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Unusual patterns of I-131 contamination

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Whole body imaging with radioiodine can detect functioning metastases, which can often be effectively treated with appropriate amounts of radioiodine. Non-physiologic I-131 uptake detected on images is usually interpreted as suggesting functioning thyroid metastases. However, extra-thyroidal I-131 accumulation does not always imply thyroid cancer metastases and has been reported on many occasions, including various non-thyroidal neoplasms, and contamination by body secretions. In order to avoid unnecessary therapeutic interventions it is extremely important to properly distinguish false-positive sites of I-131 localization. Three patients with unusual radioiodine contamination patterns, either presented for the first time or rarely presented in the existing literature, were reported. Reported cases consist of contamination in hair (due to styling hair with sputum), contamination in neck (due to drooling during sleep) and, contaminated chewing gum. False positive contamination sources were clarified by careful examination of patients and further images when necessary.

Key words: I-131 scanning, thyroid cancer, contamination

INTRODUCTION

A LARGE BODY of evidence indicates that radioiodine (I-131) is of value in the management of well-differentiated thyroid cancer. Whole body imaging (WBI) with radioiodine can detect functioning metastases, which can often be effectively treated with proper amounts of radioiodine.[1]

Following thyroid ablation, physiologic activity is expected in the genitourinary tract, gastrointestinal tract, salivary glands, oropharynx, nasopharynx and esophagus.[2,3] Non-physiologic I-131 uptake detected on images usually is interpreted as suggesting functioning thyroid metastases. However, extra-thyroidal I-131 accumulation does not always imply thyroid cancer metastases and has been reported in many circumstances,[3–21] including various non-thyroidal neoplasms,[22–26] and contamination by body secretions.[2,27–31] There is little doubt that patients with distant metastases that concentrate I-131 should receive I-131 therapy. In order to avoid unnecessary therapeutic interventions it is extremely important to properly distinguish false-positive sites of I-131 localization. We report here several examples of unusual contamination patterns on I-131 WBI in patients with well-differentiated thyroid carcinoma.

Standard approach to I-131 WBI for thyroid carcinoma in our department is to withdraw thyroid hormone replacement at least 4–6 weeks prior to the study, and to establish a serum thyroid stimulating hormone (TSH) level of >30 μIU/m*l*. I-131 WBI is performed using a large-field-of-view gamma camera (GE 400 ACT/STARCAM, Milwaukee, WI, USA) equipped with a high-energy parallel hole collimator. I-131 whole-body and appropriate static images were obtained at 24 and 48 hours after p.o. administration of 185 MBq diagnostic dose of I-131 or seven days after the administration of therapeutic doses of I-131.

CASE REPORT

Case I: Saliva Contamination of Hair

A 23-year-old male was referred to our center for I-131 therapy six weeks after total thyroidectomy and regional

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lymph node resection for papillary carcinoma. I-131 whole-body image after 5,550 MBq of I-131 therapy demonstrated multiple focal areas of uptake in the neck and thoracic regions suggesting nodal and lung metastases. Additionally diffuse accumulation of tracer surrounding the scalp was also noted (Fig. 1). TSH and thyroglobulin (Tg) levels at the time of imaging were >75 μIU/ml and 16.8 ng/ml, respectively. Further inquiry revealed that he was used to style his hair using his sputum. The contamination disappeared after washing the hair.

Case II: Saliva Contamination in Neck

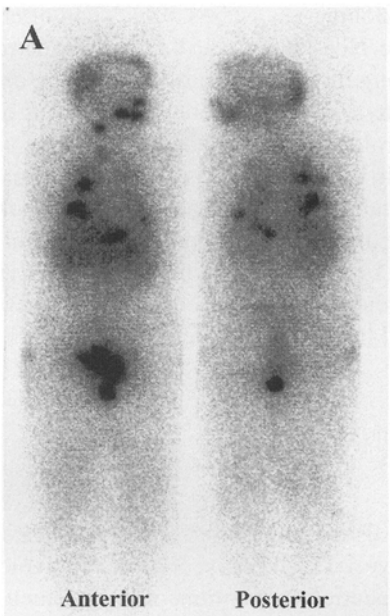
A 27-year-old male with follicular carcinoma undergone routine follow-up scan five years after surgery and I-131 treatment. Diagnostic radioiodine WBI showed I-131 accumulation at the right lower neck with increasing intensity on two consecutive days (Fig. 2). TSH and Tg levels at the time of imaging were >75 μIU/ml and 5.6 ng/ml, respectively. Activity persisted despite repeated washing of the skin. Finally it was recognized that contamination was due to sialorrhea (drooling) during sleep. Since the patient preferentially sleeps in the same position, contamination increasingly accumulated at the same location.

Case III: Radioactive Chewing Gum

A 57-year-old female who had undergone near-total thyroidectomy for papillary thyroid carcinoma was treated with 5,550 MBq of I-131. Post-therapeutic I-131 WBI demonstrated thyroid bed activity and diffuse hepatic uptake. Additionally, prominent focal tracer accumulation was observed in the right mandibular region, which is atypical for thyroid cancer metastases (Fig. 3). TSH and Tg levels at the time of imaging were >75 μIU/ml and 10.8 ng/ml, respectively. On further investigation, the patient revealed that she had a chewing gum in her right buccal region, and repeated scan after the removal of chewing gum showed no activity in that region.

DISCUSSION

I-131 WBI is a widely accepted method for detecting functioning metastases of well-differentiated thyroid carcinoma, and non-physiologic uptake is often an indication to administer large amounts of radioiodine.[1] However, extra-thyroidal I-131 accumulation does not always denote thyroid cancer metastases and has been reported in



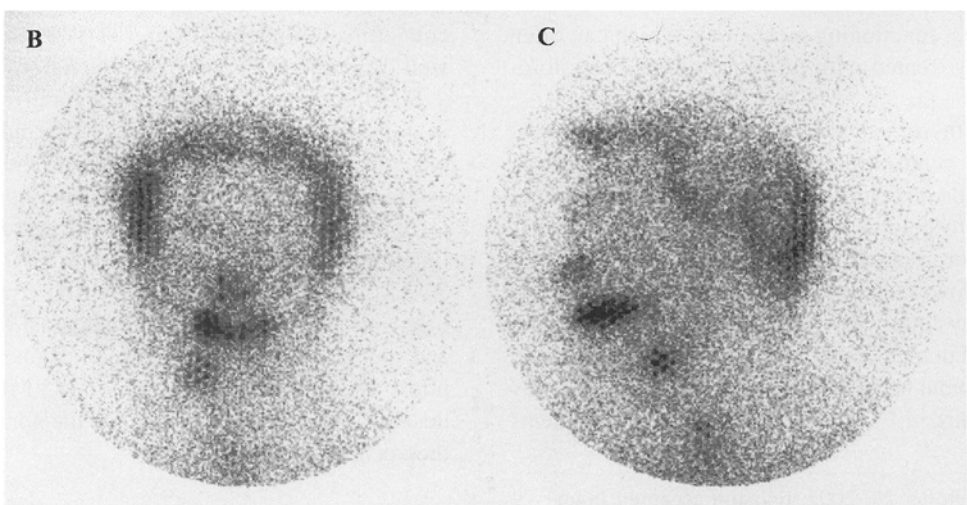


Fig. 1 (A) Anterior and posterior whole body images show multiple focal areas of uptake in the neck and thoracic region suggesting nodal and lung metastases beside diffuse accumulation of tracer surrounding the head. Anterior (B) and left lateral (C) static images of the head clearly demonstrate contamination of the hair.

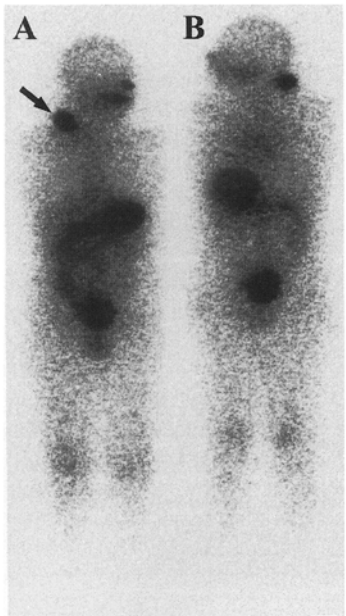


Fig. 2 Anterior (A) and posterior (B) whole-body images show intense accumulation of I-131 at the right lower neck (*arrow*) due to saliva contamination. Contamination was due to drooling and persisted despite repeated washing of the skin.

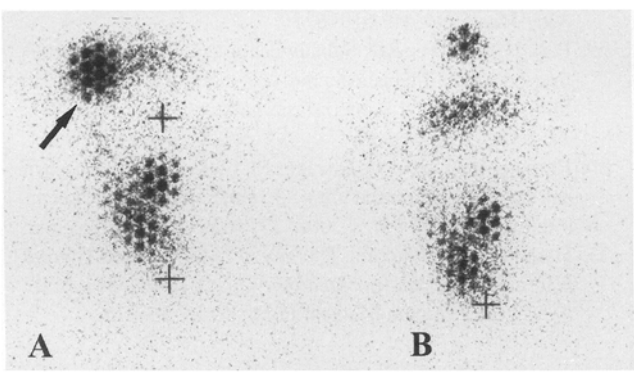


Fig. 3 (A) Anterior static image of neck after therapeutic dose of I-131 showed intense focal uptake in the right mandibular region (*arrow*), beside thyroid bed activity (markers show mentum and sternal notch). On inquiry patient revealed that a chewing gum had been present in her right buccal area during imaging. After removal of the gum, activity disappeared (marker shows sternal notch) (B).

many circumstances including various non-thyroidal neoplasms, inflammations and contamination by body secretions and exudates.[3–30]

Physiologic secretions of radioiodine from oropharynx, salivary glands, sweat glands, stomach and genitourinary tract are potential causes of misleading images. Radioiodine accumulation in the scalp due to excessive perspiration in a patient with a wig has been reported before.[18] Though our case was similar to that with the radioactive wig, contamination was in the hair and the underlying mechanism was a quite bizarre habit i.e. styling hair with sputum. This case of artificial accumulation reinforces the need to take into account patients' odd habits and fully inform them about potential contamination sources.

Although one can assume that drooling during night could be a potential cause of I-131 contamination no such case has been described in literature to our best knowledge. Since drooling continues overnight, contamination might be extensive and difficult to clean probably due to partial dermal absorption. Necessary precautions should also be taken against possible contamination of linen and pillows with I-131. Beside other potential uncommon saliva contamination types, [27–30] drooling should be questioned in cases of suspected contamination.

Using hard sour candy or chewing gum to promote salivary secretions during radioiodine therapy is a common measure to reduce the radiation dose to salivary glands.[31] Contaminated gums might mimic metastasis or dental pathologies and be a potential error source. Patients should be asked to change gum frequently and not to use it during imaging.

Although radioiodine has a very specific uptake mechanism in thyroid there are many conditions causing extrathyroidal I-131 accumulation other than thyroid cancer metastases. Nuclear medicine physicians should be aware of possible sources of contamination and false positive uptake patterns to prevent unnecessary I-131 treatments.

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