
Spurious Thyroid Cancer Metastasis: Saliva Contamination Artifact in High Dose Iodine-131 Metastases Survey

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The use of high dose ^{131}I for workup of thyroid cancer patients increases the chance of contamination artifact which may mimic metastases. Two elderly male patients with follicular carcinoma of the thyroid had salivary contamination artifacts on metastatic survey scans. These patients received a 1 and 10 mCi dose of ^{131}I , respectively. The artifacts were recognized only retrospectively when follow-up scans were obtained and compared. The characteristics of contamination artifacts and several methods to confirm these are discussed.

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Body fluid contamination artifact on routine 24-hr radioiodine thyroid scan is a very rare occurrence. When it happens, it is not difficult to recognize. However, in thyroid cancer patients who have, or are suspected of having, multiple functioning metastases, the contamination artifact may be mistaken for a true lesion.

We have encountered two patients in whom the "metastatic lesion" was later found to be a contamination artifact and we would like to report them here. It is conceivable that some thyroid cancer patients may receive an ablative dose of iodine-131 (^{131}I) inadvertently for spurious metastasis and be considered cured when follow-up scans do not show the same artifact. Contamination artifacts should be positively ruled out before the diagnosis of functioning metastases is made.

CASE REPORTS

Case 1

A 87-yr-old man with a history of neurosyphilis and thyroid isthmusectomy for follicular carcinoma 40 yr previously was admitted to the hospital for evaluation of a recent onset of dysphagia. Investigation revealed a mediastinal mass compressing the esophagus and multiple pulmonary nodules. An ^{131}I scan of the neck and chest was obtained to determine if

these lesions were functioning thyroid cancer metastases. The serum T_4 was 5.1 $\mu\text{g}/\text{dl}$ (normal 4.5 to 11.5 $\mu\text{g}/\text{dl}$), T_3 uptake ratio 1.09 (normal 0.86 to 1.14), TSH 3.8 $\mu\text{IU}/\text{ml}$ (normal 0 to 4.4 $\mu\text{IU}/\text{ml}$) and thyroglobulin 138 ng/ml (normal 0 to 60 ng/ml). The scan of the neck and chest following the oral administration of 1.04 mCi of ^{131}I (Fig. 1, upper) showed a normal sized thyroid and focal radioiodine uptake in the region of the mediastinal mass (arrowheads) and right shoulder. Also noted was abnormal ^{131}I localization in the left supraclavicular and left shoulder regions (arrows). Subsequently a complete thyroidectomy was performed. A follow-up ^{131}I survey scan using a 10.0 mCi dose was obtained 4 wk after the surgery. The patient received no hormone in the interim. At this time, the T_4 was 1.0 $\mu\text{g}/\text{dl}$, T_3 uptake ratio 0.89, TSH 39.3 $\mu\text{IU}/\text{ml}$ and thyroglobulin 128 ng/ml. The scan again showed uptake by the mediastinal mass (arrowheads) and the right shoulder lesion with multiple new functioning metastases in the chest (Fig. 1, lower). However, no abnormal activity in the left shoulder or supraclavicular region was seen (arrows). It was concluded that the activity in the left shoulder region present on the first scan was an artifact from radioactive saliva contamination (nocturnal drooling). The patient was subsequently treated with 150 mCi of ^{131}I for the metastases. A post-therapy scan 3 days later revealed the same metastatic lesions. Again, no uptake in the left shoulder region was present.

Case 2

A 57-yr-old male veteran had a history of a left thyroid lobectomy for follicular carcinoma 12 yr previously. His daily Synthroid (0.15 mg) was discontinued for 4 wk. A dose of 10 IU of TSH was given i.m. prior to a 10.3 mCi ^{131}I dose. A baseline scan revealed a surgically absent left lobe and an intact right lobe with evidence of a residual pyramidal lobe.

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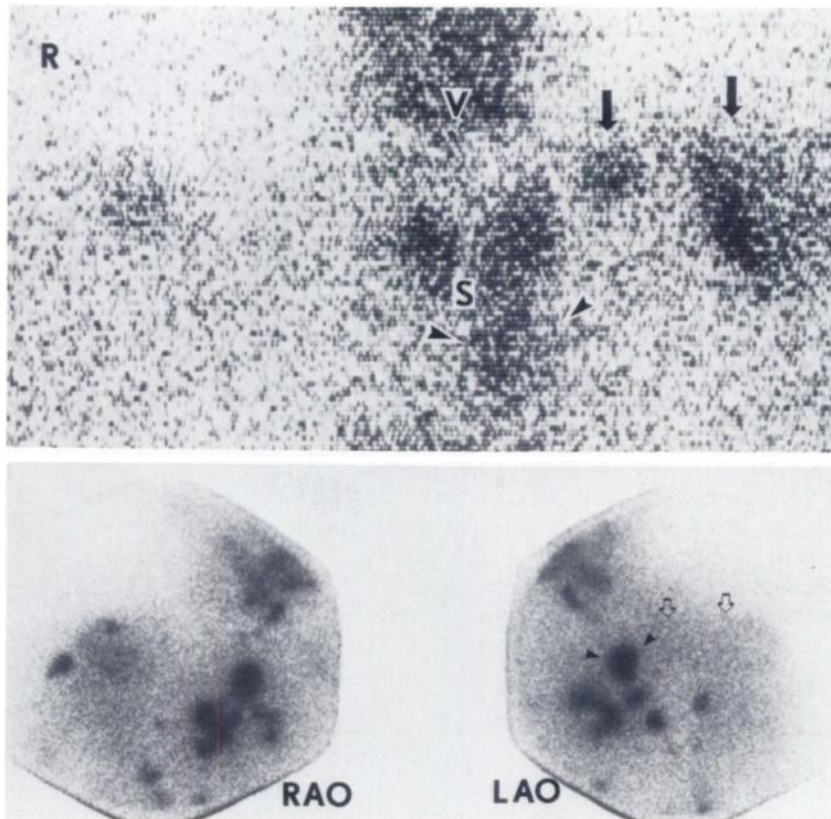


FIGURE 1
 Case 1. A: Anterior ^{131}I neck and chest scan demonstrating saliva contamination artifacts in left shoulder region (arrows). True metastatic lesions are also seen in mediastinum (arrow heads) below left lobe of thyroid and right shoulder. V = Thyroid cartilage; S = Suprasternal notch. B: Post-complete - thyroidectomy ^{131}I scan of neck and chest of same patient in RAO and LAO projections. Saliva contamination artifact did not occur in this scan. Note lack of abnormal activity in left shoulder area (arrows). Radioiodine uptake is seen in multiple new metastases, as well as in same mediastinal mass

The image of the neck and chest obtained with maximum sensitivity (Fig. 2, left) showed a "blooming" artifact due to the high ^{131}I activity in the right lobe and an area of radioiodine localization in the right shoulder, consistent with a functioning metastasis (arrow). Subsequently the residual right lobe was removed surgically. Six weeks later, without thyroid hormone administration, another ^{131}I scan of the neck and chest was obtained. Twelve tomographic "cuts" obtained by a Phocon scanner showed uptake only in the remaining pyramidal lobe. The right shoulder region was free of ^{131}I activity (Fig. 2, right). It was concluded that the abnormality on the right shoulder seen on the earlier scan was due to saliva contamination. For ablation of the residual pyramidal lobe the patient received 96.4 mCi of ^{131}I . The post-therapy scan 3 days later showed no abnormal uptake in the right shoulder region.

DISCUSSION

Image artifacts due to contamination with technetium-99m radiopharmaceuticals are relatively common occurrences in nuclear medicine studies (1). Practitioners in nuclear medicine are well aware of such possibilities and artifacts are readily recognized. On the other hand, contamination artifacts in routine radioiodine thyroid scans are quite rare. This difference may be dose related. Although radioiodine is excreted in various body fluids, contamination artifacts are usually not visualized because of the limited imaging area, small dose for diagnostic studies, and the high target to non-

target ratio. However, following a large dose of ^{131}I , contamination artifacts may become visible. Abdel-Dayem reported a case of radioactive braided hair due to excessive sweating in a Kuwaiti woman treated with 50 mCi of ^{131}I (2).

Since the value of high dose (1-10 mCi or therapy-dose) scan to detect thyroid cancer metastases was demonstrated (3,4), many institutions including our own use millicurie doses for diagnostic purposes in proven thyroid cancer patients. As larger doses of ^{131}I are accepted as routine, more contamination artifacts may be encountered. Knowing the characteristics of contamination artifacts will be helpful. Artifacts due to radioactive body fluid contamination usually do not conform to any anatomic structure; i.e., they appear to be smeared over a wide area rather than being well circumscribed. They are superficial with no underlying lesion palpable. Any extrathyroidal activity in the presence of a normally functioning thyroid gland may be a suspect. Although possible, it is very unusual to see metastases in the presence of one lobe or more of a normally functioning thyroid.

If extrathyroidal activity is seen in the neck and shoulder areas and a contamination artifact is suspected, the area should be immediately investigated to prevent a serious misinterpretation. One or more of the following methods can be tried: (a) remove the patient's garment and repeat the image, (b) obtain a lateral or tangential view to see if the activity is limited to the

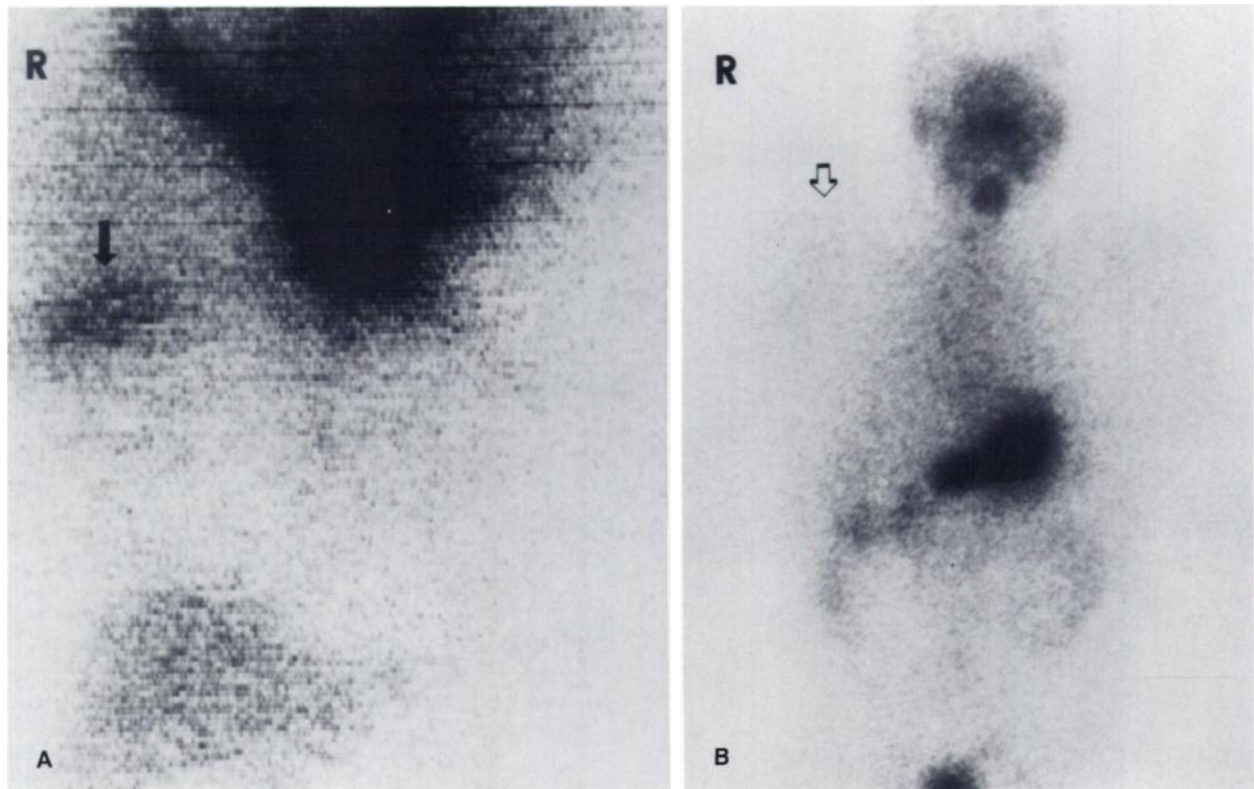


FIGURE 2

Case 2. A: Iodine-131 rectilinear scan of neck and chest in Case 2. Saliva contamination artifact is seen in right shoulder region (arrow). Also, note septal penetration and "blooming" artifacts from activity in right lobe. Activity in liver represents radioactive thyroxine being metabolized. B: Post-complete-thyroidectomy ^{131}I scan demonstrating activity in residual pyramidal lobe. Saliva contamination did not occur in this scan. Note lack of abnormal activity in right shoulder region (arrow)

skin surface, (c) perform a wipe test on the skin over the suspected area and compare with the contralateral side. It is to be noted that radioiodine is bound to tissue protein and not easily washed off. Thus, merely washing the area and reimaging may not prove to be helpful. The wipe test for the contralateral area is necessary to see if the activity obtained from the suspected area is not just the activity in sweat, and (d) repeat the study in a few days if the artifact is not confirmed. If a contamination artifact is mixed with many other true metastatic lesions, the recognition of an artifact may only be retrospective.

Recognition and confirmation of a contamination artifact in a thyroid cancer metastatic survey is of paramount clinical importance. Contamination artifacts should be completely ruled out to prevent admin-

istration of an unwarranted ablative dose of ^{131}I to thyroid cancer patients.

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