Salivary gland duct obstruction after radioiodine therapy: a case report

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ABSTRACT

Background: Radioiodine therapy has long been used in the treatment of hyperthyroid patients. Salivary complications secondary to radioactive iodine (RAI) treatment are well documented, there is little in the literature addressing salivary gland duct obstruction. We present a rare case of salivary gland duct obstruction developed 2 months after RAI treatment.

Case Presentation: We describe a 50-year-old male, treated with RAI for hyperthyroidism. He developed pain and swelling in the left submandibular region, 2 months after receiving RAI treatment (25 mCi). His salivary gland scintigraphy was done after injecting 370 MBq (15 mCi) of Tc99m pertechnetate in supine position. It revealed retention of radiotracer in the left submandibular gland with no drainage through the duct system, even on giving lemon stimulus, favoring submandibular gland duct obstruction.

Conclusion: We report this rare complication of submandibular gland duct injury occurring after RAI therapy. The occurrence of this complication even after low dose of radioiodine administration may be listed in gamut. All necessary measures must be taken to reduce such potential complications.

Keywords: Radioactive iodine treatment, submandibular gland, salivary gland scintigraphy, case report.

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Background

Radioactive iodine (RAI) therapy is an effective treatment for hyperthyroid patients. After oral administration, I-131 uptake is normally seen in gastric mucosa, lactating breast, and salivary glands. Salivary glands can concentrate 30–40 times of I-131 over the blood. The ability of salivary gland to concentrate and then excrete radioiodine is related to the adverse effects of radioiodine on salivary glands. Beta radiation adversely affects the stem cells which mainly reside in the excretory ducts of salivary glands [1]. Radiation damage to the salivary glands is already reported in several studies. However, salivary gland duct obstruction caused by RAI is not reported previously to the best of our knowledge.

Case Presentation

A 50-year-old male patient, known case of hyperthyroidism, was referred to nuclear medicine department for radioactive I-131 treatment. He was given 25 mCi of I-131 as NaI. On follow-up visit, 2 months after the therapy, he complained of pain and swelling in the left submandibular region.

Pain and swelling were exacerbated at meal time. The patient did not have any significant previous history of facial trauma, carious teeth, abnormal eating habits, external beam radiation or sialoliths.

Clinical examination revealed mild left submandibular swelling with no visually distinct localized mass. On bi-digital palpation, the left submandibular gland was tender. The remaining extraoral examination was unremarkable. The patient was examined by the surgeon to rule out sialoliths as the possible cause of obstructive sialadenitis.

His salivary gland scintigraphy was performed after injecting 370 MBq (15 mCi) of Tc99m pertechnetate in supine position. Dynamic acquisition was done for 10 minutes (one frame/minute acquisition) with infinia hawkaye gamma camera and serial static views were acquired at 10, 15, 20, and 25 minutes. Low energy all purpose collimator with 128 × 128 acquisition matrix was used. Lime juice (5 ml) was administered orally at 15 minutes of the study to stimulate salivary secretion. Visual assessment of the study revealed retention of radiotracer in the left submandibular gland with no drainage through the duct system, even after giving lemon juice stimulus as seen in Figure 1.

Discussion

Radioiodine therapy has been commonly used for the treatment of both benign and malignant thyroid conditions since 1940s [2]. I-131 concentrates in thyroid follicles and destroys thyrocytes through β particles.

RAI is handled by the human body very much similar to stable iodine in the food. It is rapidly absorbed (>90%) from the duodenum into the blood by sodium iodide symporter (NIS) on the apical membrane of enterocytes. The RAI is taken up by the thyroid via iodide transporter (NIS) in the basal membrane of the thyroid follicular cell, in the same way as natural iodine, and is similarly processed through.

NIS is also detectable and active in some extrathyroidal tissues such as the salivary glands, gastric mucosa, and lactating mammary glands. Therefore, these tissues can take up RAI by the action of the NIS. However, contrary to thyroid follicular cells, extrathyroidal tissue shows no long-term retention of iodide. Therefore, in these tissues damage due to β particles of I-131 bombardment is generally of mild degree. Complications like xerostomia, ageusia, lacrimal gland dysfunction, thyroiditis, xeropthalmia, and epiphora have been reported in literature. These side effects can reduce the patient wellness and adversely affect the quality of life [3].

Radiation damage to the salivary glands is one of the common complications of radioiodine therapy as NIS is expressed in salivary glands, especially in the striated ducts of the gland. Primary saliva is produced in the acini of the salivary glands, which subsequently drains into intercalated, striated, and excretory ducts. During the transport in the ductal system, composition of saliva is actively changed, e.g., sodium and chloride are reabsorbed, and potassium is excreted into the saliva. As radioiodine is mainly concentrated in the ductal system, beta radiation may generate luminal debris which may cause ducts narrowing. These processes can lead to obstruction of the ductal system, causing an inflammatory response in the secretory tissue (sialoadenitis), as well as glandular degeneration [4]. Reduced flow and increased transit of thickened saliva may lead to increased radiation dose delivery to ducts. Scarring after inflammation and collection of debris adds up on degree of obstruction. Consequently, persistent dry mouth adversely affects quality of life. There is reduced patient wellness and increased risk of dental carries.

Previous studies have reported that the salivary gland dysfunction is more frequent in patients receiving higher doses of 100 mCi in differentiated thyroid cancer compared with lower doses of less than 30 mCi [5]. Zanzonico estimated through the calculations based on the collection and counting of saliva samples from a 131I-treated thyroid cancer patient and a small-scale dosimetry analysis, indicating that the dose to the epithelial lining of the salivary gland ducts was 3- to 4-fold higher than the mean gland dose. This study was based on the speculation that a 1,000-rad-

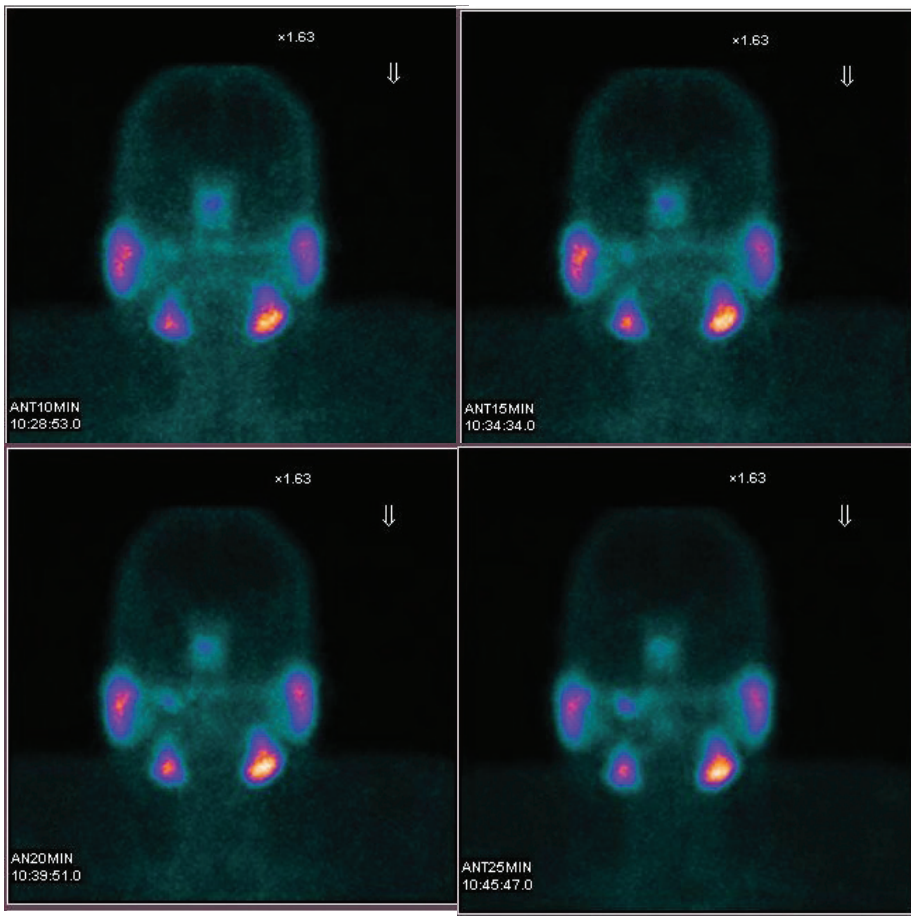


Figure 1. *Scintigraphy of salivary gland done with Tc99m, in the patient treated with I-131, shows retention of radiotracer in the left submandibular gland with no clearance even with lemon stimulus, favoring salivary gland duct obstruction.*

plus dose to the salivary duct lining is more consistent with sialadenitis than the mean salivary dose of only 300 rad [6].

This complication, although less common following low-dose treatment of RAI, warrants to take precautions to reduce their occurrence. Prevention of the I-131 induced sialadenitis can be done by parasympathomimetic drugs like pilocarpine and sialogogue agents, which accelerate salivary flow and hence radioactive clearance from the salivary glands [7]. However, not all studies advocate the efficacy of this approach [8]. Recently, amifostine is believed to be useful in the prevention of radiation damage through a cytoprotective effect [9]. The concurrent use of physiologic sialogogues like candy and gum, adequate hydration, good oral hygiene, and mouthwashes are the practical effective prevention methods [10].

Recently, a daily supplementation with 800 IU vitamin E for the duration of 5 weeks (1 week before to 4 weeks after RAI therapy) has been introduced to provide the protective effect against radiation-induced dysfunction in salivary glands [11].

Conclusion

We conclude that though the submandibular gland swelling due to submandibular duct obstruction following radioiodine therapy is rare. The occurrence of this complication even after low dose of radioiodine administration should be kept in mind. Maximum preventive actions may be taken before RAI treatment to reduce side effects including those on salivary glands.

Acknowledgement

None

List of Abbreviations

LEAP	Low energy all purpose
NIS	Sodium iodide symporters
RAI	Radioactive iodine

Consent for publication

Informed written consent was obtained from the patient to publish this case in a medical journal, anonymously.

Ethical approval

Ethical approval is not required at our institution for publishing a case report in a medical journal.

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Summary of the case

Patient (gender, age)	1	Male, 50 years old
Final Diagnosis	2	Salivary gland duct obstruction after radioiodine therapy
Symptoms	3	Swelling in the left submandibular region
Medications	4	N/A
Clinical Procedure	5	Salivary gland scintigraphy with 99mTc-pertechnetate
Specialty	6	Nuclear Medicine