
Radiation therapy is an effective treatment method that has been successfully used to treat various life-threatening illnesses. Individuals who have undergone radiation treatment for cancer are more susceptible to developing a subsequent malignancy, obesity, and dysfunction in the lungs, heart, and thyroid. They also face an elevated overall risk of chronic health issues and mortality.  

Medical imaging and the risks of radiation exposure  
The utilization of ionizing radiation in medical imaging has experienced a significant surge in recent decades. The issue of radiation exposure in medical imaging is increasingly worrisome for both healthcare practitioners and the general public. As medical imaging becomes more prevalent, there is a global emphasis on enhancing safety through the standardization and regulation of radiation dosage in medical diagnostics. Additionally, efforts are being made to educate physicians and the public about this matter.  

The American College of Radiology (ACR) offers the "ACR Appropriateness Criteria," a set of evidence-based standards developed by a panel of specialists. These guidelines serve as a reference for healthcare providers to make informed judgments regarding imaging techniques. Physicians and individuals seeking medical attention should thoroughly evaluate the potential hazards and advantages associated with radiation exposure before making a decision on diagnostic imaging procedures.  

Therapy  
The treatment primarily centers around decontamination, alleviation of symptoms, provision of supportive care, and psychosocial assistance, while also addressing the management of any concurrent disorders or injuries. Individualized supportive care is customized according to the dosage, method of administration, and consequences of exposure, as well as any accompanying conditions. Close monitoring and supportive care are necessary for most individuals who have been significantly exposed to ionizing radiation.  

Prognosis  
The prognosis depends on the individual’s underlying diseases as well as the dosage, duration, and frequency of radiation exposure. Death typically occurs due to hematological failure, damage to the gastrointestinal mucosa, injury to the central nervous system, significant damage to blood vessels, or a subsequent infection. The specific type of radiation, the total amount of radiation received, the length of exposure, and the person’s susceptibility to the effects of radiation all have an impact on the process of carcinogenesis. The exposure victim’s lifetime is at risk.
of developing cancer due to radiation. Because ionizing radiation is being used more and more for medical procedures and diagnosis, there is growing concern about the rise in iatrogenic factors that increase the risk of radiation-induced cancer. Age is a determining factor in how susceptible someone is to radiation. Individuals who are exposed to radiation during prenatal development or at a young age are more likely to develop cancer.2,4

2. Conclusion
The source, kind, quantity, duration, anatomical site, individual vulnerability, and cumulative exposure are just a few of the variables that affect the extent of radiation damage.

3. References