Nasal Radioiodine Activity: A Prospective Study of Frequency, Intensity, and Pattern

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The nose has been reported as a site of radioiodine accumulation on ^{131}I whole-body scintigraphy. To determine the frequency, intensity, and pattern of nasal radioiodine accumulation, a prospective study was performed on 21 patients referred for ^{131}I whole-body scintigraphy during a 26-mo interval. All patients were dosed with 5 mCi (18.5 MBq) of ^{131}I p.o., and imaged 72 hr later. Ninety-five percent (20/21) of patients had nasal radioactivity greater than background, and in 75% (15/20) of positive patients the pattern of activity was round. Clinical follow-up of these patients has shown no evidence of tumor involvement in the nasal area. We conclude that nasal radioiodine activity is a normal finding. Radioiodine uptake in the nasal area, without clinical suspicion of metastatic disease, should not be considered a criterion for surgical intervention or radioiodine therapy.

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Iodine-131 (^{131}I) is the principal isotope used for scanning and detection of residual or metastatic thyroid cancer. Visualization of isotope uptake outside the thyroid bed (excluding physiologic activity in salivary glands, kidneys, bladder, liver, and gastrointestinal (GI) tract) in a patient who has had a thyroidectomy for differentiated thyroid cancer may be taken as sufficient evidence of metastasis to warrant therapeutic ^{131}I administration to destroy the tumor cells (*1*). Iodine-131 uptake was identified in the nasal area of a patient who had no other evidence of metastatic disease, undetectable thyroglobulin levels, and a negative computed tomograph (CT) of this area. Our suspicion that normal nasal mucosa could concentrate ^{131}I was heightened by the finding of a single case report published over 20 years ago (*2*). Because ^{131}I uptake by nasal mucosa has important clinical and therapeutic implications, we prospectively evaluated ^{131}I uptake in the nasal area of 22 consecutive patients undergoing routine follow-up scintigraphy for thyroid carcinoma.

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MATERIALS AND METHODS

We prospectively studied all patients with pathologically proven papillary and/or follicular thyroid carcinoma who underwent ^{131}I whole-body scintigraphy at Walter Reed Army Medical Center from July 1983 to May 1985. Of 22 patients who fulfilled these criteria, one was rejected because of known skull metastases.

Right and left lateral head scintigraphs were obtained 72 hr after oral administration of 5 mCi (18.5 MBq) of ^{131}I. All patients were off of T-4 for 6 wk and T-3 for 3 wk, and all had TSH levels greater than 50 microinternational units per ml. Cobalt markers were placed to accurately define anatomy as needed. Images were acquired for 45 min or 200 count information density per cm^2 (whichever occurred first). The energy peak was 364 keV with a 20% window. A standard gamma camera (Picker 415 LFOV) with a medium-energy collimator was utilized. We performed thyroid bed uptakes on all of these patients.

The ^{131}I neck and chest scintigraphs of the head were evaluated for intensity and pattern of radioiodine uptake by a consensus (group reading) of three nuclear medicine physicians (EHN, JAN, DVN). Scans were read without knowledge of patient's clinical status, thyroid bed uptake, or treatment status. Intensity of activity was graded from 0 to 3+ (Table 1 and Figs. 1–3).

RESULTS

The age, sex, grade of intensity of nasal radioiodine uptake, and pattern of nasal radioiodine uptake in our patients are tabulated in Table 2. The patients' mean age was 43 yr (range 22 to 64 yr). Thirteen patients were female and eight were male. Ninety-five percent (20/21) of patients showed nasal radioiodine uptake. Of these 20 positive patients, the intensity of nasal radioiodine uptake was 1+ in 30% (6/20), 2+ in 30% (6/20), and 3 + in 40% (8/20). The pattern of nasal radioiodine uptake was typically round, although some cases appeared oblong or somewhat linear.

Continued follow-up, to include serial neck and chest scans, thyroglobulin assays, and clinical examinations were obtained on 90% (19/21) of the patients entered into our study. None of these patients developed new areas of activity on neck and chest scans, elevated or increasing thyroglobulin levels, or evidence of tumor on clinical examination.

TABLE 1
Intensity of Radioactivity in the Nasal Area

Intensity	Description
0	None demonstrated or equal to adjacent background
1+	Greater than background but less than parotid and/or mouth* (Figs. 1)
2+	Equal to parotid and/or mouth* (Fig. 2)
3+	Greater than parotid and/or mouth* (Fig. 3)

* If activity in the parotid and mouth is not approximately equal, the one with greater activity is used for comparison to nasal activity.

The relationship of nasal radioiodine accumulation to thyroid bed radioiodine uptake and to total cumulative radioiodine administered, both therapeutic and diagnostic, was analyzed. No significant correlation was demonstrated with either uptake ($r = -0.258$) or total radioiodine dose ($r = -0.004$).

DISCUSSION

Although McCready described nasal radioiodine accumulation in a case report in 1966 (*1*), his suggestion that it may be normal has not been verified. Nasal radioiodine accumulation on radioiodine neck and chest scintigraphy is still not considered a normal finding. A recent article by Greenler (*3*) about false-positive ^{131}I images mentioned briefly that there is physiologic secretion in the nasopharynx. However, no distinction was made regarding mouth, nasopharynx, and nose.

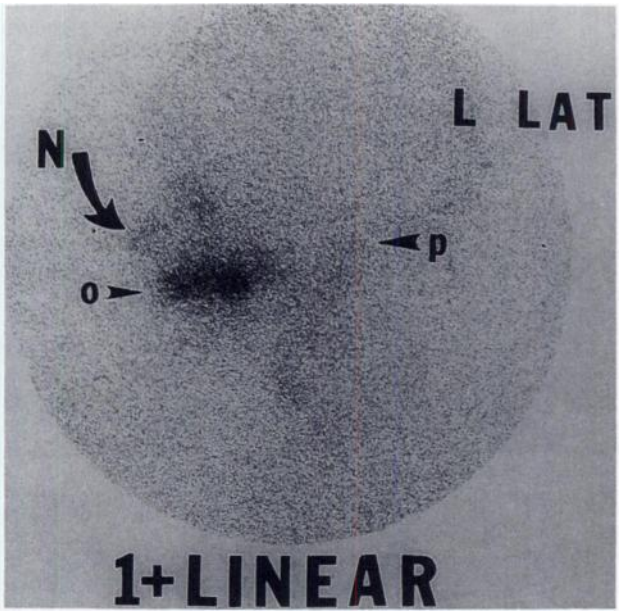

FIGURE 1
1+ linear radioiodine uptake in the nasal region. (L LAT = left lateral; N = nose; p = parotid; o = oropharyngeal).

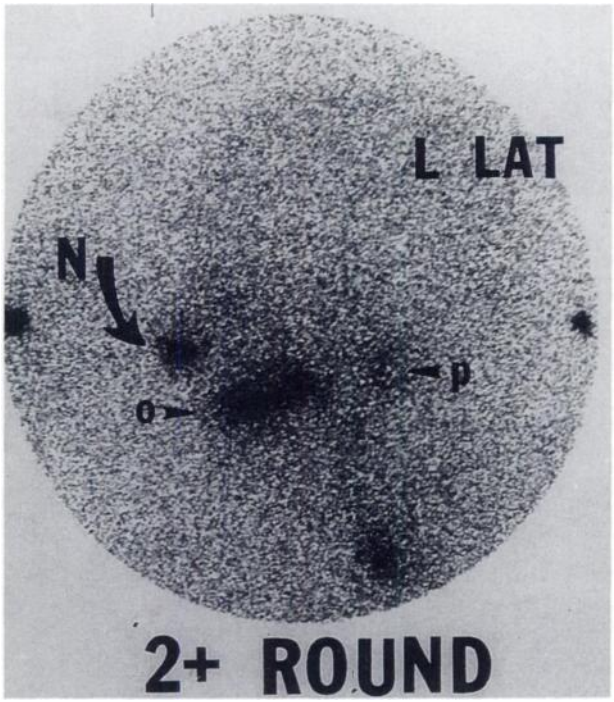

FIGURE 2
2+ round radioiodine uptake in the nasal region. (L LAT = left lateral; N = nose; p = parotid; o = oropharyngeal).

None of their eight false-positive cases was in these regions.

Our prospective study documented nasal uptake in

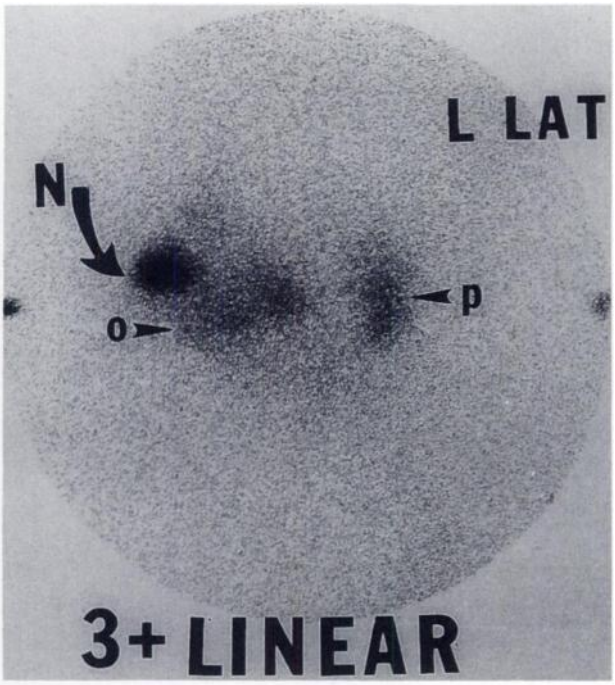

FIGURE 3
3+ linear radioiodine uptake in the nasal area. (L LAT = left lateral; N = nose; p = parotid; o = oropharyngeal). The two areas of radioactivity on each side of the image represent cobalt markers.

TABLE 2
Nasal Radioactivity

Patient no.	Age (yr)	Sex	Nasal radioactivity*	Tumor type
1	22	M	2+	P
2	24	F	3+	F
3	58	M	3+	P
4	38	M	3+	P
5	41	F	1+	P/F
6	44	F	2+	P/F
7	37	F	2+	P/F
8	62	M	3+	P
9	55	F	1+	F
10	32	F	2+	P
11	52	F	2+	P/F
12	42	M	1+	P
13	29	F	0	F
14	52	M	3+	P
15	40	M	3+	P
16	33	F	3+	F
17	64	F	3+	F
18	32	F	1+	F
19	64	M	2+	F
20	58	F	1+	F
21	28	F	1+	F

* See text and photos for grading scale.

Abbreviations: P: Papillary thyroid carcinoma. F: Follicular thyroid carcinoma. P/F: Mixed papillary and follicular thyroid carcinoma.

95% of patients who had no evidence of nasal metastases on detailed follow-up. The intensity and pattern of nasal radioiodine accumulation were typically equal to or greater than the radioiodine activity in the mouth and/or parotid, and was usually round in pattern.

Two of the original 21 patients entered into our study were lost to follow-up, yielding a 90% follow-up rate. The lack of evidence of widespread metastatic disease, combined with no evidence of local nasal tumor, makes the likelihood of isolated nasal metastases in these patients vanishingly small.

The mechanism of nasal radioiodine accumulation is unknown. McCready felt that nasal activity was mainly in the tissues, since his patient had absence of nasal secretions and nasal swabs had low radioactivity (*2*). Other tissues that concentrate iodide such as salivary glands, gastric mucosa, and palatal mucous glands of cats and rabbits are thought to do so by an active transport mechanism (*4–7*). In other organs such as mammary glands, ovary, and late gestational placenta the mechanism of iodide concentration is not yet established. Nasal pain and epistaxis have been reported after large therapeutic doses (200–400 mCi, 7.4 to 14.8 GBq) of radioiodine (*8*). Since we have found a large percentage of patients with apparent physiologic nasal activity, it appears possible that nasal pain and epistaxis may be due to radiation injury.

Our study strongly suggests that nasal radioiodine accumulation is a normal finding. The intensity and pattern of nasal radioiodine is variable; when present it is usually equal to or greater than the radioactivity in the mouth and/or parotid gland, and round. Caution should be used when evaluating uptake in the nasal area in these patients. Without further evidence of metastasis or residual tumor, nasal uptake should not be used as a sole criterion to administer ^{131}I for therapy. If nasal pain and/or epistaxis is observed following a therapeutic dose of radioiodine, radiation injury should be considered as a possible etiology. Further study may elucidate the mechanism of radioiodine accumulation and the possibility of radiation injury to the nose.

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All authors were on active duty in the United States Army when this study was performed, and this manuscript was part of their official government duties and as such cannot be copyrighted.

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