

A STORY OF IGNORANCE: ACUTE RADIATION SYNDROME CASE PRESENTATION

BİR CEHALET ÖYKÜSÜ: AKUT RADYASYON SENDROMU OLGU SUNUMU

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ABSTRACT

Acute Radiation Syndrome (ARS) is a condition that occurs as a result of exposure of a local area or the whole body to a high level (>1 Gy) of radiation in a short time and requires urgent intervention. Although the type and dose of radiation exposed varies according to the volume of tissue exposed to the radiation, the age of the individual and the current health status of the individual and the medical intervention administered, the clinical picture usually presents symptoms for the gastrointestinal, hematopoietic and cerebrovascular system. In addition to these systems, skin damage caused by radiation exposure, known as cutaneous radiation syndrome, may accompany this condition. In this case, evidence-based maintenance processes of a case diagnosed with Acute Radiation Syndrome after a radioactive accident reported by a company operating in the field of industrial radiography at a dam construction site near a village in the Marmara region of Turkey in 2016 were presented.

Keywords: Acute Radiation Syndrome, Case Report, Nursing Care, Radioactive Accident

ÖZET

Akut Radyasyon Sendromu (ARS), vücudun lokal veya tamamının, çok yüksek dozda (>1 Gy) radyasyona maruz kalması sonucunda ortaya çıkan klinik durumdur. Maruz kalınan radyasyon dozu, radyasyon tipi, ışınlanan doku hacmi, hastanın yaşı, mevcut sağlık durumu ve uygulanan tıbbi müdahaleye göre değişen klinik tabloda genellikle hematopoetik, gastrointestinal ve serebrovasküler sisteme yönelik semptomlar görülür. Bu sistemlerin yanı sıra kutanöz radyasyon sendromu olarak da adlandırılan radyasyona bağlı deri hasarları da bu tabloya eşlik edebilir. Bu olguda Endüstriyel radyografi alanında faaliyet gösteren bir firmanın Türkiye'nin Marmara bölgesine bağlı bir köy yakınlarında bulunan baraj şantiyesinde 2016 yılında bildirmiş olduğu radyoaktif kaza sonrası Akut Radyasyon Sendromu tanısı alan olgunun kanıta dayalı bakım süreçleri sunuldu.

Anahtar Kelimeler: Akut Radyasyon Sendromu, Radyoaktif Kaza, Hemşirelik Bakımı, Olgu Sunumu

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INTRODUCTION

Radiation is defined as the transfer of energy in the form of electromagnetic waves or particles that can pass into the human body (Qutob et al., 2019). This energy can be transmitted through the objects. As a result of the exposure to this transferred energy, a clinical condition called Acute Radiation Syndrome (ARS) may be seen (Qutob et al., 2019; Acosta and Warrington, 2022). The definition of acute radiation syndrome was first described by De-Coursey in 1948, after the atomic bombs dropped on the cities of Hiroshima and Nagasaki in Japan during World War II, in 1945 (De-coursey, 1948). It has been reported that the data obtained about acute radiation syndrome were obtained as a result of radiation accidents observed after the nuclear power plant accident in Chernobyl, Ukraine and the clinical data obtained from patients to whom radiotherapy used in cancer treatment was applied (Acosta and Warrington, 2022; Chobotko, 2018). The main reason for the development of acute radiation syndrome is known as damage to immature parenchymal stem cells in certain tissues. The clinical results of acute radiation syndrome in individuals may occur at different levels depending on the level of biological damage caused by radiation, the dosage of radiation exposed, the type of radiation, the distance of the individual to the radiation source, the presence of the protection factor between the source and the individual, and the medical intervention applied after exposure (Acosta and Warrington, 2022; Chobotko, 2018; Macvittie et al., 2019; Zeyrek, 2013). Although many tissues in the organism are affected by the damage caused by radiation, it is seen that hematopoietic cells, spermatocytes in the testicles and crypt cells in the intestinal system are affected when exposed to high doses of radiation. (Macvittie et al., 2019; Yüce and Barlas, 2021; Alagöz, 2017). It is also known that the skin is an organ with high sensitivity to radiation. Radiobiologic effects such as erythema, changes in nails and hair, decrease in hair growth and deterioration in the pigment of the skin at high doses manifest themselves as ulceration and dermatitis (Macvittie et al., 2019; Alagöz, 2017; Arslan, 2017). It is known that the cells that are most sensitive to radiation are those with the highest mitotic activity and the lowest degree of differentiation. Therefore, the hematopoietic system and gonads are more affected compared to other systems (Bulus, 2017). In this case, the evidence-based care processes of the case diagnosed with Acute Radiation Syndrome after a radioactive accident reported in 2016 by a company operating in the field of industrial radiography at a dam construction site located near a village in the Marmara region of Turkey are presented.

MATERIALS AND METHODS

Description of the Case

According to the statement of a sixteen-year-old male patient, he works as a worker at the E.B dam construction site.

Problem Definition of the Case

During the period when the case was working as a worker, a company operating in the field of industrial radiography and licensed by TAEK planned to carry out radiography work at a dam construction site near a village in the Marmara region of Turkey.

Due to the rainy weather, the work was canceled, the guide tube and the slider cable were removed from the device quickly and the device and its accents were placed in the vehicle. However, before the device was placed in the vehicle, the company officials left the scene without realizing that the radioactive source (Figure 1-a) had fallen from the device. Our case, who was working at the dam construction site, mistook the radioactive source for a prayer bead, picked it up from the place where it fell, kept it in the back pocket of his trousers (alternately in both pockets), and during the approximately two and a half hour journey, he caused exposure and contact with the source to people who were in the same public transportation and family members with whom he lived. E.B. started to complain of loss of appetite, red eyes, tingling in his hands, severe vomiting, dizziness, headache and diarrhea on the same day after exposure.

Initiatives

The case was admitted to the emergency department with increasing complaints the day after contact with the radioactive source, but since the suspicion of radioactivity was not known, IM treatment was administered in the emergency department for nausea and vomiting. In the following hours, the case complained of pain in the buttocks and it was observed that both buttocks were very stiff, darkening on the lower side of the buttocks, reddening on the upper side and white blisters on the right and left

buttocks above the redness. The case was discharged after treatment in the emergency department, and when the case was admitted to the hospital again, 2nd and 3rd degree burns of 5×5 centimeters in size were detected on the hands and both buttocks of the case (picture 1-b, c). At the same time, the company was reported that the substance named Iridium-192 in the device was missing and the people at the construction site were warned. The workers at the construction site reported that our case, E.B, took this substance thinking it was a rosary and it was understood that the symptoms of the case were caused by the radioactive substance. It is estimated that the case was exposed to a radiation dose corresponding to 200-300 thousand X-rays in the hip area. As a result of biological dosimetry performed through the chromosome aberration test, it was announced that he was exposed to a dose of min 1024- max 1331 mGy. Due to high dose radiation exposure in a short period of time, his treatment continued with the diagnosis of Acute Radiation Syndrome.

After emphasizing that the integrity of the biological barriers will be disrupted after radiation exposure and susceptibility to infection will increase, it is recommended to use the antibiotic, antiviral and antifungal treatment group of neutropenia prophylaxis (Evidence; 2B, Recommendation; Strong) (Assasi and Grobelna, 2017). Treatment of the case was Meropenem 3x1, Levofloxacin 1x500 mg- acyclovir 2x500 mg- fluconazole 1x50 mg in parallel with evidence-based applications. As a result of radiation exposure, it is recommended in the literature to transfuse blood products irradiated at a minimum of 25 grays in order to prevent complications such as graft versus host, febrile non-hemolytic reactions and CMV infection (Level of Evidence: 1B) (Treleaven et al., 2010). In this case, transfused blood products were irradiated with 25 gy radiation and no post-transfusion complications were observed. In the treatment of the case, Ondansetron- IV 8 mg bolus followed by 1mg/hour infusion, ondansetron maintenance: PO 3x8mg, and application after washing the leukocytes, Granulocyte colony stimulating factor (G-CSF), cytokines was used in the first 24 hours and skin grafting, left hand fingers amputation, composite skin transplantation and mechanical microdermabrasion procedures were performed. During the treatment and care process, the case's fall risk, fluid electrolyte imbalance, pain status, risk of pressure sore development, skin integrity and wound care were evaluated and treatment and care were continued.

Verbal and written informed consent was obtained from the case before writing the case report. This case study was written in accordance with the Declaration of Helsinki and ethics committee approval was not required.



Picture 1. a: the substance in contact with the case, **b:** wounds on the hand after contact with the object, **c:** wounds in the dordogluteal region after contact with the object

CONCLUSION

The effects of Acute Radiation Syndrome vary according to the degree of radiation exposure in patients. Early diagnosis and treatment processes prevent permanent consequences on the patient. In the follow-up of these processes, evidence-based practices should be followed and continued in line with the recommendations. In this case, the treatment and follow-up of E.B., who was evaluated in the light of evidence-based guidelines in diagnosis and treatment processes, continues.

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