Unilateral breast uptake of ^{99m}Tc-pertechnetate

To the Editor: A 34 years old woman was referred for thyroid scintigraphy because of a suspicion of postpartum thyroiditis. Over the last month, she had complained of fatigue, tremor, excessive sweating, and a tendency to diarrhea. Laboratory tests had confirmed hyperthyroidism; no thyroid stimulating immunoglobulins had been detected. The thyroid scan performed 20min after i.v. injection of 156MBq of technetium-99m pertechnetate (^{99m}Tc-P), on an e-cam camera, Siemens, USA), (Fig. 1) showed no accumulation of the tracer into the thyroid and thus confirmed the diagnosis of (postpartum) thyroiditis. Marked tracer accumulation was present in the left breast, whereas only slight tracer uptake was seen in the right breast. A whole body scintigraphy (Fig. 2) acquired immediately after the thyroid scan on the above camera, confirmed this peculiar biodistribution. Activity was absent from the thyroid gland, but present in salivary glands, stomach and bladder, as usual. Additionally, however, strong tracer activity was present in the left breast, in contrast to faint uptake in the right breast. From the onset of breastfeeding, the right breast had been less productive than the left one. At five months after delivery, the breastfeeding was now tapered and only the left breast was still used for feeding. While the uptake of pertechnetate in the left breast was readily explained by the lactation, the absence of uptake in the right breast was due to the absence of lactating mammary tissue.

Uptake of ^{99m}Tc-P in breast epithelial cells, like that of iodide, depends on the transmembrane sodium/iodide symporter (NIS), whose expression is known to be greatly enhanced during lactation and in breast cancer [1]. Given that oestrogen, prolactin and oxytocin are the most effective inducers of NIS expression in mammary tissues [1], equal stimulation of both breasts would be expected. Therefore, and because the right breast's milk production was lower from the onset, it seems likely that the right breast contained only little responsive breast tissue in the patient presented here. Local effects from reduced breast feeding on the right side, however, may have further contributed to the asymmetry.

Another case of unilateral breast uptake of ^{99m}Tc-pertechnetate due to unilateral feeding has been reported in a euthyroid patient with a multinodular goiter [2]. Unilateral uptake of ^{131}I has also been documented in a patient in follow-up for a papillary thyroid carcinoma, who had been breastfeeding a son since for three years with only one breast [3]. In a series of 20 ^{123}I scans performed within one week of cessation of breast feeding, uptake was asymmetric in 12 and unilateral in 3 patients. In one of the 3 patients with unilateral uptake, a history of mastitis was obtained, with consequent inability to produce milk from the involved breast [4].

The absence of functional thyroid tissue caused by thyroiditis in our patient, may have contributed to the enhanced breast uptake, by decreasing thyroid competition for the tracer. Some of the first descriptions of pertechnetate uptake by the breast were in thyroidectomized patients who were neither pregnant nor lactating [5, 6], although these may possibly have represented nonspecific vascular activity, since one of the patients showed no iodide uptake in breasts [5]. Bilateral breast uptake has been reported in a lactating patient with hyperthyroidism who showed only faint thyroid uptake, despite being diagnosed with Graves' disease [7]. In the series of 20 patients with breast uptake on ^{123}I scans that was mentioned above, thyroid remnants were present in 10 and absent in the other 10 patients [4]. A thyroid remnant was not visible on the ^{131}I scan that showed unilateral breast uptake [3]. Interactions between thyroid and breast uptake were further highlighted by one patient who showed an increased ratio of thyroid to breast activity on a 96-hour ^{131}I scan compared with the scan at 24h after tracer administration [4].

Bilateral breast activity in a pregnant patient undergoing a ^{99m}Tc macroaggregated albumin lung perfusion scintigraphy was ascribed to free pertechnetate because of concurrent visualisation of the thyroid and stomach [8]. Bilateral breast uptake has also been observed in a 4 days old infant with bilateral gynecomastia [9].

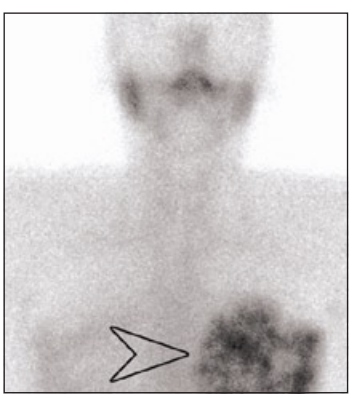

Figure 1. Thyroid scintigraphy performed in a 34 years old lactating patient because of a clinical suspicion of postpartum thyroiditis. No accumulation of ^{99m}Tc-P is observed, as expected in thyroiditis. Marked heterogeneous tracer accumulation is present in the left breast, whereas only slight tracer uptake is seen in the right breast.

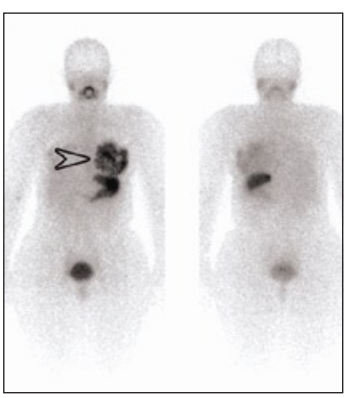

Figure 2. Whole body scintigraphy acquired immediately after the thyroid scan confirmed this peculiar biodistribution. Activity was absent from the thyroid gland, but present in salivary glands, stomach and bladder, as usual. Strong tracer activity was present in the left breast, in contrast to faint uptake in the right breast.

Besides these physiological causes of breast uptake, a range of benign or malignant breast tumours may take up ^{99m}Tc-P as well. Several studies have demonstrated enhanced expression of NIS in breast cancer [1, 10-11] as well as uptake of either ^{99m}Tc-pertechnetate or ^{131}I [11-13]. Uptake of ^{99m}Tc-P was correlated with high expression of NIS mRNA [14]. It has been suggested that high iodide uptake may be the most specific biochemical characteristic of hormone dependent mammary tumours [15]. Imaging by ^{99m}Tc-P was ineffective for breast cancer in practice, in one series it was only 63% sensitive for the primary lesion [16]. In a nursing patient with a known breast tumour, fortuitous visualisation of the normal breast at radionuclide ventriculography with ^{99m}Tc-P was reported, whereas the breast harbouring the tumour was not visualized [17]. Some instances of uptake of either ^{131}I [13, 18] or ^{99m}Tc-P [14] in benign fibroadenomata have been documented, as well as enhanced NIS expression in these tumours [14, 18-19]. In the case presented here, however, the diffuse activity in the clinically normal but lactating breast suggests lactation as the cause of the pertechnetate uptake.

In conclusion, unilateral breast uptake of ^{99m}Tc-P may occur as a result of differential activity of the breasts during lactation. Clinical history taking may distinguish this condition from uptake in malignant or benign breast tumours.

All authors declare that they have no conflicts of interest

Bibliography

1. Tazebay UH, Wapnir IL, Levy O et al. The mammary gland iodide transporter is expressed during lactation and in breast cancer. *Nat Med* 2000; 6: 871-8.
2. Tiktinsky E, Horne T, Agranovich S, Landsberg S. Unilateral ^{99m}Tc-pertechnetate breast uptake: is it always benign? *Clin Nucl Med* 2007; 32: 735-6.
3. Grónwald F, Palmedo H, Biersack HJ. Unilateral ^{131}Iodine uptake in the lactating breast. *J Nucl Med* 1995; 36: 1724-5.
4. Bakheet SM, Hammami MM. Patterns of radioiodine uptake by the lactating breast. *Eur J Nucl Med* 1994; 21: 604-8.
5. Meighan JW, Dworkin HJ. Failure to detect ^{131}I positive thyroid metastases with ^{99m}Tc. *J Nucl Med* 1970; 11: 173-4.
6. Lamoureux J. An unusual concentration of radio-pertechnetate in a patient with thyroid cancer. *Am J Roentgenol Radium Ther Nucl Med* 1974; 121: 714-5.
7. Chew CG, Sotiropoulos P. Uptake of ^{99m}Tc-pertechnetate by lactating breasts during a thyroid scan in a postpartum patient. *Clin Nucl Med* 2003; 28: 441-2.
8. Sherigar RM, Slavin JD Jr, Hawkins HB, Spencer RP. Breast uptake of ^{99m}Tc-pertechnetate during perfusion lung scan in pregnancy. *Clin Nucl Med* 1998; 23: 700-1.
9. Othman S, El-Desouki M. Neonatal gynecomastia visualized during ^{99m}Tc-pertechnetate thyroid scintigraphy. *Clin Nucl Med* 2003; 28: 988-9.
10. Rudnicka L, Sińczak A, Szybiński P et al. Expression of the Na(+)/I(-) symporter in invasive ductal breast cancer. *Folia Histochem Cytobiol* 2003; 41: 37-40.
11. Upadhyay G, Singh R, Agarwal G et al. Functional expression of sodium iodide symporter (NIS) in human breast cancer tissue. *Breast Cancer Res Treat* 2003; 77: 157-65.
12. Cancroft ET, Goldsmith SJ. ^{99m}Tc-pertechnetate scintigraphy as an aid in the diagnosis of breast masses. *Radiology* 1973; 106: 441-4.
13. Eskin BA, Parker JA, Bassett JG, George DL. Human breast uptake of radioactive iodine. *Obstet Gynecol* 1974; 44: 398-402.
14. Moon DH, Lee SJ, Park KY et al. Correlation between ^{99m}Tc-pertechnetate uptakes and expressions of human sodium iodide symporter gene in breast tumor tissues. *Nucl Med Biol* 2001; 28: 829-34.
15. Briand P. Hormone-dependent mammary tumors in mice and rats as a model for human breast cancer (review). *Anticancer Res* 1983; 3: 273-81.
16. Buchmann I, Riedmóller K, Hoffner S et al. Comparison of technetium-99m-pertechnetate and 123iodide SPECT with FDG-PET in patients suspicious for breast cancer. *Cancer Biother Radiopharm* 2007; 22: 779-89.
17. Cassidy DB, Goldstein RA, Wu DB et al. Apparent left ventricular aneurysm due to unilateral secretion of ^{99m}Tc-pertechnetate in a nursing mother with breast cancer. *Clin Nucl Med* 1990; 15: 264-5.
18. Berger F, Unterholzner S, Diebold J et al. Mammary radioiodine accumulation due to functional sodium iodide symporter expression in a benign fibroadenoma. *Biochem Biophys Res Commun* 2006; 349: 1258-63.
19. Kilbane MT, Ajjan RA, Weetman AP et al. Tissue iodine content and serum-mediated ^{125}I uptake-blocking activity in breast cancer. *J Clin Endocrinol Metab* 2000; 85: 1245-50.

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