

Radioiodine Ablation in Postpartum Patient with Differentiated Thyroid Cancer: A Case Report and Review of Literature.

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Abstract

Well differentiated thyroid carcinoma is the most commonly seen thyroid cancer. One of the presenting symptoms is thyroid nodule. In most cases following initial workup and whereby tumour is resectable, surgery is the mainstay of treatment. The subsequent postsurgical management utilising radionuclide Iodine-131 (I-131) has long been established and extensively being studied and discussed. This present case report illustrates the general overview of differentiated thyroid cancer (DTC) as well as the concerns related to radioiodine ablation in a postpartum patient with DTC.

Keywords: *radioiodine ablation, differentiated thyroid cancer, postpartum*

Introduction

Most commonly seen thyroid cancer cases are well differentiated thyroid carcinoma (DTC). Patients may present with thyroid nodule or symptoms related to tumour extension, local spread and metastasis. Surgery is the mainstay of treatment in the majority of cases following initial workup whereby tumour is resectable. The subsequent postsurgical management would usually include the usage of radionuclide Iodine-131 (I-131). However, there are several important recommended precautions and preparation measures in optimising the treatment efficacy and safety plus minimising the possible adverse effects of I-131. These include concerns related to radioiodine ablation in postpartum patients and pre-ablation cessation of breastfeeding.

Case Presentation

A 40 years old lady with underlying hyperthyroidism was noticed to have a hard thyroid nodule in June 2013. Ultrasound of thyroid showed multiple nodules in both thyroid lobes and isthmus with some appearing irregularly hypoechoic with microcalcification. She

underwent fine needle aspiration cytology of thyroid nodule that revealed malignant neoplasm with features suggestive of papillary carcinoma. She was then advised for surgery and underwent total thyroidectomy on in August 2013. Histopathological examination of the surgical specimen was reported as multifocal papillary thyroid carcinoma with possible vascular involvement and background features of multinodular goitre.

Postoperatively she was prescribed with thyroxine. At that moment, she was also confirmed to be pregnant in her second trimester. She delivered her baby in November 2013 and subsequently breastfed the infant. She was then reviewed at the Nuclear Medicine Department in March 2014 after being referred for remnant thyroid radioiodine ablation. She was counselled regarding the need for cessation of breastfeeding and other pre-ablation preparations. No medication was prescribed to stop the lactation. She came for another clinic review in April 2014. At that point, she has already stopped breastfeeding her child and being planned for radioiodine ablation in May 2014.

Upon admission to the radioiodine ward, there was no longer breast milk production. She received radioiodine ablation with 80 mCi of I-131 with prior 2 doses of intramuscular recombinant human thyroid stimulating hormone injections. Her TSH level was 78.94 μ IU/mL and the stimulated serum thyroglobulin level was $< 1.0 \mu$ g/L. Day 3 post ablation scan revealed 2 foci of

increased tracer uptake in the neck region with star effect in keeping with iodine-avid functioning thyroid tissue (Figure 1 and 2). There was mild tracer uptake seen in the soft tissue at the anterior chest bilaterally due to non-pathological uptake in the breasts (Figure 1 and 2). Elsewhere was physiological uptake.

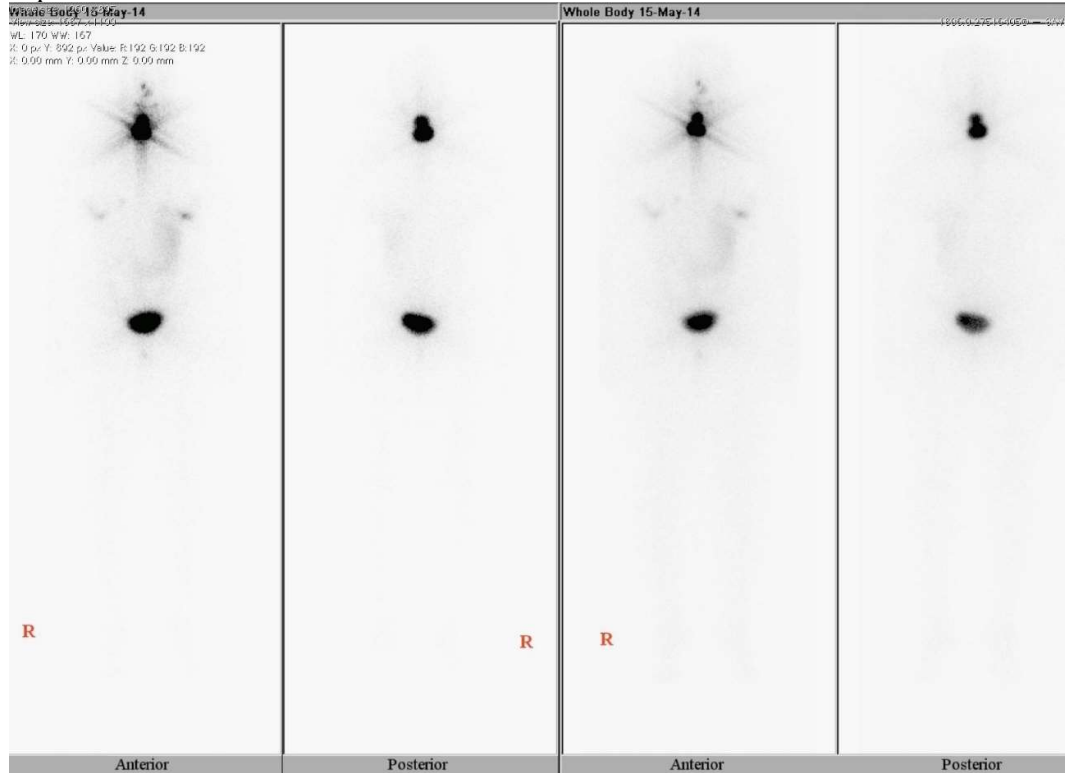


Figure 1. Post ablation scan - whole body anterior and posterior views.

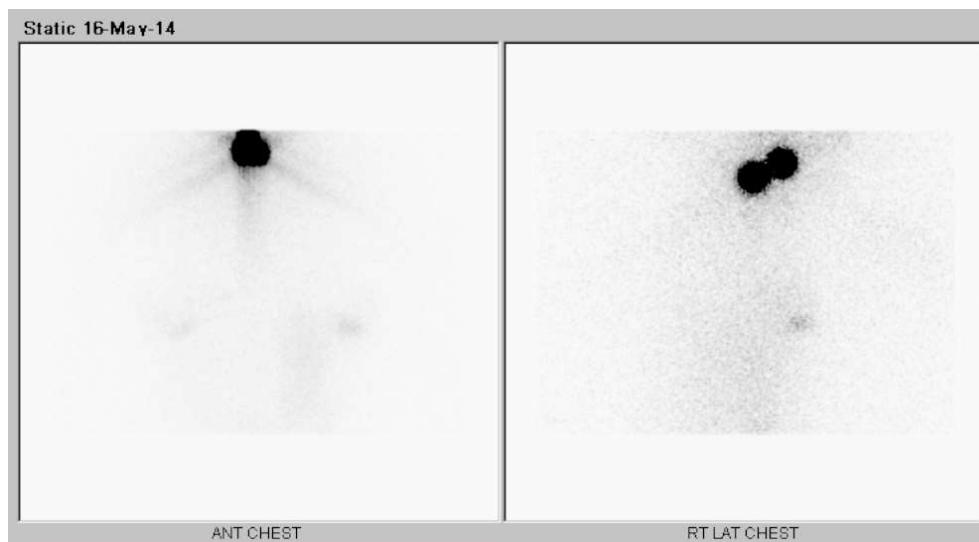


Figure 2. Post ablation scan - spot views of the chest (anterior and right lateral views).

Discussion

The oral administration of radionuclide I-131 for the treatment of benign and malignant thyroid disorders has been a commonly accepted procedure for the last 60 years (1). As for thyroid cancer, it is the most common of the endocrine malignancies with annual incidence varying considerably by geographic area, age and sex (2). DTC accounts for > 90% of thyroid cancer cases, with most patients having an excellent prognosis (3). Although DTC can be divided into papillary, follicular and Hurtle cell subtypes, they all actually arise from the thyroid follicular cells. Most DTC cells preserve the ability to concentrate and retain iodine (4).

A suspicious thyroid nodule is usually being assessed by ultrasound and cytology to ascertain the diagnosis. Total or near-total thyroidectomy is the initial treatment of DTC whenever the diagnosis is made before surgery (2). It is widely recognised that I-131 has become an integral component of the postsurgical management of DTC (5). Several published guidelines have looked into the staging of DTC and its risk stratification that incorporates tumour related parameters, histology and other clinical factors including serum

thyroglobulin level and findings of post ablative scan (2).

Consequently decision related to the management with I-131 and selection of radioiodine activity is commonly directed by the disease stage and its risk stratification. In our local setting, radioiodine is being dispensed as liquid solution. The physical half-life of I-131 is approximately 8 days. I-131 emits beta particles at various energies with the maximal energy being 606 keV and the mean energy being 191 keV. It also emits gamma rays of 364 keV and 637 keV. As ionising radiation delivered by the beta particle loses its energy after travelling about 2 mm in tissue, it disrupts chemical bonds throughout the cell inflicting devastating damage on DNA molecules and triggering cellular dysfunction leading to ultimately cell death

(In a most recent publication, it has been described that the use of radioidine in thyroid cancer generally can be divided to 3 categories; (a) remnant ablation of thyroid tissue after surgery to facilitate future monitoring of thyroglobulin, (b) adjuvant therapy after resection for patients with increased risk of recurrence, which mirrors adjuvant therapy in other solid cancers and (c) cancer treatment in an attempt to destroy

known or suspected active macroscopic viable malignant disease (5). However, there are also recommendations that certain cases such as unifocal papillary carcinoma ≤ 1 cm without any evidence of metastasis, capsule invasion, history of radiation exposure and unfavourable histology would not require I-131 ablation (7).

There are several important preparations prior to radioiodine treatment in order to promote I-131 uptake and subsequently increase its effectiveness. For a sufficient time before the contemplated therapy, patients must discontinue use of iodine containing foods, supplements and medications. They should be on low-iodine diet for approximately 2 weeks prior to radioiodine administration. Furthermore the serum TSH level prior to radioiodine treatment should exceed 30 μ IU/mL in order to maximise I-131 uptake which could be attained by withholding thyroxine hormones for about a month or by injection of recombinant human TSH (1, 4).

Pregnancy and breastfeeding are known contraindications to I-131 therapy. Pregnancy must be excluded before each treatment as radioiodine may cause detrimental risks to the foetus. Women who are lactating or have just recently stopped breastfeeding also should not be treated with I-131 since the lactating breasts may concentrate a substantial amount of iodide. This is firstly to prevent milk containing I-131 from being breastfed to the infant and secondly to limit radiation exposure of the breast tissue which has increased expression of sodium iodide symporter during lactation (8). Patients should be advised to discontinue breastfeeding for approximately 6-8 weeks before I-131 administration (4, 9). Cessation of lactation should continue after the therapy and breastfeeding can be undertaken with the birth of another child (1, 8).

The patient in this case report was postpartum and had breastfed her child at the time of referral for radioiodine ablation. She was advised to discontinue lactation and delay the I-131 treatment until lactation has fully stopped. Nevertheless, in certain circumstances some patients may require cautious use of short course of dopaminergic agents such as bromocriptine and cabergoline to stop lactation. Dopamine agonists could be beneficial in reducing breast exposure in recently lactating women, although cautiousness should be exercised given the risk of serious side effects associated with their routine use to suppress postpartum lactation (9). Possible adverse effects include gastrointestinal symptoms as well as cardiovascular, neurological and psychiatric events.

Upon treatment, the presently discussed patient no longer has breast milk production. However, her post ablation scan showed iodine-avid tissue in the neck and mild tracer uptake in the breasts bilaterally. Added spot views were acquired to exclude lung metastasis. Radioiodine activity in the chest can be due to uptake in the lungs, breasts, heart, thymus, trachea, oesophagus and external contamination such as skin, hair and garment (10). Radioiodine breast uptake has been reported to be unilateral, asymmetrical or symmetrical bilaterally in the patterns of full, focal, crescent or irregular uptake (11). In certain cases, a pre-radioiodine therapy scintigraphy with low dose Iodine-123 or Technetium-99m pertechnetate can reasonably be used to assess whether the previously lactating breasts still concentrate iodine and guide appropriate timing of the treatment (1, 12, 13).

Conclusion

Administration of oral radioiodine for the treatment of DTC has long been

established and became an important aspect of the post-operative management. There are several important recommended precautions and preparation measures related to the therapeutic use of radioiodine. In a postpartum patient with DTC who is referred for remnant thyroid radioiodine ablation, measures should be taken to

ensure adequate discontinuation of lactation prior to treatment with I-131. Cessation of lactation can be achieved either physiologically or pharmacologically. Despite that, mild radioiodine activity may still be present in the breasts and must not be mistaken for pathological lung uptake.

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