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Pathological Investigation of Cobalt radiation on the Liver and spleen of Rat

Navid Hosseini Mansoub

Department Of Animal Science, İslamic Azad University, Maragheh Branch,Iran

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ABSTRACT

This study was investigation effect of Cobalt radiation on liver of Wistar rats. The results showed that the use of different levels of dosage dependent changes in different parts of the liver tissue. On the first day after the irradiation the animals were very lethargic. Areas of necrotic hepatocytes and cell swelling were seen in G3 and G4. But in the group 4 severe congestion was seen. Also pathological study of spleen was showed that necrosis in some parts of the spleen in 3 exposed groups and fibrinoid degeneration in the central splenic vein in group 4.

Key words: Liver, Spleen, Cobalt irradiation, Rat, Necrosis.

INTRODUCTION

Co-60 is used medically for radiation therapy as implants and as an external source of radiation exposure. Combination of surgery, chemotherapy and radiation treatment are the mainstay of the modern cancer therapy [1]. Studies from exposed human and animals indicate that radiation from cobalt can affect a wide variety of tissues with greater levels of cellular divisions , [2], Necrosis and inflammation were the key features of high dose radiation injury. Exposure to the moderately low doses of cobalt 60 radiation has resulted in decreased body weight.

Radiation may be used as adjuvant or primary therapy in a variety of tumors in the chest, abdomen and pelvis. Therapeutic radiation affects not only malignant tumors but also surrounding normal tissues. The risk of injury depends on the size, number and frequency of radiation fractions, volume of irradiated tissue, duration of treatment, and method of radiation delivery. Combination of surgery, chemotherapy and radiation treatment are the mainstay of the modern cancer therapy [1]. Studies from exposed human and animals indicate that radiation from cobalt can affect a wide variety of tissues with greater levels of cellular divisions [2], Necrosis and inflammation were the key features of high dose radiation injury. Exposure to the

moderately low doses of cobalt 60 radiation has resulted in decreased body weight [3]. High-energy electromagnetic radiation emitted by certain radionuclides when their nuclei transition from a higher to a lower energy state. These rays have high energy and a short wave length. Gamma rays penetrate tissue farther than do beta or alpha particles, but leave a lower concentration of ions in their path to potentially cause cell damage. Patients with breast cancer, the combination of lumpectomy and radiation therapy as primary treatment has become more commonplace. Studies from exposed human and animals indicate that radiation from cobalt can affect a wide variety of tissues particularly those with greater levels of cellular turnover and divisions also expose to the Moderately low doses of cobalt-60 radiation has resulted in decreased body weight and organ weight [4-6].

In this study, we investigated the effect of different level of cobalt radiation on liver of rat.

MATERIALS AND METHODS

At first 20 rats were divided to 4 groups.
G1) First group as control group did not receive any radiation,
G2) was irradiated with 5 Gy,
G3) was irradiated with 7.5 Gy,
G4) was irradiated with 12 Gy.

Animals were housed under standardized conditions for light and temperature. A commercially prepared diet and clean drinking water were provided ad libitum. The rats were anesthesized with an intraperitoneal injection of mixture of ketamin (80mg/kg) and xylazine (8 mg/kg) prior to irradiation. Rats were randomly divided into four groups (n=15/group) and three groups were irradiated with 5 Gy, 7.5 Gy and 12 Gy, on the whole body for 10 to 15 minutes. The first group served as normal control. Irradiation was performed through the use of cobalt 60 rays with the device from a Canadian company Tretron, model Phoenix, belonging to the Cancer treatment center of Omid hospital, in Urmia. The cobalt radiation was administered to the body using a 250 kv orthovoltage system. A custom designed positioning device based on the standard steriolactic frame was used so that 15 animals could be simultaneously irradiated. Dosimetry was performed by implanting lithium fluoride thermoluminescent dosimeters into various areas. The corrected dose rate was determined to be 205/69c GY/min and irradiated with a distance of 7.5 cm on the field of 35x35 in the dorsoventrl axis.

During 30days after irradiation behavioural changes and other changes, mainly on the body surface, and lethality were recorded. The surviving rats at the end of experiment were sacrificed with carbon dioxide.

Samples for histological analysis were processed by commonly used methods. Whole lungs were fixed in %10 formaline.

RESULTS AND DISCUSSION

Different dosages of cobalt radiation had different changes on liver tissue. On the first day after the irradiation the animals were very lethargic. However the apparent lack of gross evidence of

any severe effect for several days was unusual. About the fifth to sixth day following exposure weight loss and ruffled fur were observed in group one and by eight day some of them died. Daily mortality increased by 10^{th} to 14^{th} day then subside. When the radiation increased to 7.5 GY somewhat different pattern of illness and death occurred. The animals in this group were severely injured by the day 3^{rd} to 4^{th}.Loss of weight were pronounced and by the fifth day some of them were dead. There was a sharp peak of mortality. None were survived beyond the 2^{nd} week. The animals which received the highest dose of irradiation were severely prostrated, very wet with sweat and by the second day some of them were already dead by the 3^{rd} day. All the rats in this group died in the 1^{st} week period. In all three groups areas of necrotic hepatocytes and cell swelling were seen (figure 1) but in the group 4severe congestion was seen. In all three groups, some of the cells lose their nuclei and cells in tissue can be seen as separate Furthermore, cell swelling occurs and the atmosphere of sinusoid is more expanding. Also pathological study of spleen was showed that necrosis in some parts of the spleen in 3 exposed groups and fibrinoid degeneration in the central splenic vein in group 4(fig2).

In the experience in humans that the tolerance of the whole liver is 30–35 Gy in conventional fractionation, but parts of liver can be treated with doses in excess of 70 Gy with three-dimensional radiotherapy treatment planning [7]. Radiation-induced liver disease (RILD), or radiation hepatitis, is a clinical syndrome of anicteric ascites and hepatomegaly occurring 2 weeks to 4 months after hepatic irradiation, because of venoocclusive disease[7].In the spleen may be irradiated to treat lymphoma, splenomegaly or hypersplenism. It is very radiosensitive and lymphoid tissues are destroyed within hours after a dose of 4–8 Gy [8-9]

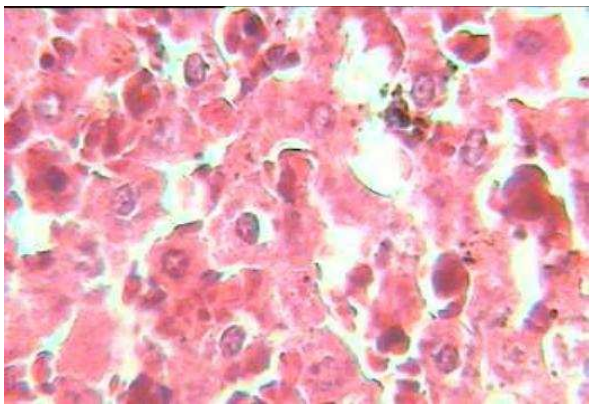

Fig1: Necrosis of liver cells in rat
(H&E X400)

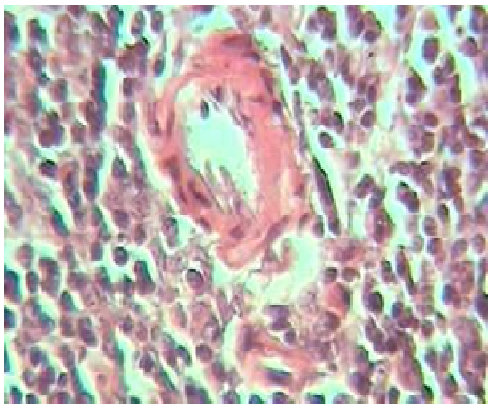

Fig2: fibrinoid degeneration in the central splenic vein in the liver of rat
(H&E X400)

REFERENCES

[1] Lee AWM, Cheng LOC, Ng SH.**1990,** *Clin Radiol* 1990; 42:24-31
[2] Blatt DR, Friedmann WA, Bova FJ, Theele DP, Mickle JP.**1994**. *J Neurosurg* ; 80:1046-1055.
[3] Clemente CD, Holst EA.**1954**. *Arch Neurol Psychiatry* ; 71:66-79.

[4] DeAngelis LM, Gutin PH, Leibel SA. Murtin Dunitz Ltd. **2002**. Interacranial tumors. Dignosis and Treatment.
[5] Rubin P, Gash DM, Hansen JT, Nelson DF, Williams JP. *Radiother Oncol* **1994**; 31:51-60
[6] Schultheiss TE, Stephens LC. *Br J Radiol* **1992**; 65: 737-753.
[7] Lepke RA, Libshitz HI. *Radiology* **1973**; 106: 195–7.
[8] Lawrence TS, Robertson JM, Anscher MS, Jirtle RL, Ensminger WD, Fajardo LF. *Int J Radiat Oncol Biol Phys* **1995**;31: 1237–48.
[9] Unger EC, Lee JKT, Weyman PJ. *J Comput Assist Tomogr* **1987**; 11: 264–8.