

Radiodermatitis incidents in cancer patients receiving radiotherapy at Haji Adam Malik Central Hospital, Medan-Indonesia



Monalisa Manik,^{1*} Ariyati Yosi,² Chairiyah Tanjung²

ABSTRACT

Introduction: Radiodermatitis or radiation dermatitis is a side effect that produced in the skin and its adnexal as a consequence of exposure to radiotherapy. Several factors influence the occurrence of radiodermatitis: factors related to the patient (*intrinsic*), such as age, race, comorbid conditions, nutritional status, and factors associated with treatment (*extrinsic*), such as dosage of radiotherapy, fractionation and radiotherapy techniques.

Methods and results: This study is a descriptive observational study with the prospective approach in 50 patients who received radiotherapy in Haji Adam Malik Hospital, Medan-Indonesia.

Anamneses and dermatological examinations conducted to all subjects on the first day, three weeks, and eight weeks during radiotherapy. From this study, the majority of the patients are women in age of 40-60 years old. The most clinical features are erythema macular rash (100%), and the most location is in the Colli region. The majority of the total dose is 5000-5900 cGy, and the most fractionation used 31-40 fractions.

Conclusions: The results of this study indicate that elderly, high radiotherapy total dose, and fractionation leads to an increased risk of radiodermatitis case.

Keywords: radiodermatitis, clinical pictures, dose radiotherapy

Cite This Article: Manik, M., Yosi, A., Tanjung, C. 2018. Radiodermatitis incidents in cancer patients receiving radiotherapy at Haji Adam Malik Central Hospital, Medan-Indonesia. *Bali Medical Journal* 7(2): 447-451. DOI:[10.15562/bmj.v7i2.776](https://doi.org/10.15562/bmj.v7i2.776)

¹Resident in Department of Dermatology and Venereology, Faculty of Medicine Sumatera Utara University

²Supervisor of Department of Dermatology and Venereology, Faculty of Medicine Sumatera Utara University, Medan-Indonesia

INTRODUCTIONS

Radiodermatitis or radiation dermatitis is a side effect of skin and its adnexal as a consequence of exposure to radiation therapy.¹ It estimated that 95% of patients receiving radiotherapy would have radiodermatitis.¹⁻³ Several factors affect the onset of radiodermatitis, including factors associated with radiotherapies (*extrinsic*), such as radiotherapy dosage, radiotherapy fractionation, radiotherapy techniques, and intrinsic factors, such as genetics, age, radiation exposed areas, comorbidities of other diseases.^{3,4}

Radiotherapy provides a radiation-biological effect of cellular effects that inhibit mitosis and increase cell permeability.⁵ Ionizing radiation disrupts the cell differentiation process in the epidermal layer. Cell proliferation disorders occur due to activation of cytokines and growth factor.⁶ Furthermore, synthesis of other proinflammatory mediators and proteases in the vicinity of fibroblasts occurs.^{7,8} Endothelial cell damage activates the coagulation system component which further leads to inflammatory processes and cytokine production which eventually delay the re-epithelization process.^{1,9}

Acute radiodermatitis usually occurs 2-3 weeks from the start of radiotherapy up to 3-4 weeks after radiotherapy completed. Acute radiodermatitis manifestations include erythema, edema, pain,

pruritus, pigmentation, desquamation, hair loss, nail changes, vesicles or bull formation, erosion or ulceration.¹⁰ Dry desquamation is characterized by squama and pruritus. Wet desquamation is characterized by serous fluid and occurs 4 to 5 weeks after radiation.¹¹ Chronic radiodermatitis can occur several months to years after completion of radiotherapy in the form of permanent damage to the dermis layer.¹²

Research on radiodermatitis is scarce in Indonesia, so this study aims to examine radiodermatitis in Haji Adam Malik Central Hospital of Medan.

METHODS

This study is a descriptive observational study with the prospective approach. This research was conducted from April to June 2016 at Radiotherapy Unit of Haji Adam Malik Central Hospital of Medan. The target population of this study was cancer patients who received radiotherapy at Haji Adam Malik Central Hospital of Medan. The reach population are cancer patients receiving radiotherapy in the Radiotherapy Unit of Haji Adam Malik Central Hospital of Medan from April to June 2016. The sample is taken by consecutive sampling method.

*Correspondence to: Monalisa Manik, Resident in Department of Dermatology and Venereology, Faculty of Medicine Sumatera Utara University
monalisamaniek@yahoo.com

Received: 2017-07-27

Accepted: 2018-2-25

Published: 2018-5-1

Fifty patients with cancer receiving radiotherapy included in the study. A history and dermatologic examination performed on day one before receiving radiotherapy, week 3 and week 8. Total dose and fractionation radiotherapy were obtained from radiology doctor in charge of the patient. The collected data was then processed and then presented in the form of frequency tables and analyzed descriptively.

RESULTS

In this study, it is known that the largest age group is 40-60 years old as many as 34 people (68%), where the incidence happens more in women 29 people (58%). Clinical features of erythema are 50 (100%), with the most common site of the lesion is the Colli region of 16 (32%). The most common dose of radiotherapy is 5000-5900 cGy of 42 people (84%),

and the most common fractionation is 31-40 fractions of 27 people (54%).

Distribution of the clinical picture by age appears when older the patient then the more severe the clinical picture appears. Distribution of clinical features by sex showed that women give a more severe clinical picture when compared with men. Distribution of clinical features based on total doses of radiotherapy seen as a higher total dose of radiotherapy provides a more severe clinical picture. Distribution of clinical features based on fractionation appears that patients who received higher fractionation gave more severe clinical features.

DISCUSSIONS

The sample average age of this study is 50.1 years. Most subjects in tage group 40-60 years of 34 peoples

Table 1 Characteristics of research subject

Groups		n (50)	%
Age	< 20	1	2
	20-40	7	14
	40-60	34	68
	> 60	8	16
Sex	Male	21	42
	Female	29	58
Clinical pictures	Macular erythema.	25	50
	Macular erythema, dry desquamation.	5	10
	Macular erythema, pruritus.	4	8
	Macular erythema, hyperpigmentation.	7	14
	Macular erythema, hyperpigmentation, pain.	2	4
	Macular erythema, hyperpigmentation, dry desquamation	1	2
	Macular erythema, hyperpigmentation, dry desquamation, pruritus	6	12
Location of lesions	Facial	4	8
	Nasal	1	2
	Colli	16	32
	Colli, submandibular	2	4
	Colli, nasal	2	4
	Colli, sternum	2	4
	Submandibular	1	2
	Thorax	10	20
	Abdomen	1	2
	Inguinal	1	2
	Pelvis, inguinal	10	20
Total dosage	2000-2900	2	4
	3000-3900	0	0
	4000-4900	6	12
	5000-5900	42	84
Fraction	21-30 fractions	23	46
	31-40 fractions	27	54

Table 2 Distribution of clinical pictures based on age

Clinical pictures	Age (years)			
	< 20(%)	20-40(%)	40-60 (%)	> 60(%)
Macular erythema	1(2)	7(14)	17(34)	0
Macular erythema, dry desquamation	0	0	5(10)	0
Macular erythema, pruritus.	0	0	4(8)	0
Macular erythema, hyperpigmentation.	0	0	7(14)	0
Macular erythema, hyperpigmentation, pain.	0	0	1(2)	1(2)
Macular erythema, hyperpigmentation, dry desquamation	0	0	0	1(2)
Macular erythema, hyperpigmentation, dry desquamation, pruritus	0	0	0	6(12)
Total	1(2)	7(14)	34(68)	8(16)

Table 3 Distribution of clinical pictures based on sex

Clinical pictures	Sex	
	Male (%)	Female (%)
Macular erythema.	13(26)	12(24)
Macular erythema, dry desquamation.	3(6)	2(4)
Macular erythema, pruritus.	3(6)	1(2)
Macular erythema, hyperpigmentation	2(4)	5(10)
Macular erythema, hyperpigmentation, pain	0	2(4)
Macular erythema, hyperpigmentation, dry desquamation	0	1(2)
Macular erythema, hyperpigmentation, dry desquamation, pruritus	0	6(12)
Total	21(42)	29(58)

Table 4 Distribution of clinical pictures based on radiotherapy total dosages

Clinical pictures	Radiotherapy total dosages (%)		
	2000-2900	4000-4900	5000-5900
Macular erythema	2(4)	6(12)	17(34)
Macular erythema, dry desquamation	0	2(4)	5(10)
Macular erythema, pruritus	0	0	4(8)
Macular erythema, hyperpigmentation	0	0	7(14)
Macular erythema, hyperpigmentation, pain	0	0	2(4)
Macular erythema, hyperpigmentation, dry desquamation	0	0	1(2)
Macular erythema, hyperpigmentation, dry desquamation, pruritus	0	0	6(12)
Total	2(4)	6(12)	42(84)

(68%). Research by Wright et al. found an average age of 51.9 years.¹³ This study suggests that older age increases the risk of radiodermatitis, which in older age there is a decrease in the re-epithelialization process and dermis atrophy resulting in an extension of healing time.¹² Largest group gender is women 29 people (58%). Altöparlak et al. in his study concluded that there was no difference between the sexes of both men and women.¹³

The most common clinical features are macular erythema of 50 people (100%). López et al. in

his study found that clinical features are erythema macula (91.7%), dry desquamation (29.6%) and wet desquamation (35.2%).⁸ Barkham et al. found 80 - 90% of radiodermatitis patients gave clinical features of macular erythema.¹⁴ Locations of the most common lesions is in the Colli region of 16 patients (32%). Brown and Rzućidlo et al. states that every area of the body has a different sensitivity to radiation, and the most sensitive parts of the body are in the anterior colli, the extremities, the chest, the abdomen and the facial area.¹⁵

Table 5 Distribution of clinical pictures based on radiotherapy fractionation

Clinical pictures	Fractionation (%)	
	21-30	31-40
Macular erythema	23(46)	2(4)
Macular erythema, dry desquamation	0	5(10)
Macular erythema, pruritus	0	4(8)
Macular erythema, hyperpigmentation	0	7(14)
Macular erythema, hyperpigmentation, pain	0	2(4)
Macular erythema, hyperpigmentation, dry desquamation	0	1(2)
Macular erythema, hyperpigmentation, dry desquamation, pruritus	0	6(12)
Total	23(46)	27(54)

In this study found the most common dose of radiotherapy was 5000-5900 cGy of 42 people (84%). Porock et al. In his research state that high doses of radiotherapy tend to cause severe reactions in patients. The larger the dose of ionizing radiation, the greater the likelihood of damage it causes.¹⁶ The most typical fractionation is 31-40 fractions of 27 people (54%). The fractionation method is done by dividing the total radiation dose into smaller daily doses, making it possible for the skin to repair due to damage caused by radiotherapy. If the amount of fractionation is high, then the number of cells will continue to decrease and will give clinical effects of radiodermatitis.¹⁷

Distribution of the clinical picture by age appears older the patient the more severe the clinical picture appears. Andrade et al. in his study found that the majority of patients with radiodermatitis occur in the age group of 58-67 years.¹⁸ In elderly, wound healing process due to exposure to radiotherapy longer than younger age. This factor is due to the degeneration process, inadequate food intake, decreased immunity and decreased circulation.^{8,10} Distribution of clinical picture by sex is seen as giving women a more severe clinical picture when compared with men. Meyer et al. in his study of head and neck cancer patients found that women were more at risk of radiodermatitis than men with a ratio of 1: 4.¹⁹

Distribution of clinical features based on total doses of radiotherapy seen as a high total dose of radiotherapy provides a more severe clinical picture. Porock et al. in his research stated that the high dose of radiotherapy tends to cause more severe skin reactions. The greater the ionizing radiation dose, the greater the likelihood of the damage it causes.¹⁵ The distribution of clinical features based on fractionation appears that patients who get the fractionation give a heavier clinical picture. Langhe et al. in his study it was found that patients

who received higher fractionation gave more severe clinical features.²¹ Fractionation method was done by dividing the total dose of radiation into smaller daily doses, making it possible for the skin to repair due to radiotherapy damage, when exposure of radiation sustained over several weeks, the more severe the damage to basal cells in the epidermis.²²

CONCLUSIONS

In this study, there were 50 subjects with radiodermatitis and its showed as follows: From the patient side: The most sex is female (58%) with the largest age group is 40-60 years (68%). In all patients, clinical features of macular erythema were 50 (100%) and the most common site of the lesion was the Colli region of 16 patients (32%). Clinical features of radiodermatitis are more severe in female patients and older age. From the side of radiotherapy: The total radiotherapy dose that most caused of radiodermatitis are 5000-5900 cGy as much as 42 people (84%) and fractionation is 31-40 fractions of 27 people (54%). Clinical features of radiodermatitis are more severe in patients who receive a higher total dose of radiotherapy and fractionation.

RECOMMENDATION

1. Research needs to be done on radiodermatitis incidents in the cancer patients receiving radiotherapy at other health centers and at different times to be comparable in studying the case of radiodermatitis
2. With this research is expected to be a learning material for clinical practitioners to be considered in performing services when finding cases of radiodermatitis so that health services are given to be optimal.

REFERENCES

1. Khanna NR, et al. Radiation dermatitis: An overview. *Indian J Burns*. 2013;21:24-31.
2. Wells M, MacBride S. Radiation skin reactions. Dalam : Faithfull S, Well M, editor. *Supportive care in radiotherapy*. New York : Churchill Livingstone. 2003:135-59.
3. Feight D, Baney T, Bruce S, McQuestion M. Putting evidence into practice: Evidence based interventions for radiation dermatitis. *Clinical Journal of Oncology Nursing*. 2011;15(5):481-92.
4. Brown K, Rzucidlo E. Acute and chronic radiation injury. *J. Vasc. Surg*. 2011; 53: 155-21.
5. Isomura M, Oya N, Tachiiri S, et al. IL12RB2 and ABCA1 genes are associated with susceptibility to radiation dermatitis. *Clin Cancer Res*. 2008; 14:6683.
6. Maryum H, Wahid Z, Ahmad I, Alam M. Frequency of cutaneous manifestations of Radiotherapy. *Journal of Pakistan Association of Dermatologists*. 2013; 23 (4): 371-7.
7. Wood G, Casey L, Trotti A. Skin Changes. Dalam : Small W, Woloschak GE, editor. *Radiation Toxicity: A Practical Guide*. Springer Science. 2006:171-81.
8. López E, et al. Early and late skin reactions to radiotherapy for breast cancer and their correlation with radiation-induced DNA damage in lymphocytes. *Breast Cancer Res*. 2005; 7:R690.
9. Mendelsohn FA, et al. Wound care after radiation therapy. *Adv Skin Wound Care*. 2002;15:216-24.
10. Edison MN, Johns CM. Acute and Chronic Cutaneous Reactions to Radiotherapy. Dalam : Coggnetta AB, Mendenhall WM, editor. *Radiation Therapy for Skin Cancer*. New York: Springer Science Business Media. 2013:55-69.
11. Malkinson FD, Panizzon RG. Radiobiology and Radiation effects. Dalam : Wolff K, Goldsmith LA, Katz SI, Gilchrist BA, Paller AS, Leffell DJ, editor. *Fitzpatrick's Dermatology in General Medicine*. Edisi ke-7. New York: McGraw-Hill. 2008: 896-900.
12. Kelly CG, Peat I. Radiotherapy and Reactions to Ionizing Radiation. Dalam : Burns T, Breathnach S, Cox N, Griffiths C, editor. *Rook's Textbook of Dermatology*. Edisi 8. Blackwell Publishing 2010:p.79.1-79.18.
13. Altoparlak U, Koca O, Koca T. Incidence and Risk Factors of the Secondary Skin Infections in Patients with Radiodermatitis. *Eurasian J Med*. 2011 Dec; 43(3): 177-181.
14. Barkham AM. Radiotherapy skin reactions and treatments. *Prof Nurse*. 1993; 8(11):732-6.
15. Brown K, Rzucidlo E. Acute and chronic radiation injury. *J. Vasc. Surg*. 2011; 53: 155-21.
16. Porock D, Kristjanson L, Nikoletti S. Predicting The severity of radiation skin reactions in women with breast cancer. *Oncol Nurs Forum*. 1998; 25: 1019-29.
17. Tortorelli, G., Di Murro, L., Barbarino, R. *et al*. Standard or hypofractionated radiotherapy in the postoperative treatment of breast cancer: a retrospective analysis of acute skin toxicity and dose inhomogeneities. *BMC Cancer*. 2013;13:230.
18. Andrade K, *et al*. Nursing consultation: evaluation of adherence to self-care in patients undergoing radiotherapy. *Rev enferm UERJ*, Rio de Janeiro. 2014; 22(5):622-8.
19. Meyer F, Fortin A, Wang CS *et al*. Predictors of severe acute and late toxicities in patients with localized head and neck cancer treated with radiation therapy. *Int J Radiat Oncol Biol Phys*; e-pub ahead of print. 2011.
20. Langhe et al.: Factors modifying the risk for developing acute skin toxicity after whole-breast intensity modulated radiotherapy. *BMC Cancer*. 2014 14:711.
21. Decker RH, Wilson LD. Radiotherapy. Dalam: Goldsmith LA, Katz SI, Gilchrist BA, Paller AS, Leffell DJ, Wolff K. *Fitzpatrick's Dermatology in General Medicine*. Edisi ke-8. New York: Mc Graw-Hill. 2012;p.2890-2899.



This work is licensed under a Creative Commons Attribution