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Incidental detection of acquired unilateral nasolacrimal duct obstruction on I-131 whole body scan following I-131 therapy for thyroid cancer: a case report

Warda Ahmad^{1*}, Nayyar Rubab¹, Farkhanda Gillani¹, Muhammad Shahzad Afzal¹, Barira Ahmad², Wajiha Ahmad³ and Muhammad Babar Imran¹

Abstract

Background Radioactive iodine 131 (I-131) is used in the treatment of differentiated thyroid cancer after thyroidectomy; however, its accumulation in non-thyroidal regions may give false positive results on iodine whole body scan (WBS). Only a few cases of radioiodine uptake in the orbital region in patients with thyroid cancer have been reported, which could be due to metastasis or false positive causes resulting from contamination or inflammatory etiology.

Case presentation We describe a case of 49-year-old male with history of papillary thyroid carcinoma. The follow-up I-131 whole body scan showed a focus of increased radiotracer uptake in the region of left orbit. Correlative single photon emission computed tomography (SPECT-CT) showed that uptake was due to stenosis of the left nasolacrimal duct causing obstructive symptoms on left side. Dacryoscintigraphy also demonstrated significant obstruction of left nasolacrimal system.

Conclusions The nasolacrimal duct obstruction is a rare adverse event after I-131 therapy that can result in an accumulation of radioiodine on whole body scan, mimicking metastasis. The use of additional spot views and SPECT-CT images along with thyroglobulin levels can help physicians in clarifying the situation in these uncertain cases.

Keywords Epiphora, Dacryoscintigraphy, Nasolacrimal duct obstruction, Papillary thyroid carcinoma, Thyroglobulin

Background

Papillary thyroid cancer accounts for the majority of all cases of differentiated thyroid cancer, which is gradually increasing in incidence. Distant metastasis from thyroid cancer can be usually detected on I-131 WBS as they have the ability to take up I-131 [1]. The cervical lymph

nodes are the most common sites of metastasis, with distant metastasis commonly seen in the lungs, bone, and rarely brain [2]. Metastasis to the uveal, choroidal, and orbital regions of the eye is uncommon [1, 3].

Only a few cases of radioiodine uptake in the orbital region in patients with thyroid cancer have been reported, and this could be due to metastasis or false positive causes resulting from contamination or inflammatory etiology [4]. This case report illustrates the uncommon case of I-131 uptake in the nasolacrimal duct, which could be easily misinterpreted as a suspicious lesion. However, correlation with clinical history and additional diagnostic parameters helped in clarifying the cause. To our knowledge, this is the first reported



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^{*}Correspondence:

Warda Ahmad

Wikolia16@outlook.com

¹ Department of Nuclear Medicine, Punjab Institute of Nuclear Medicine (PINUM), Faisalabad, Pakistan

² Department of Nuclear Medicine, Centre for Nuclear Medicine (CENUM), Lahore, Pakistan

³ Department of Radiology, Sir Ganga Ram Hospital, Lahore, Pakistan

case to describe the importance of dacryoscintigraphy in confirming nasolacrimal duct obstruction in a patient with thyroid cancer after I-131 therapy.

Case presentation

We report a case of a 49-year-old male patient with history of papillary thyroid carcinoma. Initially, patient will be presented in the outdoor department of our hospital with complaint of neck swelling in January 2020. On examination, he had multi-nodular goiter. The patient was biochemically euthyroid, and ultrasound neck showed multi-nodular goiter with largest solid nodule in left lobe and bilateral cervical lymphadenopathy at levels IB, II and III with preserved fatty hilum. The thyroid scan showed multi-nodular goiter with prominent cold nodule in the lower half of left lobe. Subsequently, patient underwent total thyroidectomy and level II and III neck dissection. Histopathology showed unifocal papillary thyroid cancer having size of 4.5 cm, with margins involved by tumor and metastatic cervical lymph nodes; size of largest metastatic deposit was 2.1 cm without any extra-nodal extension (pT3a, pN1b). After six weeks of surgery, I-131 WBS demonstrated functioning tissue in the thyroid bed; however, no abnormal accumulation of radiotracer was noted elsewhere in the body (Fig. 1A). Patient was given 1073 MBq (29 mCi) of I-131 to ablate residual tissue as serum thyroid stimulating hormone (TSH) level was normal (it was 0.34 mIU/L), and thyrogen could not be used due to financial constraints.

After three months, the patient again developed swelling in right posterior triangle of neck and biopsy showed metastatic papillary thyroid carcinoma. The laboratory investigations showed serum that TSH level was > 50 mIU/L, thyroglobulin value of 161.6 ng/mL and



Fig. 1 I-131 whole body scans in a 49-year-old male with papillary thyroid carcinoma. Panel A illustrates diagnostic scan showing functioning thyroid tissue in the neck. Panel B displays follow-up whole body scan showing focus of abnormal increased I-131 uptake in the left orbital region (black arrow). Normal distribution seen in the stomach, and however, rest of the scan showed no functioning thyroid tissue/metastasis

anti-thyroglobulin levels of 33.45 IU/ml at that time. Patient was then ablated with 7400 MBg (200 mCi) of radioiodine in July 2020. He did not receive follow-up for a period of two years. Upon his subsequent visit in March 2022, thyroxine was discontinued for four weeks, and I-131 WBS was performed which showed focus of radiotracer accumulation in the region of left orbit. Rest of the scan showed no residual thyroid tissue in the neck or functioning metastasis elsewhere in the body (Fig. 1B). The spot view after washing the face still showed focus of activity in the left orbital region (Fig. 2A). Correlative SPECT-CT revealed that uptake was in the left stenosed nasolacrimal duct (Fig. 2B). The serum TSH level was 74 mIU/L, thyroglobulin value of 1.0 ng/mL and anti-thyroglobulin levels of 1.3 IU/ml at time of follow-up I-131 WBS.

The previous I-131 WBS was thoroughly reviewed, and no uptake was found in the orbit at that time as shown in Fig. 1(A). Upon questioning the patient, it was revealed that he had been experiencing watering (epiphora) from both eyes, more prominently on the left side, for the past six months. These symptoms were consistent with the scintigraphic findings, indicating a probable diagnosis of left nasolacrimal duct obstruction. The patient did not report any previous history of infection, surgery, or trauma to the skull or orbital region. Additionally, no stone or mass was identified on corresponding CT images, ruling out other potential causes of obstruction. The case was reviewed by two senior nuclear medicine consultants and one junior physician, who collectively agreed to perform dacryoscintigraphy to assess the nasolacrimal system.



Fig. 2 Spot view (A) shows focal uptake in left orbital region (black arrow). Correlative SPECT-CT in Panel B and C illustrates that focal uptake is in left stenosed nasolacrimal duct (white arrow)

The study was done by instilling 7.4 MBq (200 μ Ci) per drop of Pertechnetate radiotracer (TcO₄⁻) in each eye. Dynamic imaging was performed using gamma camera Infinia Hawkeye 4 (equipped with processing system of Xeleris version 2.105) for 3 min followed by static images at 5-, 15- and 45-min intervals. Scan revealed accumulation of radiotracer in medial canthus of right eye followed by gradual drainage in the nasolacrimal duct showing patent nasolacrimal system on the right side. However, no significant drainage of radiotracer was noted on the left side showing left nasolacrimal duct obstruction (Fig. 3).

Discussion

Thyroidectomy followed by radioiodine therapy is an effective treatment in differentiated thyroid cancer. In the evaluation of a patient with thyroid cancer, it is important to consider the results of a scintigraphic examination in conjunction with the patient's clinical history, physical examination, biochemical data, and any available anatomical imaging. Detailed and accurate interpretation of I-131 WBS can avoid the unnecessary exposure of the patient to the high dose radioiodine and also result in better management of the patient [5].



Fig. 3 Dacryoscintigraphy showing gradual drainage of radiotracer in the right nasolacrimal duct. No significant drainage of radiotracer is noted on left side

Although I-131 WBS in thyroid cancer is exceptionally effective, its few pitfalls may shake the diagnostic confidence in detecting the metastasis. There are rare patterns of radioiodine distribution that can mimic disease [5] and the use of SPECT-CT is important in evaluation of unusual sites of metastasis from thyroid like kidneys, liver, and orbital region [6].

Limited number of cases with metastasis from differentiated thyroid cancer in the orbit, choroid and uvea have been reported [1, 7]. The false positive causes of radioiodine accumulation in orbital region include contamination by body secretions such as tear or sweat, inflammatory conditions like dacryocystitis and rarely I-131 uptake in patient with ocular prosthesis due to accumulation of I-131 in tears behind the prosthetic eye. It is, therefore, important to rule out non-malignant lesions in patients with thyroid cancer showing uptake in the orbital region [1].

The obstruction of nasolacrimal duct after I-131 therapy is one of its rare side effects and has been reported in approximately 3% of the thyroid cancer patients after I-131 therapy [8]. In this case, none of the other potential causes of acquired nasolacrimal duct obstruction, such as dacryolithiasis, trauma, drugs, sarcoidosis, granulomatous conditions or neoplasms, were present [9]. The radiation induced cell damage caused by uptake of I-131 in epithelial cells of nasolacrimal duct through the sodium-iodide (Na^+/I^-) symporter resulting in inflammation and ultimately stenosis or fibrosis is one of the proposed mechanisms for nasolacrimal duct obstruction after I-131 therapy [10].

The usual presenting features may include epiphora, medial canthus mass, conjunctivitis or dacryocystitis. The presence of inflammatory sinonasal disease at the time of treatment with I-131 can increase the risk of this adverse event [10]. However, the other causes of epiphora like allergic conjunctivitis, trichiasis, keratitis and chalazion should be kept in mind. Moreover, the symptoms are usually bilateral after I-131 therapy in case of acquired nasolacrimal duct obstruction. On average, the duration of onset for this condition ranges from 6–13 months [8, 10]. In our case, the patient did not report any history of sinonasal disease at the time of I-131 administration and developed epiphora bilaterally although prominent on left side, after one year of radioiodine therapy. In the study conducted by Kloos et al. [8], it was noted that the development of nasolacrimal duct obstruction was significantly associated with a dose of I-131 exceeding 5550 MBq (150 mCi) and patients over the age of 45 years. In the current case, both of these factors were present, indicating a potential risk for nasolacrimal duct obstruction.

Similar findings were reported by Al-Qahtani et al. [10], who retrospectively analyzed patients after I-131 therapy. They found that 2.2% of the patients developed nasolacrimal duct obstruction, with a mean duration of 11.6 ± 4.1 months. The diagnosis of nasolacrimal duct obstruction in their study was made using dacryoscintigraphy and computed tomography (CT) dacryography of the neck.

Dacryoscintigraphy can assist in determining the patency of the nasolacrimal ducts and enable early diagnosis of obstruction, even in cases of subclinical or partial lacrimal duct obstruction [11]. Early detection of nasolacrimal duct obstruction can allow for more effective treatment of the patient using options such as balloon dilation, stent placement, and external or endoscopic dacrocystorhinostomy (DCR) surgery [12].

Conclusions

The nasolacrimal duct obstruction after high doses of I-131 therapy is an uncommon side effect that can cause the accumulation of radioiodine in the orbital region on I-131 WBS. It is essential for reporting nuclear medicine physicians to have an understanding of this adverse event after I-131 therapy to precisely interpret I-131 scan and avoid unnecessary treatment with radioiodine and unwarranted follow-ups of the patient. The use of additional views, SPECT-CT, thyroglobulin levels and dacryoscintigraphy can help nuclear medicine physicians in clarifying the situation in uncertain cases.

Abbreviations

DCR	Dacrocystorhinostomy
I-131	Radioactive lodine
MBq	Mega Becquerel
mCi	Milli Curie
SPECT-CT	Single photon emission con

 SPECT-CT
 Single photon emission computed tomography

 WBS
 Whole body scan

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Author contributions

WA was a major contributor in writing the case report. NR provided valuable assistance in the writing process. MSA offered critical feedback and insights throughout the writing process, helping to improve the overall quality and clarity of the report. All authors contributed to the writing and review of the manuscript and approved the final version for submission.

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Availability of data and materials

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Declarations

Ethics approval and consent to participate

Ethics approval and consent to participate is not required at our institution for publishing a case report in a medical journal.

Consent for publication

Written consent to publish this case was obtained from the patient.

Competing interests

Authors declare that they have no competing interests.

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