bone marrow, is therefore seen in areas of Paget's disease with active marrow. This can mimic uptake of infection particularly when it is focal. Our case further demonstrates that clinico-radiographic information was crucial in this patients' scintigraphic management. The patients' medical history and radiographic findings raised the suspicion of Paget's disease as a cause of this patient's ^{111}In-WBC uptake pattern and led us to obtain a bone marrow scan to confirm it.

Photopenic areas in leukocyte imaging have been reported in traumatic, surgical or irradiation injuries, vascular necrosis, infection, neoplastic replacement, aging, fibrosis and Paget's disease (*15–17*) because of loss of normal marrow in these conditions. Accumulation of ^{111}In-WBC by Paget's disease, however, is rarely reported (*18,19*). Additionally, Paget's disease cases studied with sulfur colloid bone marrow scans showed decreased to absent marrow uptake as the marrow is replaced by fibrous tissue (*20–22*). Increased marrow uptake was only found in 1 of 21 pagetic bone reported in an abstract (*22*), and the extent of uptake is not known.

CONCLUSION

In patients with suspected osteomyelitis, particularly the elderly, abnormal ^{111}In uptake could be due to active bone marrow uptake in Pagetic bone. If ^{111}In-WBC uptake is suspected to be due to Paget's disease, correlation with a bone marrow scan should be considered, to avoid interpretational confusion.

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Technetium-99m-Pertechnetate Uptake by Intrathyroidal Parathyroid Adenoma

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A 57-yr-old woman was referred for preoperative scintigraphic localization of a parathyroid adenoma. Double-phase ^{99m}Tc-sestamibi imaging was performed followed by a separate-day [^{99m}Tc]pertechnetate thyroid scan. There was marked accumulation of both tracers by a right lower pole "thyroid" nodule which, at surgery, proved to be an intrathyroidal parathyroid adenoma. Hypervascularity is the presumed explanation for rare cases of pertechnetate-avid parathyroid adenomas.

Key Words: hyperparathyroidism; technetium-99m-pertechnetate; thyroid scans

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Nuclear scintigraphy is a well-established technique for the preoperative localization of parathyroid adenomas (*1–3*). Most imaging protocols rely on a dual-tracer subtraction technique using a perfusion tracer such as ^{201}Tl-thallous chloride or more recently ^{99m}Tc-sestamibi and a thyroid tracer ^{99m}Tc-pertechnetate or ^{123}I (*4–10*). It is generally observed that the parathyroid adenoma exhibits hyperperfusion but does not trap thyroid-specific iodine analogues, permitting the parathyroid adenoma to be differentiated from the thyroid on the subtraction image. We report a case in which a parathyroid adenoma exhibiting marked uptake of [^{99m}Tc]pertechnetate was erroneously thought to be a hyperfunctioning thyroid nodule.

CASE REPORT

A 57-yr-old woman was found to have persistent hypercalcemia following an episode of pancreatitis. Her serum calcium ranged from 2.92 to 3.15 mmole/liter (normal 2.10–2.60) with

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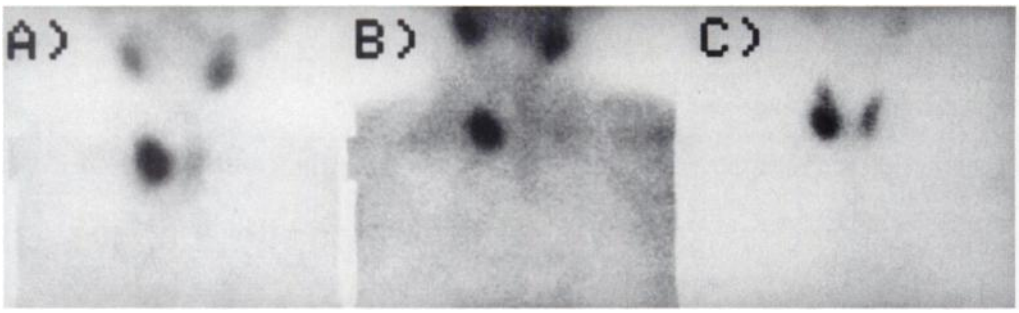

FIGURE 1. Parathyroid adenoma in right lower pole of the thyroid shows a marked uptake 15 min postinjection (A) and retention 4 hr postinjection (B) of ^{99m}Tc-sestamibi and [^{99m}Tc]pertechnetate (C).

an ionized serum calcium 1.78 mmole/liter (normal 1.17–1.32 mmole/liter). Primary hyperparathyroidism was confirmed biochemically by the presence of an inappropriately elevated serum PTH of 242 pmole/liter (normal <66). Preoperative localization was attempted with double-phase ^{99m}Tc-sestamibi imaging. Early (15 min postinjection) and delayed (4 hr postinjection) zoomed images of the anterior neck were performed following intravenous injection of ^{99m}Tc-sestamibi 740 MBq according to the method of Taillefer et al. (*11*). There was intense early accumulation of ^{99m}Tc-sestamibi appeared in the right lower pole of the thyroid with marked retention up to 4 hr (Fig. 1). A careful examination of the patient's neck revealed a corresponding, easily palpable nodule in the right lower pole of the thyroid. It is unusual for parathyroid adenomas to be palpable due to their small size and posterior location. Thus, a thyroid adenoma was suspected. A repeat scan using ^{99m}Tc-pertechnetate 370 MBq was done on a subsequent day. Marked tracer uptake, by the nodule, appeared to confirm that this was indeed a hyperfunctioning thyroid nodule. A second area of ^{99m}Tc-sestamibi retention was not evident and it was concluded that the parathyroid adenoma had not been localized.

The left neck was explored at surgery. Two normal parathyroid glands were found and biopsied. Attention was then directed to exploring the right side of the neck. The "thyroid" nodule was easily located but a parathyroid adenoma could not be found. Ultimately, the patient underwent a right hemithyroidectomy. The cut surface of the lobe revealed that the nodule was pale tan and measured 1.8 cm in greatest dimension. Microscopy showed that the nodule was in fact an intrathyroidal parathyroid adenoma enclosed by a thick fibrous capsule and surrounded by a rim of normal thyroid tissue (Fig. 2). The remainder of the lobe showed thyroid micronodularity (no larger than 3 mm). The patient developed mild symptomatic hypocalcemia following surgery (total serum calcium 1.82, ionized serum calcium 1.00) that required temporary treatment with oral calcium salts and vitamin D. She also suffered an acute episode of plantar fasciitis and pseudogout, which was precipitated by the abrupt drop in serum calcium. During the subsequent year of follow-up exams her serum calcium level has remained within the normal range on physiologic calcium supplementation.

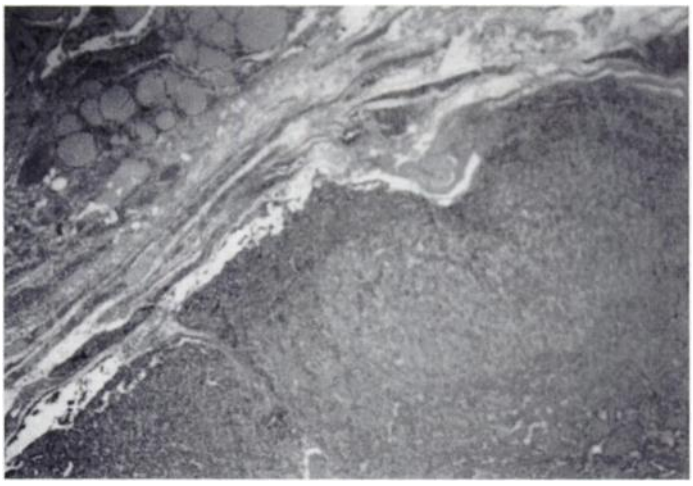

FIGURE 2. Low power-light microscopy shows the encapsulated parathyroid adenoma in the lower right of the slide surrounded by a rim of normal thyroid tissue.

DISCUSSION

We only located reports of seven other cases in which a parathyroid adenoma had shown significant uptake of [^{99m}Tc]pertechnetate (*12–15*). When an apparently hyperfunctioning thyroid nodule is the only finding in a patient with proven primary hyperparathyroidism it is important to remember this possibility. Otherwise, it may be incorrectly assumed that the "hot" nodule represents thyroid tissue and that the parathyroid adenoma has not been localized.

The mechanism for [^{99m}Tc]pertechnetate localization in a parathyroid remains uncertain. Hypervascularity is the most frequently cited explanation since there is no known cellular mechanism through which parathyroid tissue should actively trap iodine or its analogues. The presence of a thick capsule was observed in the previously reported cases and in our case as well.

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