Oncology Treatment Discovery, 2024, Volume 2, Issue 1
http://ojs.bbwpublisher.com/index.php/OTD

# Analysis of the Effect of Radiotherapy Skin Protective Agents on Skin Reactions in Patients with Nasopharyngeal Carcinoma Radiotherapy

**Junmin Chu*, Junqing Li**

The Chinese People's Armed Police Force Sichuan Corps Hospital, Leshan 614000, Sichuan Province, China

***Corresponding author:*** Junmin Chu, Chu179jm@163.com



**Abstract:** *Objective:* To analyze the application effect of radiotherapy skin protective agents on skin reactions in patients with nasopharyngeal carcinoma radiotherapy. *Methods:* One hundred and twenty nasopharyngeal cancer patients admitted to the hospital from January 2017 to January 2023 were randomly divided into a control group and an observation group of 60 cases each. Both groups received radiotherapy. The control group received traditional intervention methods while the observation group received traditional intervention methods combined with radiation therapy and skin protective agent intervention. The skin reactions, pain, comfort, and quality of life were compared between the two groups. *Results:* Both groups of patients had skin reactions, but the severity of skin reactions in the observation group was lower than that in the control group ($P < 0.05$). On the last day of radiotherapy, the pain score of the observation group was lower than that of the control group, and the comfort score was higher than that of the control group ($P < 0.05$). The total quality of life scores of the patients in the observation group were higher than those in the control group ($P < 0.05$). *Conclusion:* In treating skin reactions in patients with nasopharyngeal carcinoma undergoing radiotherapy, the application of radiotherapy skin protective agents reduced skin damage and pain and increased their quality of life.

**Keywords:** Nasopharyngeal carcinoma; Radiotherapy; Skin reaction; Radiotherapy skin protective agent

**Online publication:** March 29, 2024

## 1. Introduction

Nasopharyngeal cancer refers to a malignant tumor that occurs in the nasopharyngeal mucosa, with squamous cell carcinoma being the most common. There are regional and gender differences between the incidence rates, whereby Southern regions have a higher incidence rate than Northern, with men at higher risk than women [1]. The early symptoms of nasopharyngeal cancer are relatively insidious. Hence, when most patients are diagnosed, their condition has already progressed to the mid-to-late stage. At this time, patients would need to receive radiotherapy. During radiotherapy, skin reactions may occur, which is a manifestation of treatment toxicity, with symptoms such as local pain and itching [2]. As symptoms worsen, adverse conditions such as blisters and ulcers can be observed, which reduces the comfort level and even affects the outcome of

radiotherapy. Clinical intervention is required to ensure that the radiotherapy plan is completed as scheduled. This article aims to analyze the prevention and treatment effects of radiotherapy skin protective agents on skin reactions during radiotherapy for patients with nasopharyngeal carcinoma.

## 2. Materials and methods

### 2.1. Information

One hundred and twenty patients with nasopharyngeal carcinoma were selected (admission time: January 2017 to January 2023) and randomly divided into a control group and an observation group, with 60 patients each. The control group consisted of 39 males and 21 females aged 29–70 years old, with an average age of 58.27 ± 8.16 years. For the TMN (tumor (T), presence of metastasis (M), extent of spread to lymph nodes (N)) stage, 3, 15, and 42 cases were in stages I, II, and III, respectively. The observation group consisted of 41 males and 19 females aged 31–69 years old, with an average age of 58.40 ± 8.03 years. For the TMN stage, 5, 12, and 43 cases were in stages I, II, and III, respectively. The two sets of data were comparable ($P > 0.05$).

### 2.2. Inclusion and exclusion criteria

Inclusion criteria: (1) Patients diagnosed with nasopharyngeal carcinoma and is an undifferentiated non-keratinized cancer; (2) Patients with clear indications and are willing to receive radiotherapy; (3) can communicate properly; (4) can cooperate to complete the scale; (5) patients with complete general information. Exclusion criteria: (1) Combined with other serious skin diseases; (2) serious infectious diseases; (3) mental illness or cognitive impairment; (4) those who quit halfway.

### 2.3. Methods

Both groups received a standardized radiotherapy regimen. Based on this, the control group received traditional intervention methods. When wet dermatitis was found in the radiation field, they were first cleaned with normal saline, followed by exposure therapy. According to the degree of skin damage and local infection, patients adhered to medical advice for drug treatment. Based on the control group, the observation group received a skin protective agent at the beginning of radiotherapy. Before using the drug, the skin in the radiation field was cleaned with normal saline. The drug was applied evenly and gently using a cotton swab. The drug was applied lightly to the skin once more than 2 hours before and after radiotherapy until the entire treatment was completed.

### 2.4. Observation indicators

The occurrence and degree of skin reactions between the two groups were compared based on the RTOG (Radiation Therapy Oncology Group) acute radiation injury grading standard [3]. Level 0 indicates no abnormal skin changes; Level I indicates the appearance of follicular dark erythema on the skin, local dry peeling, and reduced sweating; Level II indicates bright red erythema, or tenderness, wet peeling, and moderate edema; Level III indicates the appearance of fusion-like wet peeling and pitting edema outside the skin folds; Level IV indicates ulcers and oozing of blood, or necrosis.

The pain and comfort of the two groups on the first and last day of radiotherapy were compared. The VAS was used to evaluate the degree of pain, with scores ranging from 0–10, indicating no pain to worst pain [4]. Kolcaba's Comfort Status Scale was used to evaluate comfort, which included 28 items. Each item was scored from 1–4, with a total score of 28–112 points [5]. The higher the score, the higher the comfort level.

The quality of life of the two groups on the last day of radiotherapy was compared. The Cancer Treatment

Functional Evaluation Scale was used, which included four dimensions: physical, emotional, functional, and social/family status, corresponding to 7, 6, 7, and 7 items, respectively [6]. Each item ranged from 0–4 points, with a total score of 0–108 points. The higher the score, the better the quality of life.

### 2.5. Statistical methods

The data were analyzed using the SPSS 25.0 statistical software. The measurement data were expressed as mean ± standard deviation and compared using a *t*-test. Count data were expressed as % and analyzed using the chi-squared ($\chi^2$) test (the rank sum was used for the rank data test, Z). Results were considered statistically significant at $P < 0.05$.

## 3. Results

### 3.1. Occurrence of skin reactions

As shown in **Table 1**, both groups of patients had skin reactions, but the severity of skin reactions in the observation group was lower than that in the control group ($P < 0.05$).

**Table 1.** Occurrence of skin reactions between the two groups [*n* (%)]

| Group | Cases, *n* | Level 0 | Level I | Level II | Level III | Level IV | Total |
|---|---|---|---|---|---|---|---|
| Control group | 60 | 0 (0.00) | 30 (50.00) | 24 (40.00) | 6 (10.00) | 0 (0.00) | 60 (100.00) |
| Observation group | 60 | 0 (0.00) | 48 (80.00) | 12 (20.00) | 0 (0.00) | 0 (0.00) | 60 (100.00) |
| Statistics | - | | | Z = 3.036 | | | $\chi^2 = 0.000$ |
| *P* | - | | | 0.002 | | | 1.000 |

### 3.2. Pain and comfort score

As shown in **Table 2**, there was little difference in pain and comfort scores between the two groups of nasopharyngeal cancer patients on the first day of radiotherapy ($P > 0.05$). On the last day of radiotherapy, the observation group had lower pain scores and higher comfort scores than the control group ($P < 0.05$).

**Table 2.** Pain and comfort scores between the two groups (mean ± standard deviation, points)

| Group | Cases, *n* | Pain score | | Comfort rating | |
|---|---|---|---|---|---|
| | | First day of radiotherapy | Last day of radiotherapy | First day of radiotherapy | Last day of radiotherapy |
| Control group | 60 | 6.25 ± **1.18** | 3.32 ± **1.08** | 73.56 ± **5.15** | 80.27 ± **3.36** |
| Observation group | 60 | 6.19 ± **1.23** | 1.86 ± **0.41** | 73.40 ± **5.57** | 91.46 ± **4.10** |
| *t* | - | 0.273 | 9.790 | 0.163 | 16.351 |
| *P* | - | 0.786 | 0.000 | 0.871 | 0.000 |

### 3.3. Quality of life score

As shown in **Table 3**, the scores and total scores of each dimension of the patient's quality of life in the observation group were higher than those in the control group ($P < 0.05$).

**Table 3.** Quality of life scores between the two groups (mean ± standard deviation, points )

| Group | Cases, *n* | Physiological condition | Emotional state | Functional status | Social/family situation | Total score |
|---|---|---|---|---|---|---|
| Control group | 60 | 19.25 ± 2.05 | 15.31 ± 2.11 | 18.17 ± 2.14 | 19.35 ± 2.22 | 72.32 ± 4.19 |
| Observation group | 60 | 22.14 ± 2.16 | 17.27 ± 2.05 | 20.65 ± 2.01 | 22.65 ± 2.34 | 82.65 ± 3.37 |
| *t* | - | 7.517 | 5.161 | 6.543 | 7.925 | 14.881 |
| *P* | - | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

## 4. Discussion

The cause of nasopharyngeal cancer is currently unknown. It is mainly related to genetics, diet, environment, and other factors. For example, increased consumption of salty foods, such as salted fish and pickles, will increase the risk of nasopharyngeal cancer. Individuals who are exposed to an environment with high content of dust, formaldehyde, and other substances for a long time are also prone to nasopharyngeal cancer [7,8]. Studies have found that nasopharyngeal cancer is a relatively mild disease, with a close relation to Epstein-Barr virus infections [9]. The early symptoms of nasopharyngeal cancer are not obvious. As the disease progresses, symptoms such as headache, hearing loss, ear stuffiness, nasal congestion, and neck lumps can be observed. Currently, the most effective clinical treatment for nasopharyngeal cancer is radiotherapy, including chemotherapy, targeted therapy, immunotherapy, surgical treatment, and traditional Chinese medicine (TCM) treatment. Radiotherapy is the first choice for nasopharyngeal cancer as it can eradicate the tumor cells. However, during radiotherapy, skin and mucosal damage is likely to occur, causing great pain to the patient and affecting the treatment outcome.

Skin and mucosal damage caused by radiation is known as radiodermatitis. This happens when the skin exposed to the radiation field absorbs many high-energy physical radiations, directly damaging epidermal cells. However, when the radiation dose is between 20Gy and 40Gy, the basal layer stem cells will lose new ones. Cell regeneration ability is manifested as the continuous reduction of mature epithelial cells in the early stage, the expansion and tortuosity of capillaries, the occurrence of ischemic necrosis of small thrombus, and in the later stage, local epithelial shedding and ulcer formation [10]. If radiotherapy is performed under high temperatures, radiation dermatitis may appear within two hours. The intense pain will directly affect the patient's cooperation with treatment, thereby reducing the therapeutic effect of radiotherapy. Therefore, skin reactions need to be properly managed during radiotherapy. Traditionally, drugs that have a repair effect on epithelial tissue, such as recombinant human epidermal growth factor (rhEGF), are used to alleviate symptoms and reduce inflammation. However, this method is ineffective due to the complexity of the biochemical chain reaction of radiodermatitis.

The observation group was given radiotherapy skin protective agents based on the conventional intervention methods. The results showed that patients in the observation group had lesser skin reactions, lower pain scores on the last day of radiotherapy, higher comfort scores, and improved quality of life as compared to the control group ($P < 0.05$). Data show that using radiation therapy skin protective agents can reduce the degree of skin reactions of patients, actively relieve pain, and improve patients' comfort and quality of life during radiotherapy. Radiation therapy skin protective agents promote skin regeneration, balance skin moisture, prevent local cell damage, and facilitate epidermal cell repair. The main component of the skin protective agent is aloe gel. Aloe is a lily plant with detoxification and liver-drying functions. It is commonly refined into aloe vera gel, which is rich in a variety of natural moisturizing factors, such as complex polysaccharides and amino acids that can replenish lost water, facilitate the recovery of collagen function, and maintain the

skin in a smooth and tender state. In addition, the special substances in aloe gel will also inhibit the synthesis of melanocytes and are useful for whitening. Substances such as serine and glycine can resist radiation and promote skin metabolism. In addition, aloe vera contains high levels of human flavin glycosides, which can sterilize and inhibit bacteria, facilitate local metabolism, converge sores, prevent skin keratinization, and promote cell regeneration. Aloe vera gel can also enhance the ability of cells to resist oxidative damage. Hence, consistent use can delay skin aging. It is often used daily to treat allergies, acne, and other problems, due to its heat-clearing and detoxifying effects. Lanolin, another main ingredient in skin protectants, is obtained through processing and extraction from wool. It helps the skin become tender and smooth. Lanolin is contained in many skin care products, mainly in anti-wrinkle creams. Lanolin can replenish water, promote moist and smooth skin, and exhibit good anti-aging effects when the skin is relatively dry. Lanolin contains high vitamin E content, which can remove and resist harmful acid substances, promote skin elasticity, and delay aging [11]. The skin protectant was applied to the exposed skin on the first day of radiotherapy. It is simple to operate and can be easily cleaned. Furthermore, it can increase the skin's tolerance to radiation, reduce the degree of skin damage, relieve pain, and increase the patient's compliance with treatment.

## 5. Conclusion

The application of radiotherapy skin protective agents to patients undergoing radiotherapy for nasopharyngeal carcinoma reduced the degree of skin reactions, relieved pain, and improved their quality of life.

## Disclosure statement

The authors declare no conflict of interest.

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