Pilocarpine effectiveness in preventing xerostomia induced by radiation

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Abstract

Objective: The purpose of this review was to assess the effectiveness of concurrent pilocarpine treatment on xerostomia induced by radiation in patients suffering from malignancies.

Method: I'm going to thoroughly review electronic databases, in order to find publications examining the impact of simultaneous pilocarpine treatment for radiation-induced xerostomia.

Outcomes of interest: Salivary flow, quality of life, adverse effects, patient-reported xerostomia score, clinician-rated xerostomia grade, were the outcomes of interest.

Findings: Simultaneous pilocarpine administration during radiation therapy may raise the salivary flow rate six months after treatment and lower the xerostomia grade rated by the clinician. Pilocarpine did not substantially affect patient-reported xerostomia during the first three months, but by the sixth month, it was better. Pilocarpine's side effects were moderate and bearable.

Conclusion: Concurrent pilocarpine administration during radiation therapy lowers the xerostomia severity and increases the rate of salivary flow.

Key words: pilocarpine, xerostomia, radiation

Introduction

In the multidisciplinary treatment of cancer, radiotherapy is used either as the primary treatment regimen or as an adjuvant. Xerostomia is one of the most prevalent acute and chronic adverse effects of radiation treatment. Xerostomia is a subjective feeling of dry mouth that can be brought on by changes in salivary flow or composition (1). Patients with xerostomia frequently report problems speaking and swallowing, loss of taste, poor oral hygiene, and other symptoms that significantly lower quality of life (2).

Treatments such as sialagogic drugs and salivary replacements have been proposed to alleviate radiation-induced xerostomia (3). Pilocarpine is a cholinergic agonist that has been licensed by the FDA to treat xerostomia by stimulating salivary glands. More promising are preventive regimens, such as parotid gland sparing with 3D conformal or intensity-modulated radiation therapy (IMRT) and submandibular gland transfer before irradiation (4). Research has validated the noteworthy function of IMRT in averting xerostomia and preserving typical oral functions (5). However, the salivary glands may still partially overlap the planned target volume even with IMRT, which might lead to some degree of xerostomia and salivary glands damage (6).

Pilocarpine was given concurrently with radiation therapy in order to reduce xerostomia caused by radiation in patients with malignancies, according to an early clinical trial (7). Although its precise effectiveness is still being studied, no published experiment has proven pilocarpine's effectiveness in preventing xerostomia to be sufficiently strong thus far. Before concurrent pilocarpine is advised for regular usage, there must be strong evidence. Thus, our goal was to do a review in order to assess pilocarpine administration effectiveness on xerostomia caused by radiation in patients suffering from malignancies.

Method

Using various combinations of the following keywords, I searched electronic databases for pertinent articles: pilocarpine, salagen, radiation, radiotherapy, xerostomia, dry mouth, and hyposalivation. No additional restrictions on the publishing type or language were placed on the review of any paper published up to 2024. I also manually looked the reference lists of research that qualified.

Literature Review and Results

A double-blind, randomized clinical trial conducted in 2023 (8) involving 63 patients with xerostomia induced by radiation, found that saliva secretion significantly decreased in the control group when compared to the pilocarpine mouthwash group at different times after radiotherapy (8).
In 2024, Kittichet al. (9) carried out a study to evaluate the long-term effect and adverse reactions of pilocarpine in treating and preventing radiation-induced xerostomia in patients with cancer. Their study suggests that long-term pilocarpine usage in irradiated cancer is possible for both the treatment and prevention of xerostomia induced by radiation (9).

A 2024 research by Gül et al. (10) patients continued their pilocarpine medication, with 12 months median duration. Ten milligrams was the median maintenance daily dosage. After taking the medicine, the total Patient-Reported Outcome Measurement scale dropped dramatically from 13 to 7. Questions on dry mouth, drinking water while eating, carrying water, taste, and drinking water while speaking showed significant improvements. When patients receiving intensity-modulated radiation treatment were compared to those receiving conformal radiotherapy, the initial and maintenance dosages of pilocarpine were lower, and the duration of pilocarpine administration was shorter (10).
According to recent study conducted in India in 2023 by Kaue et al., (11) despite improved findings on salivary absorption after six months, oral pilocarpine did not significantly alter the salivary gland excretory system. Oral pilocarpine, on the other hand, considerably reduced xerostomia symptoms with only mild, mostly sweat-related, adverse effects (11).

In 2022, research was carried out by Agrawal S et al (12) to assess the effectiveness and safety of oral pilocarpine taken concurrently with radiation therapy in order to protect patients with cancer from radiation-induced xerostomia. The findings of the study showed that the administration of pilocarpine during, and three months after irradiation was beneficial in improving patient compliance with radiation treatment. During the various stages of the post-radiation assessment, most patients showed less subjective symptoms and lower grades of toxicities (12).

Burlage et al. (2008) found that patients who received pilocarpine and a mean parotid dose above 40 Gy had a significantly lower loss of parotid flow one year after radiotherapy, despite the fact that there were no significant differences in the parotid flow rate complication probability for the two treatment arms. In The Late-Life Impact of Managing Normal Tissue/Somatic Objectives comparable trends towards less complaints related to dryness were seen for the pilocarpine group in both the analytical scale and patient-rated xerostomia scores (13).

The study conducted by Fisher et al. (2003) involved the randomization of 249 patients. Patients were split equally between the arms based on factors such as salivary function, tumour location, T stage, gender, race, and tobacco use. In the pilocarpine arm, a Karnofsky performance level of 90% was more typical. Nutritional supplements were taken by 29% of patients in the placebo arm and 20% of patients on the pilocarpine arm. Patients in the placebo group experienced more mouth soreness and difficulty chewing. In the pilocarpine arm, there was a statistically significant preservation of salivary function; nevertheless, patients experienced difficulty with swallowing, activity, hyposalivation, and taste. At three months, there was no difference in the arms' mucositis scores, and both showed a greater need for oral nutrition (14).

Conclusion

Concurrent pilocarpine treatment during radiation therapy has been shown to lower the grade of xerostomia assessed by clinicians and raise the rate of salivary flow. In the long term, it might also improve patients with xerostomia. There is a need for more high-quality studies using standardized outcome measures and questionnaires.

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