A Nursing Perspective on Radiation-Induced Xerostomia

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Xerostomia during and following a course of head and neck irradiation profoundly impacts the quality of life of many patients. Xerostomia not only affects mucous membranes and teeth but also interferes with patient comfort.

Introduction

A common consequence of head and neck irradiation, xerostomia can greatly diminish the patient's quality of life. The impact of xerostomia is both profound and wearing on the patient. Radiation therapy for head and neck cancer affects the salivary glands located within the field of irradiation. When the radiation dose reaches 1,000 cGy, the patient may begin to experience mild to moderate dryness of the mouth [1-3]. This symptom may progressively worsen over the course of therapy and continue for more than 6 months after treatment has been completed [4-6]. If the radiation dose exceeds 4,000 cGy, xerostomia may become a chronic problem [6], and when radiation therapy is combined with chemotherapy, xerostomia may be exacerbated [7].

Impact of Symptoms

The symptoms associated with xerostomia affect the patient's usual activities of daily living (Table 1). Dryness of the mouth and lips causes discomfort ranging from mild irritation to a severe burning sensation [8]. Due to the tenacity of the remaining saliva, managing the thick oral secretions can be difficult, requiring the patient to expectorate frequently or manually remove the saliva.

**Eating Difficulties**--The patient with xerostomia is at increased risk for oral stomatitis and may note that the taste of foods is altered or diminished [3,9,10]. However, the dysgeusia associated with xerostomia is separate from the effects of radiation on the taste buds. Since saliva is a natural lubricant used for chewing and swallowing foods, the enjoyment of meals frequently diminishes for those with xerostomia because of difficulties in eating. Dentures often do not fit properly in the patient with xerostomia because saliva aids in denture stability and retention, making it difficult to bite and chew food.

**Periodontal Disease and Caries**--When saliva changes from a thin to a thick, stringy consistency, it is unable to perform its usual function of teeth cleansing. Instead, the thick saliva causes food and bacteria to adhere to the teeth, resulting in plaque build-up, which, in turn, leads to periodontal disease. With prolonged xerostomia, the patient is at risk for caries development because of the decrease in pH of the saliva and the proliferation of cariogenic bacteria, such as *Streptococcus mutans* and *Lactobacillus* species [9].

**Oral and esophageal infections** are also more common since the normal balance of flora in the mouth is altered, and consequently, bacterial and fungal organisms flourish [11-13]. Chronic xerostomia also has been shown to delay esophageal acid clearance and alter 24-hour esophageal pH--abnormalities associated with a higher incidence of gastroesophageal reflux and esophagitis [14].

**Sleep Disturbances**--Sleep is frequently interrupted because the patient needs to awaken to quench a parched mouth. Patients often complain either of waking up with "cotton-mouth" or with their tongue adhering to the roof of their mouth.

**Effect on Other Activities**--Patients with xerostomia often curtail such activities as attendance at educational lectures and recreational events because of the inability to sit comfortably through a program. Air travel is especially difficult because of decreased humidity in airplanes. Public speaking can also be a problem for the patient with xerostomia; coupled with the usual parasympathetic response one gets in front of a crowd, the person needs to take frequent sips of water.

**Exacerbating Factors**--Symptoms characteristic of xerostomia may be intensified when changes in climate occur. Areas of low humidity or use of furnaces or heaters during cold weather can exacerbate the discomfort associated with xerostomia.

Finally, if the patient is taking medications that cause dryness of the mouth (Table 2), symptoms of...
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xerostomia are intensified [15].

Nursing Care

Nursing interventions for xerostomia are aimed at increasing patient comfort, maintaining mucosal integrity, preventing infections, sustaining nutrition, and increasing the tolerance of therapy (Table 3). Assessing the patient prior to treatment concerning eating, chewing, mouth-care practices, and comfort is crucial. During treatment, the mouth is routinely examined for inflammation and potential infections.

An assessment of the oral cavity for the presence of xerostomia includes inspection of the lips, tongue, gingiva, mucous membranes and teeth. Any or all of the following findings may indicate xerostomia: dry, cracked lips; furrowed or coated tongue; dry, dull appearance of the gingiva or mucous membranes, and plaque or debris coating the teeth. Saliva may be thick, ropy, or absent. In addition, a thorough periodontal and mouth evaluation and prophylaxis by a dentist is important prior to the start of head and neck irradiation [3,12,16-19].

Mouth Care

The patient and family should be instructed about mouth-care procedures that will provide adequate cleansing and minimize or prevent complications, such as stomatitis and oral infections [8,20,21]. Protocols for oral care have been described in the literature [20,22-24].

Mouth care is recommended before and after each meal and at bedtime to maintain the integrity of the oral tissues and teeth [8,25,26]. Brushing with a soft-bristled toothbrush and flossing (if tolerated) clean the surfaces of the teeth and periodontal tissues, helping to prevent or reduce plaque build-up. Also, mouth care, itself, can stimulate salivary flow [15,25].

Gargling or rinsing with normal saline every 2 hours, and as needed, reduces the stringy saliva, while cleansing and refreshing the oral cavity. Commercial mouthwashes frequently contain alcohol and other detergents, and therefore, should be avoided since the alcohol can cause more dryness and produce pain when it comes into contact with inflamed mucosal tissues.

Caries Prevention

Fluoride treatments need to be performed at bedtime to help strengthen the tooth enamel and prevent caries formation [27]. The fluoride is either brushed onto the teeth or put in carrier trays, which are placed on the teeth for up to 5 minutes. The patient is instructed to not rinse the mouth or eat food or drink fluids for up to 30 minutes after fluoride has been applied.

If dental decay occurs with daily fluoride treatments, the frequency of application is increased to twice daily [3,19], which can also help prevent demineralization of tooth enamel associated with xerostomia [28]. In the presence of xerostomia, chlorhexidine mouth rinses have been used to minimize caries development by reducing plaque formation and decreasing levels of cariogenic bacteria in the oral cavity [29,30].

Denture Care

Xerostomia can cause the dentures to become less stable on the gingival surface, causing tissue breakdown as a result of the increased friction between the prosthesis and mucosa [9]. Use of denture liners can help cushion the prosthesis; however, a thorough evaluation by the patient's dentist is recommended to ensure denture fit and stability. Appropriate modifications of the prosthesis improve denture retention as well as patient comfort.

Therapeutic Interventions

Saliva Substitutes and Lubricants

Commercially available saliva substitutes can be used to promote the comfort of the mucosal surfaces. These products usually contain carboxymethylcellulose or other lubricants, which form a slippery film on tissues. Oral Balance was reported by radiation oncology nurses to be well-tolerated by patients with xerostomia by providing longer-lasting relief of dryness compared with other similar marketed products [31-33].

In addition to saliva substitutes, other lubricants can be used to provide comfort. Less than 1 teaspoon of butter or vegetable oil placed in the mouth has been reported to lubricate the oral cavity and provide relief of some symptoms, although a possible disadvantage to this remedy is personal
Emollients used on the lips can help prevent drying and chafing. However, lemon-glycerin products should be avoided because glycerin is a drying agent and the lemon can decalcify teeth as well as cause pain in a dry mouth or on oral lesions [35,36].

**Drugs**

Several therapeutic drugs have also been used successfully to treat xerostomia. Bromhexine, anethole-trithione (Sialor, Sulfarlem), and bethanecol have all been reported to be effective in relieving xerostomia. One drug that is commercially available, pilocarpine hydrochloride, has been evaluated for its efficacy in a large number of patients. For example, Valdez et al [37] and Greenspan and Daniels[38] showed that pilocarpine given orally to head and neck cancer patients with radiation-induced xerostomia increased salivary flow and provided symptomatic relief. The safety and efficacy of oral pilocarpine tablets in successfully treating radiation-induced xerostomia was subsequently proven in two large, placebo-controlled clinical trials involving head and neck cancer patients [39,40].

**Dietary Modifications**

Patients with xerostomia can have particular difficulties chewing and swallowing dry or sticky foods, such as breads or peanut butter. Patients are instructed to eat soft, moist foods. Also, the use of gravies or sauces can help make foods easier to chew and swallow. Having ample fluids to drink with meals helps enhance eating comfort. Patients are advised to refrain from consuming alcohol or tobacco, since they can promote further mouth irritation. Patients are also instructed to increase their fluid intake between meals unless contraindicated, since frequent intake of water or juices can provide both hydration and comfort. Other remedies include applying fine mists of water from a sprayer to dry mucosal membranes or sucking on hard, sugarless candies or chewing gum to stimulate saliva secretion. Papain, the proteolytic enzyme found in papayas, may be helpful in dissolving tenacious saliva [24,41]; this suggests that patients may benefit from eating fresh papayas or drinking papaya juice before meals.

**Patient Education**

Nursing care involves assessing the physical and emotional aspects of the patient before, during, and after a course of head and neck irradiation, and providing interventions, education, and support. Patients and families need to know about the causes of xerostomia, its timing of occurrence, and methods that may be used to alleviate the symptoms. Because xerostomia may become a chronic problem, the emphasis needs to be on long-term management of the patient's oral status. Offering support before and during treatment is necessary but becomes even more important in the follow-up phase of care. The patient and family may expect symptoms to resolve quickly and may become extremely disappointed when they persist. Helping the patient to creatively use a variety of interventions to relieve xerostomia gives the patient and family a sense of control in minimizing the symptoms associated with xerostomia.

**Conclusions**

The presence of saliva is something most people take for granted. The experience of receiving radiation therapy for head and neck cancer and the subsequent xerostomia that this treatment induces can be devastating to the patient and family. Alterations in the way that the patient performs even the most mundane activities, such as eating, can have a profound effect on a person's coping ability [42]. Exhaustion and despair is often experienced by the already debilitated person, since xerostomia is a 24-hour-a-day, chronic problem. By instructing patients and their families about the occurrence of xerostomia, along with measures to maintain oral hygiene and treat xerostomia, nurses can help minimize these symptoms. Moreover, patients will be better able to maintain their nutritional status, and long-term side effects, such as tooth decay and periodontal disease, can be avoided.

**References:**

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