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Platelet Count Changes in Solid Cancer Patients Under Radiation Therapy- 1 Year Prospective Study

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Abstract

Background: Normal platelet count ranges from 150,000 to 450,000 cells per microlitre of blood. Radiotherapy is generally used as a part of cancer treatment to control or kill malignant cells. However normal blood cells are affected too. Thrombocytopenia is common complication of radiation therapy that often increases the risk of bleeding and therefore, causes treatment interruptions.

Material and Methods: All patients were histopathologically or FNAC proven solid cancer patients. They received radiotherapy for at least 4½ weeks using conventional fractionation schedules (5fractions/week). Platelet counts were performed at baseline and then once in two weeks during the course of therapy.

Results: A total of 24 radiotherapy patients were analyzed. The outcome of study showed that there was no drastic decrease in platelet counts even after the effects of radiotherapy, therefore it is least affected.

Conclusion: No drastic decrease in platelet counts were found during radiotherapy. As sample size could not be that large. So, more rigorous studies involving larger sample size are needed for further understanding into this vital aspect of oncology.

Keywords: Platelets, radiotherapy, solid cancer, thrombocytopenia

Introduction

In malignancy, it is known that the tumor cells compete with the normal host cells and ablate the immune system causing nutritional deficiencies manifesting as anaemia and deranged haematological parameters. Additionally, radiotherapy and chemotherapy which are the important treatment modalities for various malignant tumors, themselves incur myelosuppression. Hence, a thorough knowledge about the haematological profile of cancer patients before, during and after treatment is important.

Radiation includes alpha, beta and gamma rays and neutrons with sufficient energy to generate ion pairs (electrons), which can generate chemically active free radicals [1]. These radicals can damage the molecular structure resulting in cell dysfunction (somatic effect) or mutations (genetic damage). The alterations caused by radiotherapy do not occur immediately and may take weeks or even months to occur. Many studies have shown that high-dose ionizing radiation obtained by accidental exposure or radiation therapy can damage human health, such as inducing cancer, invading the haematopoietic system, and causing leukemia [2].

Bone marrow is one of the organs at risk as a result of treatment with radiotherapy and the most radiosensitive cells in the body are the haematopoietic stem cells in the bone marrow which are continuously replacing circulating peripheral blood cells. Previous studies have reported that

radiation can cause great damage to haematopoietic system components, which leads to the reduction of platelets, and subsequently life- threatening thrombocytopenia [3]. In general, declines in the lymphocyte, granulocyte and eryothrocyte counts occur over hours, days and weeks, respectively [4]. The platelet count typically declines 5-10 days following exposure to a mild or moderate IR dose [5]. The duration of thrombocytopenia correlates directly with IR dose and platelet utilisation at sites of active bleeding (due to non- haematological sequelae of IR exposure such as gastrointestinal injury, trauma, etc) [5].

Platelets play an important role in haemostasis. A normal platelet count ranges from 150,000- 450,000 per micro litre of blood. Thrombocytopenia is a term used to indicate a remarkable reduction or drop in platelet counts [6]. It is common complication of radiotherapy that often increases the risk of bleeding and therefore, causes treatment interruptions. Additionally, in radiation injured persons, bleeding and thrombocytopenia are directly responsible for significant mortality [7]. When the platelet count is low, the treatment may either be delayed or a lower dose is recommended until the platelet levels return to normal. In a drastically low platelet count, platelets are transfused.

Material And Methods

The present study was conducted as a prospective study for a period of one year w.e.f 1st November, 2020 to 31st October, 2021 in the Postgraduate Department of Pathology, Government Medical College, Jammu.

Inclusion Criteria

The study included all patients of solid cancer with histopathologically/FNAC proven diagnosis; receiving radiotherapy; referred to the postgraduate Department of Pathology from Department of Radiotherapy and Oncology, Government Medical College and Associated Hospitals Jammu.

Exclusion Criteria

1. Patients with terminal stage cancers.
2. Patients with a known disease of the haematopoietic system.
3. Patients with primary decrease of platelet count.
4. Referred patients already on radiotherapy before presentation at the hospital.

The blood samples of patients were routinely collected in the OPD wing of the department of Pathology. All the patients received radiotherapy for at least 4½ weeks using conventional fractionation schedules (5fractions/week). Platelet counts were performed at baseline and then once in two weeks during the course of therapy.

Results

The platelet values of patients from 22-72 years of age receiving radiotherapy using conventional fractionation schedules are given below in the table. After two and four weeks of radiotherapy the value of platelets ranges from 1.3-3.5 lakh cells per micro litre and 1.0- lakh cells per micro litre respectively

Table: Results of platelet count changes in patients

Samples	Age	Gender	Baseline (lakh)	2 weeks (lakh)	4 weeks (lakh)
1	31	F	2.0	1.5	1.2
2	46	F	3.0	2.6	1.8
3	60	F	2.8	1.5	1.4
4	67	M	1.5	1.3	1.6
5	22	F	4.0	3.5	2.0
6	50	F	2.6	1.8	1.6

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7	70	M	1.6	1.5	1.3
8	63	F	4.0	3.5	3.5
9	58	F	3.0	2.5	2.2
10	72	M	2.2	1.8	1.0
11	51	M	4.0	3.4	3.0
12	70	F	3.0	2.5	3.0
13	58	F	3.8	3.5	3.2
14	70	M	3.2	2.8	2.6
15	60	M	2.2	2.0	2.6
16	58	M	2.0	1.5	1.0
17	60	M	2.5	2.2	2.0
18	47	M	3.5	3.2	2.7
19	52	M	2.3	1.4	1.9
20	43	F	2.6	2.2	3.0
21	58	M	3.0	2.0	2.0
22	60	F	2.2	2.0	1.5
23	67	M	2.3	2.6	3.0
24	63	M	2.6	2.5	2.2

Discussion

It is observed that no drastic decrease in platelet counts occur even after the effects of radiotherapy. This might be due to the platelet transfusions which counter the effect of bone marrow suppression due to radiotherapy whenever platelet levels are life threatening. The results of a study by Kadiyala SV et al., (2018) [8] are also in support of our above finding who investigated impact of radiation exposure on platelets in cancer patients. No alteration was found in platelet counts in correlation with patient's sex or age in a study by Lundgren MSFS et al., (2008) [9]. A new platelet growth factor, Mpl ligand, is currently under evaluation in phase I trials [8]. An effective platelet growth factor could help to avoid the well-known risks of platelet transfusions derived from multiple donors and also eliminate delays in radiotherapy due to thrombocytopenia. Platelet-derived growth factor (PDGF) stimulates the proliferation of megakaryocytes, erythrocytes, leucocytes, and their progenitors, presumably through the multiple endogenous growth factors released from mesenchymal stem/ stromal cells [10].

Conclusion

Radiation exposure in cancer patients and its impact on platelets have been investigated for 24 patients. No drastic decrease in platelet counts were found during radiotherapy. As sample size could not be that large. So, more rigorous studies involving larger sample size are needed for further understanding into this vital aspect of oncology.

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