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A Case Report: Combined Acupuncture and Low-Level Laser Therapy to Mitigate Radiation-induced Oral Mucositis

By Penny Nguyen, DAC, LAc

Abstract

Oral mucositis is a common and debilitating side effect of radiation therapy in head and neck (H&N) cancer patients, often leading to symptoms such as xerostomia (dry mouth), dysgeusia (altered taste), and oral pain. This case report examines the treatment of a 70-year-old female who underwent radiation therapy for tonsillar cancer and experienced ongoing radiation-induced oral mucositis. After receiving acupuncture and low-level laser therapy (LLLT) for 1.5 years, the patient was able to decrease either the dose or frequency of her pain medication and gained weight since losing about 50 lbs with cancer treatment. This case report highlights the potential therapeutic effect of combining acupuncture and LLLT to alleviate H&N post-radiation symptoms. However, this report is limited by inconsistent treatment protocols and a lack of quantitative measurement, necessitating further studies to confirm treatment efficacy.

Keywords: Radiation side effects, tongue pain, mucositis, acupuncture, LLLT, dysgeusia, case report

Introduction

Oral mucositis is one of the most common forms of side effects in patients undergoing radiation therapy on the head and neck (H&N) (American Cancer Society, 2020). Globally, there are 890,000 new cases (4.5% of all cancers) every year of H&N squamous cell carcinoma (Barsouk et al., 2023). An estimated 80-100% of patients who undergo radiation therapy have to manage its side effects (Cleveland Clinic, 2022).

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Radiation therapy is the standard form of H&N cancer treatment to target specific areas, especially post-surgery, to kill lingering cancer cells (Radiation, 2019). High doses of energy damage the DNA of cancer cells, interrupting replication, however, this also injures healthy cells (National Cancer Institute, 2019). H&N radiation degrades the mucosal lining of the oral cavity, as well as the taste buds, making oral mucositis and dysgeusia (altered taste) the most common side effects. Oral mucositis can encompass symptoms such as a red, swollen mouth or gums, xerostomia (dry mouth), mouth ulcers, pain, difficulty swallowing, and bleeding (Cleveland Clinic, 2022).

Small trials and pilot studies (Garcia et al., 2009; Blom et al., 1996) show that acupuncture may relieve radiation-induced xerostomia, possibly via stimulation of salivary gland activity. However, until recently, few rigorously controlled trials had tested acupuncture in long-term head and neck cancer survivors with chronic post-radiation symptoms. The evidence remains limited, particularly with respect to objective salivary flow measures and outcomes such as dysgeusia.

Low-level laser therapy (LLLT) is another modality that is used to improve salivation and decrease the severity of mucositis (González-Arriagada et al., 2017). It is hypothesized that LLLT may stimulate residual gland function in addition to its other known functions such as improving microcirculation, increasing cell respiration, and enhancing ATP production (Palma et al., 2017).

This case report examines the treatment of a 70-year-old female who underwent radiation therapy for tonsillar cancer. Her symptoms included oral pain, xerostomia, and dysgeusia, treated with acupuncture for three years and laser therapy for one year, with significant patient-reported benefit. Given the limited research on acupuncture for the side effects of H&N radiation, this case study aims to provide insight and an avenue for further investigation.

Diagnostic Theory

Yin is the material substance of the body that keeps things moist and nourished. Radiation therapy introduces toxic heat to the body, especially the upper burner, which dessicates yin substances such as body fluids resulting in symptoms like dry mouth, dry skin, skin burns, and dysphagia (Li et al., 2003; Ding, 2021; Maciocia, 2003).

Liver and Kidney yin deficiency due to toxic heat invasion is the most common diagnosis for patients undergoing radiation therapy (Wang, 2023). Liver yin and Kidney yin are closely related to one another, so when one of them is depleted, the other soon will be as well (Ding, 2021). Furthermore, yin deficiency due to toxic heat can lead to both qi and blood deficiency because blood is a yin substance, and blood is the mother of qi, which means it carries and nourishes qi (Ding, 2021). When there is insufficient blood, qi becomes deficient, most often Spleen qi, which can be observed in the poor appetite and fatigue of patients undergoing radiation and chemotherapy (Wang, 2023). When Spleen qi is deficient, it also fails to support the Lung in sending body fluids upward, resulting in diminished saliva (Li et al., 2003; Maciocia, 2003).

Patient Information

The patient was a 70-year-old Caucasian female presenting with the chief complaint of oral mucositis. She was diagnosed with tonsillar cancer in 2020 and has been dealing with dysgeusia, xerostomia, and oral pain ever since undergoing radiation and chemotherapy.

Cancer symptoms started as a persistent earache, found to be caused by a 3 cm nodule in her throat. Surgery removed the surrounding lymph nodes and the cancer entirely in July 2020. Radiation therapy until September 2020 targeted the remaining surrounding lymph nodes.

During this process, the patient developed mouth pain, xerostomia, and dysgeusia; the only foods she could tolerate were bananas and lemons. She was often fatigued, and the severity of dryness limited her to a liquid diet. She lost ~50 lbs.. Intermittent thrush was treated with nystatin. Her extensive medical history and medication list may be seen in Table 1 and Appendix A.

Table 1. List of medical conditions

HTN (hypertension)	Irritable bowel syndrome
Angina effort	Cancer of tonsil
CAD (coronary artery disease)	Lymphedema
History of coronary artery stent placement	Hypokalemia
Hyperlipidemia LDL goal <70	Elevated LFTs
Type 2 diabetes mellitus with complication	Calculus of gallbladder with acute cholecystitis and obstruction
Abnormal cardiovascular function study	Hyponatremia
Primary hypertension	SBO (small bowel obstruction)
Abnormal glucose level	Hypomagnesemia
Arthritis of carpometacarpal (CMC) joint of right thumb	Leukocytosis
Asthma	Pyelonephritis
Depression with anxiety	Long QT interval
Hypothyroidism	Cystocele, midline

At her initial intake, her tongue was dry and dark red in color, with horizontal fissures branching from a deep vertical fissure. Additionally, she had a peeled tongue coating, a sign of severe yin deficiency. Pulse assessment revealed a weak and thready pulse.

Throughout her year of treatment, her tongue alternated between a deep red and pale color, and from a geographic to a peeled coating, but the fissures always remained, though the lessening in depth. Yin deficiency and Spleen qi deficiency were her most common TCM diagnoses, considering all the dryness she had as well as dysgeusia, recurrent infection, and fatigue.

Treatment

The patient received a total of 45 treatments from Spring 2021 to Fall 2024. Consistent laser therapy began during the last 21 treatments, from Spring 2023 to Fall 2024. Before beginning LLLT, the patient confirmed that she was cancer free in the head and neck area, since LLLT may be contraindicated for active tumor sites (Bamps, 2018).

Acupuncture students from Bastyr University provided care under the supervision of licensed acupuncturists at the Bastyr Center of Natural Health in Seattle, Washington. Acupuncture treatments were dependent on each supervisor and student, but points were selected based on TCM principles.

The patient had private acupuncture until Treatment 14, then switched to a community acupuncture setting. Needle retention time ranged from 20 in private sessions to 45 minutes in community acupuncture. Seiren D-Type needles were used for Yintang, and for other points, Mac 36 and 34 gauge, 30 mm needles were inserted to the appropriate depth with minimal stimulation.

Infrared (IR) LLLT was performed with an Advant LZ30k laser using the acupuncture probe head protected with plastic wrap. Touching the tongue, the laser was moved slowly over the affected areas. Dosages and settings varied slightly between treatments.

Table 2: List of acupuncture treatments and point selections

Tx# and Timing	Tx Principles	Acupoints/Laser Setting	Additional Tx	Pain Scale 10=worst
1 - Week 1	Tonify SP/KI qi, tonify yin, clear HT heat	Ren 23, Ren 24, SP6, ST6, HT6, Yintang, LI4, ST36, KI7, KI1, LR3, HT5, SP9, KI3		6-10/10
2 - Week 2		the above w/ Ren 12, IR laser 60 J (Inflammation)		4/10
3 - Week 2		(No LLLT on 3rd Tx)		4/10
4 - Week 7		Ren 23, Ren 24, SP6, ST6, HT6, Yintang, LI4, LR3, ST36, Ren 12, IR laser 50 J (Chronic Pain)		
5 - Week 10			nystatin and dexamethasone rinse	2-3/10
6 - Week 13		Ren 23, Ren 24, SP6, ST6, KI6, HT6, Yintang, LI4, LR3, KID3, ST36, ST7, IR laser 50 J (Chronic Pain)		2-3/10
7 - Week 14	Tonify SP/KI qi, tonify yin, clear LR/HT heat	the above w/ PC7, LR2	clonazepam	4/10
8 - Week 15		the above w/ IR laser 50 J (Inflammation)		3/10
9 - Week 16		Ren 23, Ren 24, SP6, ST6, HT6, Yintang, ST3, ST36, LI4, LR3, LI11, GB2, IR laser 50 J (Inflammation)		
10 - Week 33	Tonify SP/KI qi, tonify yin, dispel LR wind	Ren 23, Ren 24, SP6, ST6, KI6, HT6, HT8, PC6, ST36, Ren 14, ST40, IR laser 50 J (Inflammation)		2-3/10
12 - Week 35		the above w/ IR laser 60 J (Inflammation)		2/10
13 - Week 44		the above w/ IR laser 60 J (Chronic Pain)		6/10
14 - Week 52*	Tonify SP/KI qi, tonify yin, clear LR/HT heat	Ren 23, Ren 24, SP6, KI6, LI4, LR3, ST25, IR laser 70 J (Chronic Pain)		4/10
19 - Week 61		the above w/ IR laser 60 J (Chronic Pain)		
21 - Week 71		Ren 23, Ren 24, SP6, ST36, KI6, HT6, Yintang, IR laser 50 J (Chronic Pain)		

*Start of community acupuncture treatment

Treatment Outcomes

A visual analog scale (VAS), 1-10, with 10 being the worst, was used for the first 14 treatments. During the first treatment, the patient reported a pain level of 10/10 without the use of pain medication and 6/10 with the use of pain medication.

As mentioned, pain limited her diet to milk, bananas, smoothies, and cereals, which had to be washed down with a liquid. Fatty foods, sweets, eggs, and cheese tasted rancid, while fruits would burn her tongue. She had episodes of high pain (10/10) and dysgeusia due to eating spicy or acidic foods (except for lemon), but the pain would decrease and stabilize after a week or post-treatment. Her pain stabilized to 2-3/10 from treatments 4-12. The pain increased to 6/10 during Treatment 13 and reduced to 4/10 during Treatment 14. By Treatment 21, she reported a decrease in dysgeusia and could eat apples, one of the most challenging foods previously.

As can be seen in Appendix A, although the medication list increased overall, her pain medication list stayed relatively the same. The dose and frequency of the pain medication slightly decreased over time. Acetaminophen was then taken once a day as opposed to every 6 hrs; aspirin decreased from 325mg to 81mg, and oxycodone was taken every 6 instead of every 4 hrs.

Between Treatments 17 and 18, the patient came to the clinic to receive treatment, even though she knew she had to go to urgent care due to a large hematoma from a fall. She said she did not want to miss an appointment because the LLLT and acupuncture helped her dry mouth and pain so much. The most improvement was observed during treatments administered in close succession. The pain level between treatment 9 (week 16) and treatment 10 (week 34) remained the same, which may be due to the combination of treatments and medication that she started during treatment 5 (week 10).

From the onset of the tonsillar cancer, the patient weighed 180 lb in the spring of 2020. When she started acupuncture in 2021 without LLLT, she weighed 146 pounds. By the time she started LLLT in combination with acupuncture in the spring of 2023, she weighed 126 lb, and by the fall of 2024, she weighed 133 lb. Her weight fluctuated between 126 lb and 133 lb throughout 2023 and 2024, but it remained steady, and she did not experience the same weight loss as she had between 2020 and 2022.

Figure 1: In-office VAS scale per treatment up until Treatment 14
 Episodic pain would reach 10/10 between treatments.

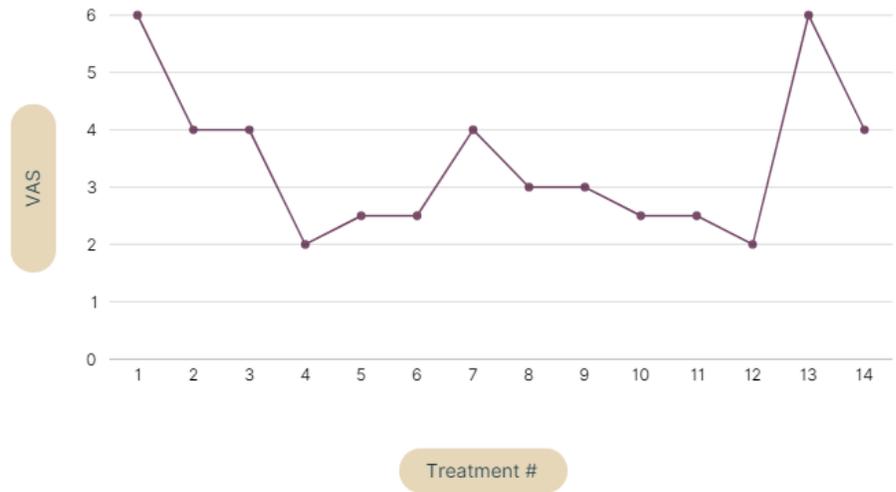


Figure 2: In-office VAS per treatment based on weeks up until Treatment 14
 Episodic pain would reach 10/10 between treatments.



Discussion

The side effects of H&N radiation therapy can be long-lasting. There has been some controversy on the benefit of acupuncture for people experiencing xerostomia, stating there is insufficient evidence (Assy & Brand, 2018). There has been recent research on acupuncture to help alleviate these symptoms (Regina de Sousa et al., 2023), which involves stimulating the salivary glands and using other body and auricular points.

LLLT also shows promise in treating radiation-induced xerostomia, depending on the type of protocol used (Ribeiro et al., 2024). There have been more recent studies on LLLT and acupuncture as separate modalities to improve symptoms of oral mucositis; however, no studies have combined the two modalities. The closest study investigated the effects of laser acupuncture on salivary flow rate in individuals with Sjögren's syndrome, revealing a significantly higher production of saliva (Cafaro et al., 2014). The control group did not receive manual acupuncture.

This case report highlights the potential benefits of acupuncture and LLLT treatment in stabilizing patients experiencing oral mucositis, thereby improving their quality of life and alleviating symptoms of oral mucositis. From a biomedical perspective, the mechanisms of acupuncture are not well understood; however, it is hypothesized that acupuncture affects the central nervous system by manipulating the fascia and increasing blood flow both locally and distally, thereby stimulating saliva production (Cohen et al., 2024). LLLT has been shown to upregulate ATP production, facilitating tissue repair, and has an analgesic effect by releasing endorphins (Dantas et al., 2020).

From a TCM perspective, this patient had xerostomia and dysgeusia caused by severe yin and Spleen qi deficiency. It can be hypothesized that tonifying the yin reduced the fissures in the tongue. Also, from tonifying the Stomach and Spleen qi, a tongue coat was able to form (Ding, 2021). It is unlikely that needles alone would have strengthened yin directly, because yin is a physical substance requiring tangible nourishment from diet and herbs (Williams, 2024). This patient's food restriction made supporting yin particularly difficult. However, acupuncture can be used to tonify qi, and by tonifying qi, it can in turn generate blood, which nourishes yin (Ding, 2021).

Improving sleep quality can also nourish blood and yin (Williams, 2024). Although the interpretation of LLLT in TCM terms has not been researched, clinically, it appears to tonify qi and yang. It is contradictory that LLLT does not

introduce more heat, which can be detrimental to the body. However, it is similar to moxibustion in that it introduces heat into the body to warm yang and tonify qi.

This case was complicated by recurrent candida infections that aggravated the oral mucositis. Although inconsistent, during the periods the patient was receiving more weekly treatment, her pain stabilized, and she reported that the treatments were helping prevent the pain and xerostomia from surging back. An in vitro study investigating LLLT for oral candida resulted in a reduction of colonies; however, further research is needed to confirm their findings (Hasanah et al., 2024). Despite that, the study suggests LLLT may help alleviate oral pain by reducing candida infection in combination with nystatin.

It is important to consider the limitations of this case. Due to multiple students charting, it became difficult to track the patient's progress quantitatively, as the VAS was missing for the last seven treatments, and the forms of treatment kept changing depending on the supervisor. The acupuncture points used and the LLLT settings and amounts of joules applied to the tongue varied inconsistently throughout the treatments. The VAS score was also affected by having different clinicians, as well as the patient normalizing her new standard pain tolerance to 3/10. There were multiple instances where she reported having increased pain and being unable to eat, but she reported on average a 3/10 in office.

Additionally, there was no device to measure the amount of saliva she was producing. The follow-up was also not consistent. The timing of each treatment was spread apart, and information such as diet change and severity of oral mucositis was sometimes absent. No adverse reactions for acupuncture or LLLT were reported.

Conclusion

This case report examines the potential benefits of combining acupuncture and LLLT in treating oral mucositis in patients who have undergone head and neck radiation. Although this case study has many limitations, it provides insight into methods to improve the quality of life, pain, and xerostomia associated with radiation-induced oral mucositis.

Informed Consent

The patient provided written informed consent for the publication of this case report, and a copy is on file with the author.

Safety

No adverse events were anticipated or reported.

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Appendix A

Comparison of medications from first to last treatment. (Changes in medication frequency or dose are in bold.)

Medication	Treatment 1	Treatment 21	Change
Acetaminophen (Tylenol)	500 mg, 1–2 tablets q6h PRN	500 mg, 1 tablet q6h PRN	↓ Max dose reduced
Alpha-lipoic Acid	600 mg tablet, 1 daily	600 mg capsule, 1 daily	Formulation
Aspirin	325 mg, 1 daily	81 mg chewable, 1 daily	↓ Dose, chewable form
Bacillus Coagulans-Inulin (probiotic)	1–250 billion CFU daily	Same	–
Biotin	5 mg tablet, 1 daily	5 mg capsule, 1 daily	Formulation
Cholecalciferol (Vitamin D3)	2000 IU daily	Same	–
Cyanocobalamin (Vitamin B12)	1000 mcg, 1 daily	500 mcg, 1 daily	↓ Dose
Escitalopram (Lexapro)	20 mg, 1 daily	Same	–
Hydrochlorothiazide	25 mg, 1 daily	Same	–
Levothyroxine (Synthroid)	100 mcg, 1 daily	75 mcg, 1 daily	↓ Dose
Metformin (Glucophage)	1000–1500 mg BID	1000–1500 mg BID	–
Oxycodone (Roxicodone)	5 mg q4h PRN	Same	–
Polyethylene glycol (Miralax)	17 g daily	–	Removed
Temazepam (Restoril)	30 mg HS PRN	Same	–
Tretinoin (Retin-A)	0.025% cream, apply 3x/week	–	Removed
Alprazolam (Xanax)	0.5 mg TID PRN	–	Removed
Metoprolol succinate (Toprol-XL)	–	25 mg ER, 1 daily	Added
Nitroglycerin (Nitrostat)	–	0.4 mg SL PRN chest pain	Added
Nystatin (Mycostatin)	–	100,000 units/mL suspension	Added
Psyllium (Konsyl)	–	283% packet, 1 daily	Added
Ticagrelor	–	(Brilinta) 90 mg tablet, take 1 tablet 2 times daily	Added
Atorvastatin (Lipitor)	–	40 mg tablet, 1 tablet daily	Added
Clonazepam (Klonopin)	–	0.5 mg tablet, 1 tablet 2 to 3 times daily Topical use only	Added
Duloxetine (Cymbalta)	–	60 mg capsule, take 1 capsule daily	Added
Lidocaine (Xylocaine) 2% viscous solution	–	5 mL by mouth every 4 hours as needed for pain	Added
Krill oil	–	300 mg caps, 1 tablet daily	Added