

Port-Site Implantation Diagnosed by Iodine-131 Post-Ablation Single-Photon Emission Tomography-Computed Tomography After Robotic Thyroidectomy: A Case Report

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G





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Conflict of interest: None declared

Patient:	Female, 37
Final Diagnosis:	Port-site implantation after robotic thyroidectomy
Symptoms:	None
Medication:	—
Clinical Procedure:	Iodine-131 post-ablation whole body scan and single photon emission tomography-computed tomography
Specialty:	Nuclear Medicine
Objective:	Unusual or unexpected effect of treatment
Background:	Robotic thyroidectomy using remote access approaches is currently regarded as the optimal surgical protocol for highly selected patients. This approach has excellent cosmetic outcomes compared with conventional open transcervical thyroidectomy. Although the remote access approach offers significant benefits, it can cause complications associated with the large working space required for surgery. Such complications can lead to unusual imaging findings.
Case Report:	We report a case of a 37-year-old woman with thyroid cancer who underwent robotic thyroidectomy and demonstrated unusual port-site implantation findings on post-treatment iodine-131 whole-body scintigraphy and single-photon emission computed tomography-computed tomography. Evaluation of stimulated thyroglobulin and additional imaging studies did not reveal any remarkable findings. Through a multidisciplinary discussion, we discovered that the bag had developed a tear during specimen retrieval. Our patient was administered a therapeutic dose of radioiodine, which accumulated within the target area and successfully ablated the implanted tissue. Follow-up imaging and biochemical studies were normal after a follow-up period of 7 years.
Conclusions:	Port-site seeding is a rare and unexpected surgical complication; however, it can be treated with radioiodine therapy involving a therapeutic dose. Meticulous surgical manipulation is essential to prevent port-site implantation related to spillage and tearing of thyroid or cancer tissue. Awareness and identification of these rare complications, which manifest as unusual imaging findings, are critical for improving the accuracy of interpretation.
MeSH Keywords:	Positron-Emission Tomography • Thyroidectomy • Tomography, Emission-Computed, Single-Photon • Whole Body Imaging
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Background

Thyroid cancer is one of the most common neoplasms occurring in young women. Given the sex of the patients and their youth at the time of initial diagnosis and surgery, avoiding an anterior neck scar is an important consideration. Over the past 2 decades, surgeries have been advanced to improve the satisfaction of patients and minimize or avoid visible neck scarring. These advanced approaches range from minimally invasive techniques to the remote access thyroidectomy technique using an endoscope or a robot [1,2]. In recent times, endoscopic or robotic remote access thyroidectomy using the axillary, breast, anterior chest wall, postauricular facelift, or transoral approach has gained considerable popularity, along with the significant advancement and development of newer state-of-the-art surgical procedures and instruments [3,4]. Robotic thyroidectomy performed by experienced surgeons is feasible and has several advantages over conventional open thyroidectomy, such as an excellent cosmetic outcome with a similar complication rate; however, it should only be performed in highly selected patients, and requires extensive dissection to create a working space for the surgery, more time, and learning periods for overcoming technical difficulties [2,5–7]. Consequently, unexpected complications that may result in unusual imaging findings can occur [8].

Radioiodine therapy and radioiodine whole-body scintigraphy (WBS) have been widely used as therapeutic regimens for over half a century. Imaging studies, including single-photon emission computed tomography-computed tomography (SPECT-CT), ¹⁸F fluoro-2-deoxyglucose positron emission tomography-CT (PET-CT), and ultrasonography (US) are of considerable value in differential diagnosis when unexpected findings are encountered on WBS after robotic thyroidectomy. Here, we present the rare findings of iodine-131 (I-131) WBS and SPECT-CT along the port site after robotic thyroidectomy in a woman with concurrent follicular and papillary thyroid cancers.

Case Report

A 37-year-old woman with a follicular thyroid nodule in the left thyroid lobe underwent left lobectomy using the robot-assisted bilateral axillo-breast approach. A frozen biopsy did not reveal any malignancy. However, a 1.7-cm follicular carcinoma with microscopic extrathyroidal extension and vascular invasion was pathologically confirmed. Completion thyroidectomy was performed using the same surgical procedure 4 months later. A 0.12-cm incidental papillary carcinoma confined to the right thyroid lobe was detected during this surgery.

Three months later, 481-MBq radioiodine therapy using levothyroxine withdrawal was administered. Multiple areas of unusual

radioiodine uptake were observed in the central neck and left upper chest area on WBS. We performed additional SPECT-CT to identify the exact anatomical locations; this revealed that the area of unusual uptake was located along the left axillary subcutaneous tunnel and in the residual thyroid tissue on the thyroidectomy bed (Figure 1A–1C). After discussion with a multidisciplinary team, we discovered that the surgical bag had developed a tear during retrieval of the wrapped thyroidectomy specimen through the narrow transaxillary subcutaneous tunnel during surgery. We speculated that the lesions were caused by thyroid tissue implantation associated with thyroid capsule rupture and cancer microseeding.

The serum thyroid-stimulating hormone, stimulated thyroglobulin (Tg), and thyroglobulin antibody levels were 28.5 uIU/mL (normal range 0.3–5.0 uIU/ml), 2.45 ng/mL (0.90–1.80 ng/dl), and 10.99 U/mL (–60 U/ml), respectively. There were no abnormal hypermetabolic lesions suggestive of malignancy on PET-CT. Follow-up US of the neck performed 2 months later was completely normal. I-123 WBS also showed no residual thyroid tissue or seeding lesions 1 year later. The serum Tg level decreased to 0.22 ng/mL with levothyroxine withdrawal. Even though the possibility of the initial tumor microseeding could not be definitely excluded by these parameters, the unusual lesions disappeared after radioiodine therapy. There was no definite evidence of local recurrence in these areas after a follow-up period of 7 years.

Discussion

Differentiated thyroid malignancy includes papillary and follicular carcinomas and accounts for approximately 90% cases of thyroid cancer [9]. It is extremely uncommon to have 2 concurrent primary cancers within the same thyroid gland. This case was histopathologically reported as the combination of papillary and follicular carcinomas, which has been reported in only a few of cases [10]. A collision tumor is defined as the coexistence of 2 adjacent but histologically distinct and independent malignant tumors in the same thyroid, without histological admixture [10]. Collision tumors can occur in various organs such as the ovaries, colon, lung, stomach, skin, and kidneys, but they are extremely rare in the thyroid [11]. It has also been suggested that each malignant component should be treated as an independent primary tumor [12].

Robotic thyroidectomy has significant advantages, including excellent cosmetic outcomes, a magnified surgical view, and rapid postoperative recovery. Despite these positive aspects, its complications and limitations include restrictive surgical indications, the requirement of a large working space, and port-site seeding [1,2]. Complications such as port-site seeding and recurrence have been reported in association with

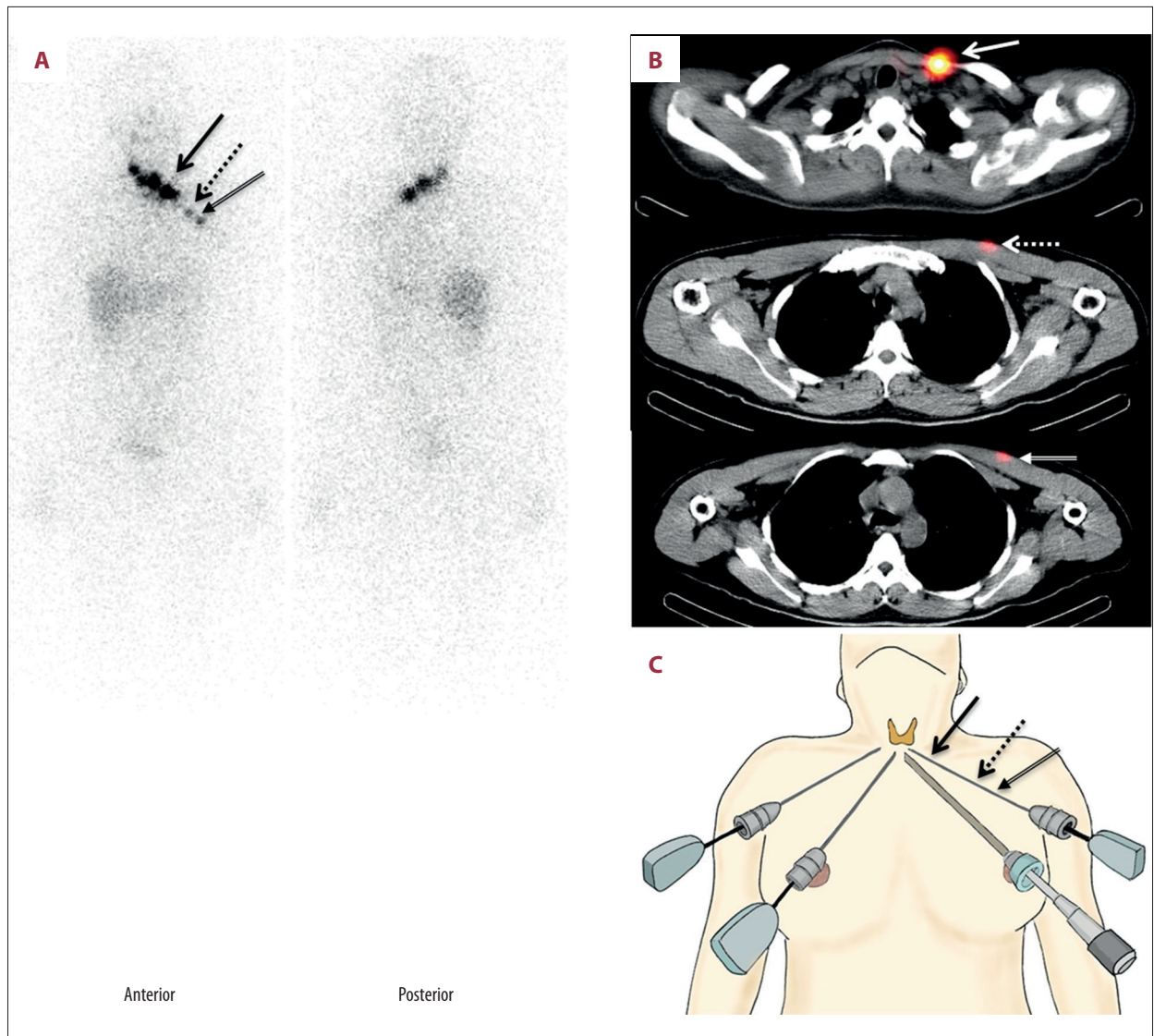


Figure 1. Port-site implantation diagnosed by iodine-131 single-photon emission tomography-computed tomography (SPECT-CT) after robot-assisted completion thyroidectomy in a 37-year-old woman with follicular carcinoma. **(A)** High-dose (481 MBq) radioiodine therapy using levothyroxine withdrawal shows multiple areas of unusual iodine uptake in the thyroidectomy bed and left axilla (black arrows). **(B)** SPECT-CT images show that the lesions seen on the upper anterior chest wall are in fact on the superficial layer of the pectoralis major muscle (white arrows). **(C)** Seeding during retrieval coincides with the tunnel of the axillary approach in this illustration (black arrows).

malignancies involving the colon, ovaries, adrenal glands, and bladder [8,13–16]. The chances of direct tumor spillage during robotic thyroid surgery are high because of the friability of the thyroid tissue and the small working space available during surgery. The mechanism of tissue or tumor spread at the site of trocar insertion during laparoscopic surgery remains unknown [17,18], although one hypothesis states that implantation along the port tunneling site is caused by the surgical specimen during the surgeon's manipulation, rather than other factors such as the gas used and the biological properties of the tumor [19]. Reports of rare cases have documented thyroid

cancer recurrence around the operative bed and subcutaneous tunnel after endoscopic thyroidectomy [20,21], as well as tunnel-site seeding of normal thyroidal tissue on post-therapy WBS [22,23]. In one case, the original lesion was diagnosed as benign nodular hyperplasia after surgery, but multiple recurrent nodules were discovered along the subcutaneous tunnels [20]. The important inference from all of these observations is that careful manipulation of the pathological thyroidal tissue and packing of the resected specimen during retrieval are necessary to prevent rupture or spillage.

Accidental spillage of the specimen during bag removal was evident in the present case, and the pattern of unusual uptake on post-treatment WBS and SPECT-CT represented a seeding accident along the tunnel site. Although we did not objectively verify these areas, the patient was administered a radioiodine capsule at a therapeutic dose, which successfully accumulated within the target area. No evidence of recurrence or metastasis was observed on various laboratory and imaging studies during a follow-up period of 7 years.

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Conclusions

This report documents rare findings of port-site implantation demonstrated by WBS and SPECT-CT after robotic thyroid surgery. We should consider the surgical procedures performed and correlate them with any unusual imaging manifestations to ensure better interpretation of these findings and accurate management. Port-site seeding is a rare and unexpected surgical complication; however, it can be treated with radioiodine therapy involving a therapeutic dose. Nevertheless, surgeons should be careful during surgical manipulations in order to prevent complications arising from the tearing and spillage of fragile thyroid or cancer tissue.

Conflict of interest

None.