

Radiotherapy-Associated Oral Lesions in a Geriatric Patient with Nasal Squamous Cell Carcinoma: A Case Report

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Background: Patients who receive chemotherapy or radiotherapy may experience oral complications such as oral mucositis, xerostomia, dental caries, periodontal disease, tissue fibrosis, opportunistic infections of the mucous membranes, neurosensory disorders, loss of taste, osteoradionecrosis, and trismus. This complication often causes high morbidity, oral frailty, and decreased quality of life. Oral mucositis is a common side effect of radiotherapy and often causes nutritional disorders and interruption in treatment.

Purpose: This case report shows topical management in radiotherapy-treated geriatric patients with multiple oral lesions. It also shows the effectiveness of topical therapy for oral lesions in this case.

Case Presentation: A 76-year-old male patient underwent radiotherapy for stage 4 nasal squamous cell carcinoma. After 22 radiotherapy sessions, the patient developed oral mucositis Grade 3 based on WHO criteria, characterized by painful ulcers, trismus, and dysphagia.

Case Management: The patient was given topical drug therapy with a combination of 0.9% NaCl compress, 0.025% hyaluronic acid mouthwash, and petroleum jelly. Significant improvement was observed within five days, and resolution of oral mucositis occurred at the third visit.

Conclusion: Management of oral lesions in geriatric patients receiving radiotherapy or chemotherapy is useful to prevent disruption of treatment and reduce the risk of oral frailty.

Keywords: geriatric, oral frailty, oral lesion, oral mucositis, squamous cell carcinoma

Introduction

Unwanted alterations in the surrounding tissues may result from radiation therapy administered to the head and neck area.¹ Oral lesions are the most common side effect in patients undergoing curative radiotherapy for head and neck cancer.^{2,3} Oral mucositis, hyposalivation, loss of taste, dental caries, osteoradionecrosis, and trismus are among the side effects of radiation therapy that can affect a patient's quality of life.^{1,4,5} Oral mucositis occurs in 73–100% of patients receiving radiation therapy with manifestations such as erythema or ulcers in the oral mucosa and can extend to the throat, larynx, and esophagus.⁶ The common cause of oral mucositis is damage to basal epithelial cells due to chemotherapy or radiotherapy. Currently, the pathogenesis of oral mucositis has become more complex and includes the formation of reactive oxygen species (ROS), an unstable molecule containing oxygen that can easily react with other molecules in the cell. ROS accumulated in the cell can damage DNA, RNA, and proteins, causing cell death. In addition, there is activation of transcription factors, such as nuclear factor κ B, and inflammatory pathways, such as the cyclooxygenase pathway, as well as upregulation of pro-inflammatory cytokines, such as tumor necrosis factor (TNF)- α and interleukin (IL)-1 β . As a result, this can lead to thinning of the epithelium and damage to the oral mucosa, resulting in tissue damage and death.⁷

Treatment of oral mucositis in the elderly has its difficulties because physiologically, the decline in the regeneration system and the direct effects of cell death due to radiotherapy further slow down the healing process of mucositis. Oral mucositis due to radiotherapy affects nutrition, oral care, and causes severe pain and dysphagia. This leads to significant weight loss and a decrease in the patient's overall quality of life. More critically, oral mucositis due to radiotherapy can cause temporary interruptions in radiation treatment, reducing its effectiveness.^{3,8,9}

Pain associated with erythematous and ulcerative lesions is the main morbidity of oral mucositis. Pain due to oral mucositis can interfere with oral function, including impaired nutritional intake, which can lead to weight loss and immune dysfunction. Oral mucositis can also interfere with quality of life.

Oral frailty is a condition of decreased oral function in individuals, especially in the elderly population. This can include problems such as difficulty chewing and swallowing, as well as decreased dental and oral health. Oral frailty can contribute to larger health problems, including malnutrition and overall physical decline.¹⁰ Radiotherapy, especially to the head and neck area, can cause damage to the oral tissues, contributing to the development of oral mucositis. This condition can worsen oral health and oral function, which in turn can increase the risk of oral frailty. Oral mucositis can cause pain, difficulty chewing and swallowing, and decreased nutritional intake, all of which contribute to overall poor health.^{11,12}

Case Report

A 76-year-old male patient was referred to the Department of Oral Medicine, Dr. Hasan Sadikin General Hospital with the main complaint of pain and bleeding from the tongue, oral cavity, and corners of the lips since the 15th radiation session (July 28, 2023, about 3 weeks since the first radiation). The patient also had difficulty opening his mouth (only 1 finger wide), pain when swallowing, difficulty eating and speaking, and pain in the eye sockets. The patient was initially diagnosed with nasal squamous cell carcinoma by the surgical oncology department around January 2023. When he came to the Department of Oral Medicine, Dr. Hasan Sadikin General Hospital, the patient underwent radiotherapy (session 22, with the first session on July 4, 2023). The patient had undergone two operations in the surgical oncology and plastic surgery departments around April. The patient had been given paracetamol 500 mg as an analgesic, eye drops, and saline solution as a mouthwash by the Radio Oncology department, but the complaints did not improve. The patient had not brushed his teeth for the past 2 weeks due to pain in his oral cavity. The patient only consumed porridge and juice. No drug or food allergies were reported. The patient had a history of smoking for about 50 years but quit smoking after being diagnosed with nasal squamous cell carcinoma, and he denied consuming alcohol.

During the general condition assessment, the patient was afebrile, and all vital signs were within normal range. Extraoral examination showed abnormalities in the right submandibular lymph node, with a nodule of hard consistency, skin-colored, easily movable, measuring 3x2x2 cm, and painful. The left submandibular and right submental glands were not palpable but painful. Intra-oral examination showed one ulcer with a white base surrounded by erythema and dried saliva, shallow depth, irregular shape, with diffuse borders, and pain in the left corner of the lip. There were several ulcers with a white base surrounded by erythema, shallow depth, irregular shape, diffuse borders, and pain around teeth 33–37 and 43–47, a mouth mirror attached to the buccal mucosa and dorsum of the tongue, and poor oral hygiene (Figure 1). The upper and lower labial mucosa, dorsum of the tongue, left and right lateral tongue, floor of the mouth, palate, and dental examination could not be evaluated thoroughly because the patient could not open his mouth maximally. The CODS (Clinical Oral Dryness Score) result was moderate (score 5). Based on anamnesis and clinical examination, the working diagnosis was Oral Mucositis (WHO) Grade 3 with a differential diagnosis of oral pseudo-membranous candidiasis, accompanied by Exfoliative Cheilitis and moderate Xerostomia on the Challacombe scale.

Non-pharmacological therapy includes education to increase water intake to at least two liters per day and to consume a balanced diet. Pharmacological therapy includes topical medication. Patients are instructed to maintain dental and oral hygiene by compressing the upper and lower lips with gauze soaked in 0.9% NaCl for 30 minutes. The patient is also instructed to clean his teeth, tongue, and oral cavity by gargling with 0.025% hyaluronic acid mouthwash 10 mL for 1 minute three times a day and applying a thin layer of petroleum jelly to the upper and lower lips three times a day.

The patient showed improvement at the 2nd visit, five days after the first visit. The patient experienced improvement in pain and bleeding from the tongue, oral cavity, and corners of the lips, but it had not completely healed (Figure 2). The

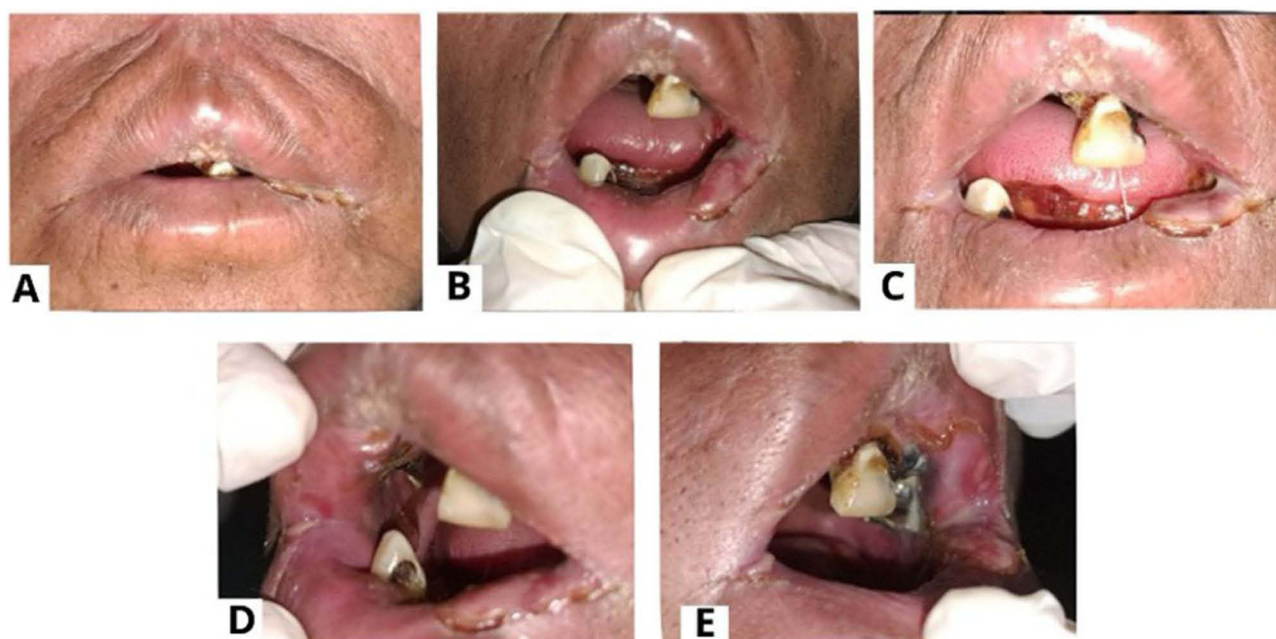


Figure 1 Clinical condition of the patient's oral cavity at the first visit. Dry, crusted lips with exfoliation and angular fissures (A); Ulceration and hemorrhagic crusts on the upper and lower labial mucosa (B); Erythematous tongue with coating and presence of blood crusts on lips (C); The right oral commissure shows an ulcerative lesion and inflammation (D); Left oral commissure with deep ulceration (E).

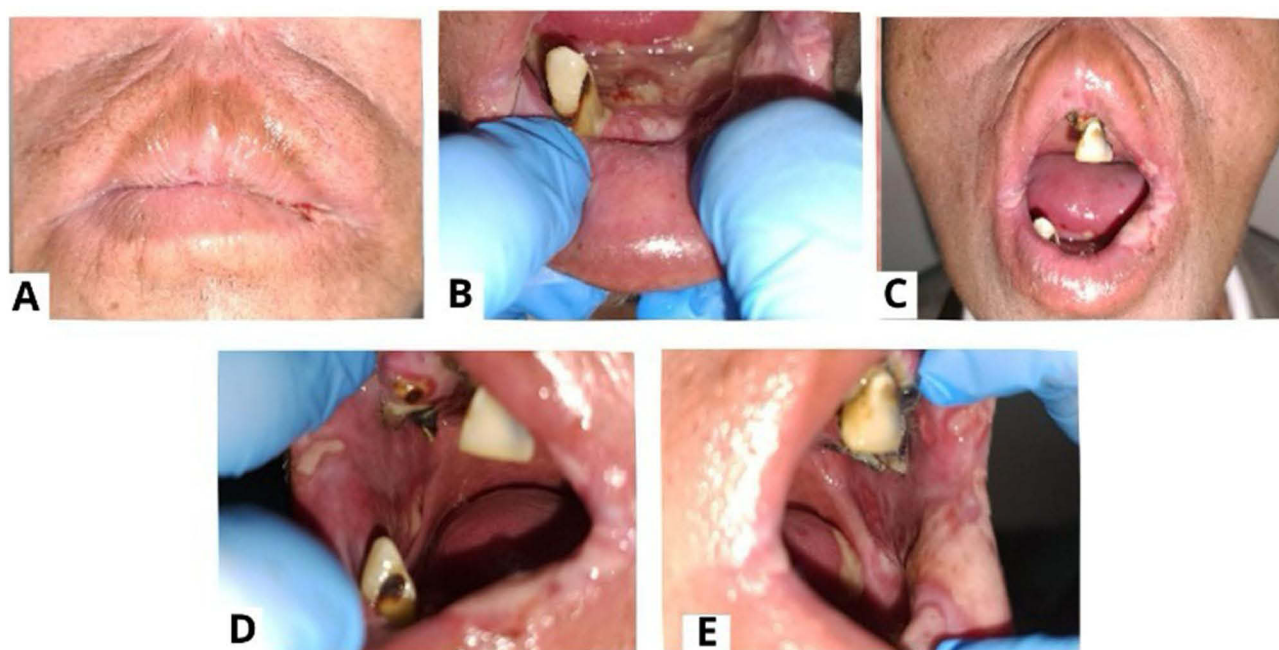


Figure 2 Clinical improvement at the second visit following symptomatic and supportive treatment. Lips appear less dry with reduced fissuring and crusts (A); Healing observed on labial mucosa; reduction in erythema and ulcers (B); Tongue appears cleaner; overall improvement of oral hygiene (C); The right oral commissure shows re-epithelialization (D); The left oral commissure also shows signs of epithelial healing and resolution of necrosis (E).

patient also had difficulty opening the mouth, eating, swallowing, and speaking. The patient had completed the 25th radiation session. The patient had used the prescribed medications along with medications from the Radiation Oncology Department. The patient was still on a soft diet, consuming porridge and juice. Extraoral examination showed dry and peeling lips, one ulcer with a white base surrounded by erythema and dried saliva, shallow depth, irregular shape, diffuse

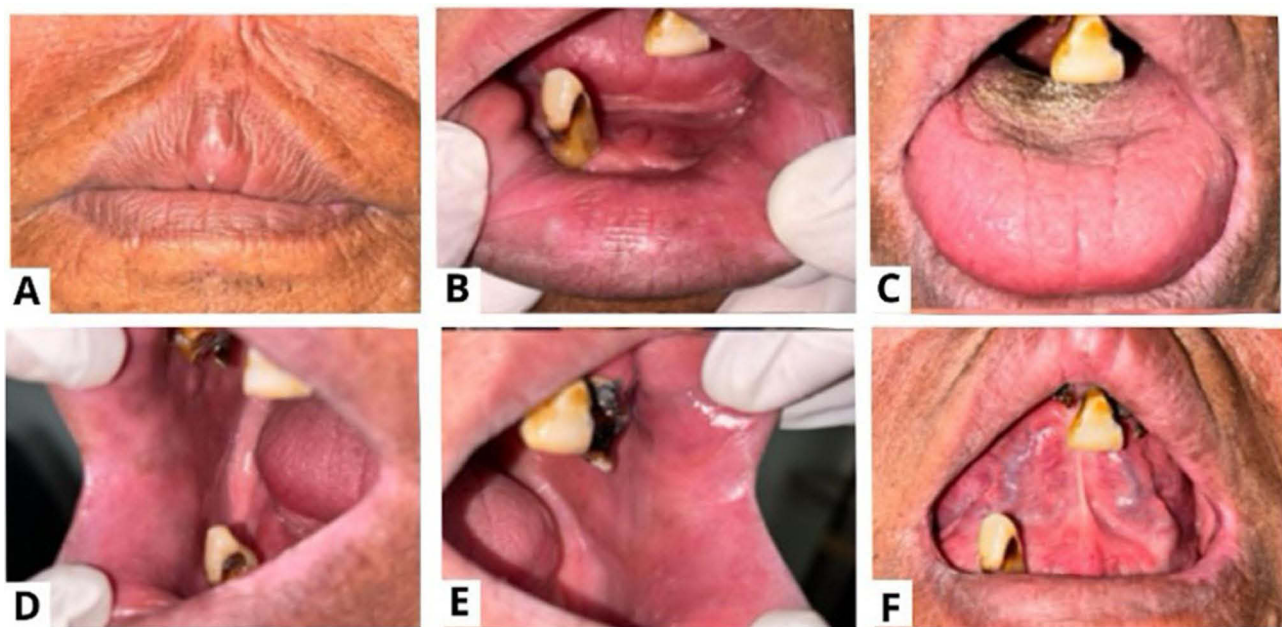


Figure 3 Clinical condition of the patient's lips and oral cavity at the last visit. Lips fully healed with normal appearance and no residual fissures (A); Labial mucosa is fully re-epithelialized with healthy pink mucosa (B); The tongue surface appears healthy with no signs of coating or erythema (C); Right oral commissure with intact mucosa (D); Left oral commissure fully healed (E); Palatal and gingival mucosa showing healthy, normal tissue architecture (F).

borders, and pain in the left corner of the lips, which showed improvement. Improvement was also seen in the upper and lower labial mucosa, left and right buccal mucosa, dorsum of the tongue, and floor of the mouth.

At the 2nd visit examination, there were multiple ulcers on the entire surface of the upper and lower gingiva with a white base surrounded by erythema, shallow depth, irregular shape, diffuse borders, and discomfort (Figure 2). Non-pharmacological and pharmacological therapy were continued. The patient was referred for further dental and oral care to the periodontics, dental conservation, and oral surgery departments.

At the 3rd visit, significant improvement was seen, with excellent healing of all oral lesions (Figure 3). Complaints of pain and bleeding from the tongue, oral cavity, and corners of the lips, as well as difficulty opening the mouth, and pain when swallowing, eating, and speaking, had resolved, but the oral cavity remained dry. The patient completed radiation therapy about 3 months ago (September 8, 2024). The patient has been using prescribed medications. The patient is still on a solid diet but requires water assistance to swallow due to dryness. The next non-pharmacological therapy is instructions to brush teeth with a soft and fine bristle toothbrush and fluoride toothpaste 2 times a day, in the morning after breakfast and at night before bed, stop compressing the upper and lower lips with gauze moistened with 0.9% NaCl, and stop rinsing using 0.025% hyaluronic acid mouthwash. Meanwhile, pharmacological therapy began to focus on xerostomia, namely instructions to gargle using 10 mL of chlorine dioxide lemon for 1 minute, then spit it out 3 times a day, avoid gargling, eating, and drinking for 30 minutes afterward, and continue to apply a thin layer of petroleum jelly to the upper and lower lips 3 times a day.

Discussion

Oral side effects of mucositis and xerostomia significantly affect the quality of life in patients receiving head and neck radiation therapy. During the second week of the current trial, 29.1% of patients had oral lesions; by the end of the study, that number had risen to 100%. Almost 30% of patients had oral lesions during the second week, while 53.3% and 90% of patients, respectively, had oral lesions in the next stage. Patients with oral lesions experience more intense pain and burning, which interferes with the oral cavity's normal function and raises the risk of secondary infections.⁵

This case report describes a 76-year-old male patient with Oral Mucositis Grade 3 (WHO) who developed severe oral complications during radiotherapy for nasal squamous cell carcinoma. Oral mucositis is inflammation and ulceration of

the oral mucosa that often occurs as a side effect of radiotherapy and chemotherapy.⁵ The WHO scale for assessing the severity of oral mucositis consists of four levels: Grade 0, where there is no oral mucositis; Grade 1, where there are erythematous (red) lesions and pain but no ulceration; Grade 2, where there are ulcers and erythema, but the patient is still able to eat solid foods; Grade 3 where ulcers and erythema are causing the patient to start requiring liquid food due to pain; and Grade 4 where there are severe ulcers such that the patient is unable to eat at all due to severe pain.^{13,14} The abnormality in the right submandibular lymph node suggests the possibility of metastatic spread or reactive lymphadenopathy due to ongoing inflammation and infection. The patient showed multiple ulcers with a white base surrounded by erythema, trismus, dysphagia, and poor oral hygiene. This is in line with the literature stating that early signs of mucositis include a white mucosal appearance due to hyperkeratinization and intraepithelial edema or redness caused by hyperemia and thinning of the epithelium.^{13,15}

Radiation therapy directly affects the mucosal epithelial cells, causing thinning of the epithelium. It also compromises the oral defenses by reducing mucosal cell turnover, increasing permeability, and weakening the mucosal barrier.^{8,13} The cumulative dose of radiation that often causes oral mucositis and decreased saliva production is 30 Gy or more. While the radiation dose that can damage the epithelium can occur after receiving a total dose of 5000–6000 cGy.^{5,7} This is consistent with this case, where the patient had received 180 to 220 cGy of radiation daily. The patient began experiencing symptoms after the 15th radiation session, approximately three weeks into treatment. Other studies have shown that mucositis with erythema often occurs within 1 to 2 weeks, worsening during treatment, and usually peaking at 4 weeks, with symptoms continuing for at least 2 weeks after treatment.¹³

NaCl 0.9% is an isotonic fluid that is physiological, non-toxic, and does not cause hypersensitivity. In addition, NaCl 0.9% has an anti-inflammatory response, so it can reduce symptoms of pain and erythema. Cold compresses cause an analgesic effect by slowing the speed of nerve conduction so that fewer pain impulses reach the brain. Another possible mechanism is that the cold dominates and reduces the perception of pain. In addition, cold compresses cause vasoconstriction of blood vessels, so that they cause a numbing effect on the mucosa. Cold compresses are a natural and simple alternative that quickly reduces pain, other than using drugs.¹⁶

In addition to 0.9% NaCl therapy, patients were given 0.025% hyaluronic acid therapy. This case report has shown that hyaluronate can reduce oxidative damage. Hyaluronate binds free radicals, breaking them down into less harmful fragments and thereby inactivating reactive oxygen species. This function reduces the incidence and severity of mucositis and protects epithelial cells from damage.⁸ Furthermore, hyaluronate has been shown to maintain fibroblast activity and halt cell senescence, which can worsen mucosal damage and inhibit epithelial regeneration.^{8,13} By reducing the inflammatory reaction, hyaluronic acid creates a protective physical barrier, helps in tissue healing, and promotes cell proliferation. Hyaluronic acid promotes re-epithelialization, accelerates the healing process, increases basal layer keratinocyte proliferation, and helps shrink erosive or damaged areas of the oral mucosa.^{3,8,13}

After being given 0.025% hyaluronic acid therapy, the patient was also given petroleum jelly therapy. Petroleum jelly is one of the most commonly used topical agents to increase the production of antimicrobial peptides, repair the skin barrier, and maintain skin moisture. In 1895, Robert Chesebrough, a chemist in Titusville, Pennsylvania, first discovered that workers used “rod wax” to treat open wounds. Petroleum jelly is a rare semisolid mixture of branched and cyclic saturated hydrocarbons with a length of more than 25. It is a combination of liquid components, such as mineral oil, and solid components, such as paraffin wax and microcrystalline wax. It is tasteless, almost odorless, and non-irritating. As an occlusive moisturizer that does not contain water, petroleum jelly can reduce skin water loss (TEWL) by 50% to 99%. Studies have shown that petroleum jelly can reduce TEWL by almost 50% in 40 minutes, more effectively than other oily creams.¹⁷

The patient also experiences xerostomia due to radiation therapy to both major salivary glands. Prescribed radiation therapy can cause acinar cell atrophy, necrosis, vascular connective tissue changes, and impaired neurological function. Studies have shown that saliva production can decline rapidly, with a decrease of up to 50% after one week of radiation.^{13,18,19} Depending on how much salivary tissue is irradiated, xerostomia can be cured within six months, but in many cases, the loss of taste is irreversible. Radiation also changes the composition of saliva by reducing secretory immunoglobulin A, buffering capacity, and increasing acidity.¹³ However, the treatment plan in this case is focused on controlling the mucositis first to relieve pain, reduce the risk of infection, and improve oral function. Once the mucositis

has resolved, attention can then be directed more effectively to managing xerostomia to maintain oral health and comfort. Xerostomia is treated after oral mucositis has resolved by gargling with chlorine dioxide lemon 10 mL for 1 minute and then spitting it out 3 times a day.

Oral frailty in geriatric patients undergoing radiotherapy can affect quality of life and treatment outcomes. Oral frailty can occur due to several factors related to the aging process and the impact of the therapy itself. Studies show that patients with head and neck cancer undergoing radiotherapy experience an increased risk of oral side effects, which can exacerbate oral frailty, particularly through decreased nutritional and hydration intake due to difficulties in swallowing and speaking. This will lead to a decline in quality of life and disrupt the radiotherapy process itself. Therefore, proper management of the side effects of radiotherapy is crucial to prevent the worsening of oral frailty and its impact on the overall health of patients.^{20–23}

This case report has several limitations that must be acknowledged. First, the findings are based on a single case report, which limits the generalizability of the results to a broader population. The specific characteristics of this patient, including advanced age, long smoking history, and pre-existing oral hygiene problems, may not be representative of all patients with radiation-induced mucositis. The lack of long-term follow-up data also prevents ongoing evaluation of the effectiveness of therapy and its potential side effects.

This case underscores the importance of early intervention and multidisciplinary care in managing radiation-induced oral mucositis, particularly in elderly patients with multiple risk factors. Topical therapy was clinically effective in relieving mucositis symptoms in this patient, with no reported side effects. Future studies are needed to further validate the effectiveness of topical therapy, explore its long-term benefits, and assess its impact on preventing mucositis in a broader patient population.

Conclusion

This case highlights the complexity and challenges in managing severe grade 3 Oral Mucositis in a 76-year-old male patient undergoing radiotherapy for nasal squamous cell carcinoma. The patient's presentation, including painful ulcers, trismus, and dysphagia, is indicative of the severe impact of radiation on the oral mucosa, with additional complications such as xerostomia. Management strategies focused on symptomatic relief of mucositis through topical therapy of 0.9% NaCl compresses, 0.025% hyaluronic acid mouthwash, and petroleum jelly for the lips, which effectively reduce oral mucositis. This case report demonstrates that these topical therapies can treat oral lesions due to radiotherapy can provide significant benefits in managing radiation-induced oral lesions, with the potential to improve patient outcomes and quality of life.

Consent Statements

The patient has approved and written informed consent for the publication of this case report, including the images. The institution has also approved the publication of this articles.

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Disclosure

The authors report no conflicts of interest in this work.

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