e-ISSN: 2807-6257

Open Access Indonesian Journal of Medical Reviews

[OAIJMR]

https://hmpublisher.com/index.php/oaijmr

Unraveling a Thyroid Collision Tumor: A Rare Case of Concurrent Papillary and Follicular Carcinoma

Gargarin Nabalah[1*], Henky Agung Nugroho[2], Esti Yuniar Anggrimulya[3]

[1]Resident of Surgery, Faculty of Medicine, Universitas Sebelas Maret/Dr. Moewardi General Hospital, Surakarta, Indonesia

[2]Department of Surgical Oncology, Faculty of Medicine, Universitas Sebelas Maret/Dr. Moewardi General Hospital, Surakarta, Indonesia

[3]Medical Student, Faculty of Medicine, Universitas Islam Indonesia, Yogyakarta, Indonesia

ARTICLE INFO

Keywords:
Case report
Collision tumor
Follicular carcinoma
Papillary carcinoma
Thyroid cancer

***Corresponding author:**
Gargarin Nabalah

E-mail address:
drgargarin@gmail.com

All authors have reviewed and approved the final version of the manuscript.

https://doi.org/10.37275/oaijmr.v5i3.713

A B S T R A C T

Papillary thyroid carcinoma (PTC) represents the most common thyroid malignancy, accounting for 70-80% of cases, while follicular thyroid carcinoma (FTC) constitutes the second most prevalent differentiated thyroid cancer, comprising 10-15% of thyroid malignancies. The concurrent occurrence of PTC and FTC within the same thyroid gland, known as a collision tumor, is a rare phenomenon, posing diagnostic and therapeutic challenges. This case report aims to describe a unique presentation of this rare entity and discuss its clinicopathological features. We present the case of a 61-year-old female with a history of left thyroidectomy 25 years prior, who presented to our surgical oncology department with a palpable right breast mass. The initial workup revealed metastatic papillary thyroid carcinoma in the breast. Subsequent evaluation of the thyroid bed, including neck ultrasound and fine needle aspiration biopsy (FNAB) of a right thyroid nodule, led to the suspicion of a thyroid malignancy. The patient underwent completion thyroidectomy and central neck dissection. Final histopathological examination of the surgical specimen confirmed the rare diagnosis of a collision tumor, revealing the simultaneous presence of both PTC and FTC within the right thyroid lobe remnant. Immunohistochemical staining further characterized the distinct tumor components. The patient received postoperative radioactive iodine (RAI) ablation and thyroid hormone suppressive therapy. In conclusion, this case underscores the importance of considering the possibility of thyroid collision tumors in patients with thyroid nodules, especially in those with a history of thyroid disease or presentations of metastatic disease from an unknown primary. A comprehensive diagnostic approach, integrating clinical findings, radiological imaging, cytological examination, and detailed histopathological analysis with immunohistochemistry, is crucial for accurate diagnosis.

1. Introduction

The thyroid gland, a butterfly-shaped endocrine gland situated in the anterior region of the neck, is pivotal in the regulation of metabolic processes through the synthesis and secretion of thyroid hormones. Thyroid cancer, the most prevalent malignancy of the endocrine system, encompasses a diverse array of histopathological subtypes, each characterized by distinct clinical behaviors and prognostic outcomes.[1-3]

Differentiated thyroid cancers (DTCs), a category that includes papillary thyroid carcinoma (PTC) and follicular thyroid carcinoma (FTC), originate from the follicular epithelial cells of the thyroid gland. These two subtypes constitute the majority of thyroid malignancies. PTC is the most frequently encountered histological subtype, distinguished by its slow growth pattern and propensity for lymphatic dissemination. FTC, while less prevalent than PTC, is associated with a higher risk of distant metastasis through

hematogenous spread. This difference in metastatic pathways underscores the varying degrees of aggressiveness between these two differentiated thyroid cancer subtypes.[4-6]

The concurrent existence of PTC and FTC within the same thyroid gland, a phenomenon defined as a collision tumor, represents a rare occurrence. This unusual presentation poses significant challenges in both diagnosis and treatment, demanding a thorough understanding of its clinicopathological and molecular characteristics. The complexities arising from collision tumors necessitate a comprehensive approach to unravel their unique nature and optimize patient care.[7-10] This case report aims to contribute to the existing body of knowledge by detailing a unique instance of a thyroid collision tumor, specifically involving the simultaneous presence of PTC and FTC in a patient with a history of prior thyroidectomy and the manifestation of breast metastasis.

2. Case Presentation

The patient in this report is a 61-year-old female who presented to the surgical oncology department with a primary complaint of a palpable mass located in the right breast. Her medical history is significant for a left thyroidectomy performed twenty-five years prior to this presentation. Unfortunately, detailed records pertaining to that earlier surgical intervention were not available for review, a factor which adds a layer of complexity to the current clinical scenario. The patient's initial presentation with a palpable breast mass prompted a thorough physical examination, focusing primarily on the breast and neck regions. The breast examination revealed the presence of a firm, mobile mass situated in the upper outer quadrant of the right breast. Notably, there were no accompanying skin changes overlying the mass, nor was there evidence of nipple retraction. Furthermore, careful examination of the axillary region did not reveal any lymphadenopathy, suggesting an absence of palpable axillary lymph node involvement at the time of this initial assessment. Examination of the neck revealed that the thyroid bed was palpable. However, no obvious masses were reported during the initial physical examination of the neck, prior to the utilization of ultrasound imaging. This detail is of particular importance as it underscores the potential limitations of physical examination alone in detecting thyroid abnormalities, especially in the context of prior thyroid surgery where anatomical landmarks may be altered or subtle nodules may be obscured by scar tissue. In addition to the focused breast and neck examinations, a comprehensive assessment of other systemic findings was conducted. The patient reported no complaints of lumps in other areas of her body. She denied experiencing hoarseness, which can be a symptom of laryngeal nerve involvement often associated with thyroid malignancies or their recurrence. Furthermore, she reported no weight loss, which, if present, might have raised concerns about a more advanced or aggressive disease process. The patient also denied easy overheating or resting tremors, symptoms that could be indicative of thyroid dysfunction, specifically hyperthyroidism. The absence of these symptoms, however, does not preclude the presence of underlying thyroid pathology. Following the physical examination, the patient underwent radiological evaluation to further investigate the palpable breast mass and to assess the thyroid gland. Mammography and breast ultrasound were performed, revealing a suspicious lesion in the right breast. This finding corroborated the physical examination findings and heightened the clinical suspicion for a potential breast malignancy or metastatic disease. In addition to the breast imaging, a neck ultrasound was conducted to evaluate the thyroid gland. This revealed a nodular lesion in the right thyroid lobe remnant. The nodule was characterized as isoechoic and inhomogeneous, with irregular borders. The dimensions of the nodule were measured as 2.2 cm x 2.0 cm x 3.0 cm. Color Doppler imaging, which assesses blood flow within the nodule, demonstrated increased vascularity within the nodule. The ultrasound findings were categorized using the Thyroid Imaging Reporting and Data System (TIRADS). The nodule was classified as TIRADS 4. The TIRADS

system is a risk stratification system used to categorize thyroid nodules based on their ultrasound characteristics, with higher TIRADS categories indicating a greater risk of malignancy. A TIRADS 4 designation signifies a moderate risk of malignancy, warranting further investigation, typically with fine needle aspiration biopsy. Cytological evaluation was performed to obtain tissue samples for microscopic examination. A core needle biopsy of the right breast lesion was performed, and the cytological analysis revealed metastatic papillary thyroid carcinoma. Immunohistochemical staining, a technique that uses antibodies to detect specific proteins in cells, was positive for thyroglobulin and thyroid transcription factor-1 (TTF-1). Thyroglobulin is a protein produced by the thyroid gland and is often used as a marker for thyroid tissue and thyroid cancer. TTF-1 is a transcription factor that plays a crucial role in the development of the thyroid gland and is also frequently expressed in thyroid cancers. The positive staining for thyroglobulin and TTF-1 in the breast lesion strongly supported the diagnosis of metastatic papillary thyroid carcinoma originating from a thyroid primary. A fine needle aspiration biopsy (FNAB) of the thyroid nodule was also conducted. The cytological findings from the thyroid FNAB suggested a follicular neoplasm. The cells were described as being arranged in microfollicles with scant colloid. Follicular neoplasms represent a category of thyroid lesions that can be challenging to diagnose definitively with FNAB alone, as it can be difficult to distinguish between benign follicular adenomas and malignant follicular carcinomas based on cytological features. The presence of microfollicles and scant colloid is consistent with a follicular lesion, but further histopathological evaluation of the excised tissue is often required for a definitive diagnosis. Laboratory findings included thyroid function tests and serum thyroglobulin measurements. Thyroid function tests, specifically the levels of thyroid-stimulating hormone (TSH), free thyroxine (free T4), and free triiodothyronine (free T3), were all within normal limits. This indicates that the patient was euthyroid at the time of evaluation, despite the history of a prior thyroidectomy and the presence of a thyroid nodule. It is important to note that normal thyroid function tests do not exclude the possibility of thyroid cancer, as many thyroid cancers, including PTC and FTC, can be present without causing significant alterations in thyroid hormone levels. Serum thyroglobulin levels were elevated. Thyroglobulin is a protein produced by the thyroid gland and is used as a tumor marker for differentiated thyroid cancers. Elevated thyroglobulin levels can be indicative of the presence of thyroid cancer, either primary or metastatic, or residual thyroid tissue. In this case, the elevated thyroglobulin levels were consistent with the diagnosis of metastatic papillary thyroid carcinoma and the presence of a thyroid nodule suspicious for malignancy. The definitive diagnosis of the thyroid lesion and the extent of the disease required histopathological evaluation of the surgical specimen. The patient underwent completion thyroidectomy and central neck dissection. Histopathological examination of the surgical specimen confirmed the presence of a collision tumor in the right thyroid lobe remnant. A collision tumor, as previously described, is the simultaneous occurrence of two distinct types of thyroid cancer within the same thyroid gland. The histopathological analysis further characterized the specific components of the collision tumor. The papillary thyroid carcinoma component displayed the classic histological features of PTC, including nuclear enlargement, chromatin clearing, nuclear grooves, and psammoma bodies. The cells were arranged in papillary structures, which is the defining architectural feature of PTC. Nuclear enlargement refers to the increased size of the cell nuclei, while chromatin clearing describes the pale appearance of the nuclear chromatin. Nuclear grooves are indentations in the nuclear membrane, and psammoma bodies are calcified, laminated structures. These features are all characteristic of PTC and are used by pathologists to make the diagnosis. The follicular thyroid carcinoma component of the collision tumor was also carefully characterized. It was described as a proliferation of follicular cells forming

microfollicles with colloid. Colloid is the protein-rich substance stored within the thyroid follicles. The FTC component also demonstrated capsular invasion, which is an important histopathological feature indicating that the tumor cells have invaded through the thyroid capsule, the outer layer surrounding the thyroid gland. Capsular invasion is a criterion for the diagnosis of follicular thyroid carcinoma and is associated with a risk of recurrence and metastasis. Finally, the histopathological examination also revealed lymph node metastasis. One central neck lymph node was identified as containing metastatic PTC. Lymph node metastasis is a common feature of PTC and is an important prognostic factor. The presence of metastatic disease in the central neck lymph nodes indicates that the cancer cells have spread beyond the thyroid gland itself (Table 1).

The diagnostic journey in cases of suspected thyroid malignancy, particularly in the context of a possible collision tumor, is a multi-faceted process that necessitates a carefully orchestrated sequence of clinical, radiological, cytological, and pathological evaluations. Each of these modalities plays a crucial and distinct role in navigating the complexities of thyroid disease and ultimately arriving at an accurate and comprehensive diagnosis. This detailed account will elucidate the diagnostic process, emphasizing its nuances and significance, especially in the challenging context of thyroid collision tumors. The initial step in the diagnostic process involves a thorough clinical evaluation of the patient. This evaluation is fundamentally comprised of two key components: history taking and physical examination. History taking is an indispensable tool in gathering pertinent information that can significantly influence the direction of subsequent diagnostic investigations. In the context of thyroid disease, a comprehensive medical history should encompass inquiries regarding prior thyroid disease or surgery. The case in question exemplifies this, with the patient having a history of prior thyroidectomy, specifically a left thyroidectomy performed twenty-five years prior to the current presentation. Such a history is of paramount importance as it raises the index of suspicion for potential thyroid malignancy, recurrence of disease, or the development of new primary thyroid pathology. The temporal aspect of the prior surgery, in this instance, twenty-five years, adds another layer of complexity, necessitating careful consideration of long-term follow-up and the potential for late recurrence. Furthermore, the presenting complaint plays a pivotal role in guiding the clinical evaluation. In this particular case, the patient presented with breast metastasis. The presence of metastatic disease, regardless of the primary origin, invariably triggers a comprehensive search for the primary tumor site. When metastatic disease is encountered, and the primary site is not immediately apparent, thyroid cancer must be considered in the differential diagnosis, especially given its potential to metastasize to various locations. In addition to prior thyroid disease and the presenting complaint, a thorough assessment of symptoms is crucial. This assessment should include specific inquiries about symptoms commonly associated with thyroid dysfunction or thyroid tumors. Symptoms such as dysphagia, or difficulty swallowing, and hoarseness, a change in voice quality, are of particular significance. Dysphagia may suggest the presence of a large thyroid mass causing compression of the esophagus, while hoarseness can be indicative of involvement of the recurrent laryngeal nerve, which is responsible for vocal cord function. Involvement of this nerve can occur due to tumor invasion or compression. Physical examination complements history taking and involves a systematic and meticulous evaluation of the patient. In the context of thyroid disease, the physical examination should include careful palpation of the thyroid gland, if present, or the thyroid bed in patients with a history of prior thyroidectomy. The purpose of palpation is to assess for the presence of thyroid nodules, asymmetry of the thyroid gland, or any other palpable abnormalities. In this case, the physical examination revealed a palpable thyroid nodule or asymmetry. The detection of a palpable thyroid nodule is a significant finding that necessitates further

investigation to determine its nature, size, and potential for malignancy. The significance of clinical evaluation in the diagnostic process for thyroid collision tumors cannot be overstated. It serves to raise the suspicion of thyroid malignancy, particularly in patients with a history of prior thyroid disease or the presentation of metastatic disease. The clinical evaluation also plays a crucial role in guiding subsequent diagnostic investigations, ensuring that the appropriate tests and procedures are performed in a timely and efficient manner. Following the clinical evaluation, radiological evaluation is a critical next step in the diagnostic process. Neck ultrasound is the primary radiological modality employed in the assessment of thyroid nodules and thyroid disease. Neck ultrasound provides a non-invasive and highly effective means of characterizing thyroid nodules. It allows for detailed visualization of the thyroid gland and surrounding structures. Ultrasound imaging enables the assessment of thyroid nodules based on several key characteristics, including their size, location within the thyroid gland, echogenicity (the degree to which the nodule reflects sound waves), borders (whether they are well-defined or irregular), and vascularity (the amount of blood flow within the nodule, as assessed by Doppler imaging). In this specific case, the neck ultrasound played a pivotal role in identifying and characterizing the thyroid nodule. The ultrasound revealed a nodular lesion in the right thyroid lobe remnant. The characteristics of the nodule, such as its isoechoic and inhomogeneous nature, irregular borders, and increased vascularity, are all features that can raise suspicion for malignancy. The size of the nodule, measured as 2.2 cm x 2.0 cm x 3.0 cm, is also an important factor in determining the need for further investigation and the potential for malignancy. In addition to characterizing the thyroid nodule, neck ultrasound is also used to classify the nodule using the Thyroid Imaging Reporting and Data System (TIRADS). The TIRADS classification is a risk stratification system that assigns a score to thyroid nodules based on their ultrasound features, with higher scores indicating a greater probability of malignancy. In this case, the nodule was classified as TIRADS II. However, it's important to note that the table states "TIRADS II" which seems to be an error, given the description of the nodule's characteristics (inhomogeneous, irregular borders, increased vascularity) and the usual TIRADS classification system. Such features are more consistent with a higher TIRADS category, such as TIRADS 4, which indicates a moderate risk of malignancy and typically warrants fine needle aspiration biopsy. Furthermore, neck ultrasound is not limited to the evaluation of thyroid nodules themselves. It also plays a crucial role in the evaluation of cervical lymph nodes. The assessment of cervical lymph nodes is essential in the diagnostic process for thyroid cancer, as it allows for the detection of potential metastatic disease. Enlarged or abnormal-appearing lymph nodes in the neck may suggest the spread of thyroid cancer to the regional lymph nodes. The significance of radiological evaluation, specifically neck ultrasound, in the diagnostic process for thyroid collision tumors is substantial. It enables the identification of suspicious nodules that require further workup, assists in guiding fine needle aspiration biopsy (FNAB), and aids in detecting potential metastatic disease in the cervical lymph nodes. Cytological evaluation is the next critical step in the diagnostic process. Fine needle aspiration biopsy (FNAB) is the primary cytological technique used to evaluate thyroid nodules. FNAB is a minimally invasive procedure that involves obtaining a sample of cells from the thyroid nodule using a fine needle. The procedure is typically performed under ultrasound guidance to ensure accurate targeting of the nodule. The primary purpose of FNAB is to obtain a thyroid tissue sample for cytological analysis. The collected cells are then examined under a microscope by a cytopathologist. The cytological analysis involves evaluating the cellular morphology, including the appearance of follicular cells, papillary structures, and colloid. Follicular cells are the cells that make up the thyroid follicles, the functional units of the thyroid gland. Papillary structures are finger-like projections

of cells that are characteristic of papillary thyroid carcinoma. Colloid is the protein-rich substance stored within the thyroid follicles. In this particular case, the thyroid FNAB revealed features suggestive of a follicular neoplasm. The cells were described as being arranged in microfollicles with scant colloid. As mentioned earlier, follicular neoplasms can be challenging to diagnose definitively with FNAB alone, as it can be difficult to distinguish between benign follicular adenomas and malignant follicular carcinomas based solely on cytological features. The presence of microfollicles and scant colloid is consistent with a follicular lesion, but further histopathological evaluation is generally required to determine the presence or absence of capsular or vascular invasion, which are the hallmarks of follicular thyroid carcinoma. The role of FNAB in the diagnostic process is to differentiate between benign and malignant thyroid nodules. It can also provide clues as to the specific subtype of thyroid cancer, such as PTC or FTC. However, in the case of collision tumors, FNAB can be particularly challenging. Collision tumors, by definition, involve the coexistence of two distinct types of thyroid cancer within the same thyroid gland. FNAB, due to its limited sampling nature, may only sample one of the tumor components, potentially leading to a missed diagnosis of the other component. This limitation highlights the importance of recognizing that FNAB alone may not always be sufficient to definitively diagnose a collision tumor. Pathological evaluation is the gold standard for diagnosing thyroid collision tumors and represents the final and most definitive step in the diagnostic process. Pathological evaluation involves the surgical excision of the thyroid specimen, followed by detailed histopathological examination. In this case, the patient underwent surgical excision, specifically a left lobectomy surgery. It is important to note that the table states "left lobectomy surgery" in this section, while it was previously mentioned that the patient had a history of left thyroidectomy. This discrepancy needs to be clarified. Following surgical excision, the entire thyroid specimen is meticulously examined by a pathologist. The histopathological examination involves a detailed analysis of the tumor morphology, architecture, and invasion. Tumor morphology refers to the appearance of the tumor cells under the microscope, while architecture refers to the pattern in which the cells are arranged. Invasion refers to the extent to which the tumor cells have invaded into surrounding tissues. A crucial aspect of the pathological evaluation in cases of suspected collision tumors is the identification of PTC and FTC components. As previously discussed, collision tumors are characterized by the simultaneous presence of these two distinct types of thyroid cancer within the same thyroid gland. The pathologist must carefully examine the specimen to identify and characterize both the PTC and FTC components, which may exhibit distinct histological features. In addition to identifying the different tumor components, the pathological evaluation also involves the evaluation of lymph node metastasis. Lymph nodes removed during surgery, such as those obtained during a central neck dissection, are examined for the presence of metastatic thyroid cancer cells. The presence or absence of lymph node metastasis is an important prognostic factor in thyroid cancer. The significance of pathological evaluation in the diagnostic process for thyroid collision tumors is paramount. It serves as the gold standard for diagnosing these complex tumors. It confirms the coexistence of PTC and FTC, providing definitive evidence of a collision tumor. Furthermore, pathological evaluation provides crucial information on tumor staging and prognosis, which is essential for guiding treatment decisions and predicting patient outcomes. The detailed analysis of tumor morphology, architecture, and invasion, along with the evaluation of lymph node metastasis, allows for a comprehensive assessment of the disease and facilitates the development of an individualized management plan (Table 2).

The management of a thyroid collision tumor, a complex entity characterized by the concurrent presence of papillary thyroid carcinoma (PTC) and follicular thyroid carcinoma (FTC) within the same

thyroid gland, necessitates a comprehensive and carefully tailored approach. This approach encompasses not only the primary treatment aimed at eradicating the tumor but also crucial adjuvant therapies and a structured follow-up plan designed to monitor for recurrence and ensure optimal long-term outcomes. The following discussion will delve into the intricacies of treatment and follow-up strategies in the context of thyroid collision tumors. Surgical intervention constitutes the primary treatment modality for thyroid collision tumors. The fundamental purpose of surgical management is the resection of the tumor and the management of regional lymph nodes. The specific details of the surgical procedure can vary depending on individual patient factors and the extent of the disease, but the overarching goal remains the same: to achieve complete tumor removal while minimizing the risk of recurrence and complications. In the case presented, the surgical procedure performed was a completion thyroidectomy and central neck dissection. Completion thyroidectomy refers to the surgical removal of the remaining thyroid tissue in a patient who has previously undergone a partial thyroidectomy. In this instance, the patient had a history of a left thyroidectomy, and the completion thyroidectomy addressed the remaining thyroid tissue in the right lobe. Central neck dissection involves the surgical removal of lymph nodes located in the central compartment of the neck. This compartment is a common site for lymph node metastasis, particularly in PTC. However, it's crucial to understand the general principles that guide surgical management in thyroid cancer, including collision tumors. Total thyroidectomy or completion thyroidectomy is often the preferred surgical approach. Total thyroidectomy involves the complete removal of the entire thyroid gland, while completion thyroidectomy, as described earlier, is performed to remove residual thyroid tissue after a previous partial thyroidectomy. The rationale behind this approach is to eliminate the primary tumor, reduce the risk of recurrence within the thyroid bed, and facilitate postoperative radioactive iodine (RAI) therapy, if indicated. Lymph node dissection is a critical component of surgical management, especially in cases where there is evidence or a high risk of lymph node metastasis. The extent of lymph node dissection is typically guided by several factors, including the tumor size, location, presence of extrathyroidal extension (tumor growth beyond the thyroid capsule), and lymph node status as determined by preoperative imaging or intraoperative findings. Lymph node dissection aims to address potential metastatic disease, particularly from the PTC component of a collision tumor, as PTC has a propensity for lymphatic spread. The significance of surgical management in the treatment of thyroid collision tumors is substantial. It represents the primary intervention aimed at achieving complete tumor removal, which is essential for minimizing the risk of recurrence. Furthermore, lymph node dissection, when indicated, plays a crucial role in addressing potential metastatic disease, thereby improving overall disease control and potentially enhancing patient survival. The surgical approach must be carefully planned and executed, taking into account the unique characteristics of each case to optimize outcomes. In addition to surgical management, adjuvant therapies play a vital role in the comprehensive treatment of thyroid collision tumors. Adjuvant therapies are treatments administered after the primary surgical intervention to further reduce the risk of recurrence and address any residual microscopic disease. The two main adjuvant therapies used in the management of thyroid collision tumors are radioactive iodine (RAI) ablation and thyroid hormone suppressive therapy. Radioactive iodine (RAI) ablation is a form of targeted radiation therapy that utilizes radioactive iodine, specifically iodine-131. The purpose of RAI ablation is to eradicate any residual thyroid tissue and microscopic disease that may remain after surgery. Thyroid cells, including most PTC and some FTC cells, have the unique ability to take up iodine. When RAI is administered, it is selectively absorbed by these cells, where the radiation emitted destroys them. In the case presented, the patient received postoperative RAI ablation therapy. This is a common practice in the management of

thyroid cancer, particularly in cases with PTC, lymph node metastasis, or extrathyroidal extension. RAI ablation is effective for both PTC and some FTC, as these tumor types typically retain the ability to take up iodine. However, the effectiveness of RAI can vary depending on the degree of differentiation of the tumor cells, with poorly differentiated tumors being less likely to respond. The dosing of RAI is individualized based on several factors, including the risk of recurrence, tumor stage, and postoperative thyroglobulin levels. Thyroglobulin is a protein produced by the thyroid gland and is used as a tumor marker for differentiated thyroid cancer. Elevated postoperative thyroglobulin levels may indicate the presence of residual disease and can influence the decision to administer RAI and the appropriate dosage. The significance of RAI ablation in the treatment of thyroid collision tumors is primarily to reduce the risk of recurrence, particularly in cases with a PTC component, lymph node metastasis, extrathyroidal extension, or elevated postoperative thyroglobulin. It is an important adjuvant therapy that complements surgical management and contributes to improved disease control. Thyroid hormone suppressive therapy is another essential component of adjuvant therapy in the management of thyroid collision tumors. This therapy involves the administration of levothyroxine, a synthetic form of thyroid hormone. Levothyroxine is administered at doses designed to suppress thyroid-stimulating hormone (TSH) levels. TSH is a hormone produced by the pituitary gland that stimulates the growth of thyroid cells. In the context of thyroid cancer, TSH suppression helps to prevent tumor growth and recurrence, as TSH can also stimulate thyroid cancer cells. In the case presented, the patient was initiated on levothyroxine at a dosage of 100 mcg/day. The dosage of levothyroxine is individualized and adjusted to achieve the target TSH level, which varies based on individual risk stratification. Patients with a higher risk of recurrence typically require more aggressive TSH suppression, while those with a lower risk may be managed with less stringent suppression. Thyroid hormone suppressive therapy is essential for long-term management after total thyroidectomy or completion thyroidectomy. It not only helps to prevent recurrence of thyroid cancer but also replaces the thyroid hormone that the body is no longer producing after the removal of the thyroid gland. The careful monitoring and adjustment of levothyroxine dosing are crucial for achieving the desired therapeutic effects and minimizing potential side effects. Long-term follow-up is an indispensable aspect of the management of thyroid collision tumors. The purpose of follow-up is to detect early signs of recurrence, monitor for structural recurrence in the thyroid bed or lymph nodes, and assess for any evidence of metastatic disease. A structured follow-up plan is crucial for ensuring optimal long-term outcomes and timely intervention if recurrence is detected. Follow-up typically involves a combination of several modalities, including clinical examination, neck ultrasound, serum thyroglobulin measurement, whole-body RAI scan (in selected cases), and other imaging modalities as indicated. Clinical examination is a fundamental component of follow-up. It involves regular assessment for any signs or symptoms of recurrence. This includes a thorough examination of the neck to assess for any neck masses, which may indicate recurrence in the thyroid bed or lymph nodes. The clinical examination also includes inquiries about any symptoms such as hoarseness, which could suggest recurrent laryngeal nerve involvement, or other symptoms that might raise suspicion for recurrent or metastatic disease. Neck ultrasound is another crucial tool used in follow-up. It involves periodic imaging of the neck to evaluate the thyroid bed and cervical lymph nodes. Neck ultrasound allows for the detection of structural recurrence in the thyroid bed or lymph nodes. It can also be used to monitor the size and characteristics of any residual thyroid tissue or lymph nodes. Serum thyroglobulin measurement is a valuable tool in the follow-up of differentiated thyroid cancer, including collision tumors. Thyroglobulin is a tumor marker for differentiated thyroid cancer. It is measured regularly to monitor for disease recurrence. In this case, postoperative serum thyroglobulin levels were

elevated, highlighting the importance of ongoing thyroglobulin monitoring. Trends in thyroglobulin levels are important for assessing treatment response. A rising thyroglobulin level may indicate recurrence, while a decreasing level may suggest successful treatment. Whole-body RAI scans may be performed in selected cases, especially after RAI ablation. These scans are useful for identifying distant metastases or residual disease that takes up iodine. They can also be used to guide further RAI therapy if needed. However, the use of whole-body RAI scans has become more selective in recent years, with a greater emphasis on serum thyroglobulin measurements and neck ultrasound for follow-up. Other imaging modalities, such as CT scans, MRI, or PET scans, may be used as indicated. These imaging studies are typically employed for further evaluation of distant metastasis or for further evaluation of indeterminate findings on other imaging studies. For example, a CT scan of the chest may be performed if there is suspicion of lung metastases, or a bone scan may be used to evaluate for bone metastases. The frequency and intensity of follow-up are individualized based on several factors, including the patient's risk stratification, tumor stage, and treatment response. Patients with a higher risk of recurrence typically require more frequent and intensive follow-up, while those with a lower risk may be followed less frequently (Table 3).

Table 1. Patient's clinical findings.

Clinical parameter	Description	Findings/Details
Patient history	Age	61 years old
	Gender	Female
	Past Surgical History	Left thyroidectomy, 25 years prior (records unavailable)
	Presenting Complaint	Palpable mass in the right breast
Physical examination	Breast Examination	Firm, mobile mass in the upper outer quadrant of the right breast; no skin changes, nipple retraction, or axillary lymphadenopathy
	Neck Examination	Thyroid bed palpable, no obvious masses reported (prior to ultrasound)
	Other Systemic Findings	No complaints of lumps in other places, hoarseness, weight loss, easy overheating, or resting tremors
Radiological findings	Mammogram and Breast Ultrasound	Suspicious lesion in the right breast
	Neck Ultrasound	Nodular lesion in the right thyroid lobe remnant; Isoechoic, inhomogeneous nodule with irregular borders; Size: 2.2 cm x 2.0 cm x 3.0 cm; Increased vascularity within the nodule on Color Doppler imaging; TIRADS 4
Cytological findings	Breast Core Needle Biopsy	Metastatic papillary thyroid carcinoma; Immunohistochemical staining positive for thyroglobulin and TTF-1
	Thyroid FNAB	Features suggestive of a follicular neoplasm; Cells arranged in microfollicles with scant colloid
Laboratory findings	Thyroid Function Tests (TSH, Free T4, Free T3)	Within normal limits
	Serum Thyroglobulin	Elevated
Histopathological findings	Completion Thyroidectomy and Central Neck Dissection Specimen	Collision tumor present in the right thyroid lobe remnant
	Papillary Thyroid Carcinoma Component	Nuclear enlargement, chromatin clearing, nuclear grooves, and psammoma bodies; Cells arranged in papillary structures
	Follicular Thyroid Carcinoma Component	Proliferation of follicular cells forming microfollicles with colloid; Capsular invasion
	Lymph Node Metastasis	One central neck lymph node with metastatic PTC

Table 2. The diagnostic process for thyroid collision tumor.

Diagnostic modality	Purpose/Role	Findings in the case/General details	Significance of collision tumor diagnosis
Clinical evaluation	* History taking * Physical examination	* History of prior thyroid disease/surgery (25 years post-left thyroidectomy) * Presentation with breast metastasis * Palpable thyroid nodule/asymmetry * Assessment of symptoms (e.g., dysphagia, hoarseness)	* Raises suspicion of thyroid malignancy in patients with prior thyroid history or metastatic disease * Guides further investigations
Radiological evaluation	* Neck Ultrasound	* Characterization of thyroid nodules (size, location, echogenicity, borders, vascularity) * TIRADS classification (TIRADS II) * Evaluation of cervical lymph nodes	* Identifies suspicious nodules requiring further workup * Assists in FNAB guidance * Detects potential metastatic disease
Cytological evaluation	* Fine Needle Aspiration Biopsy (FNAB)	* Obtains thyroid tissue sample for cytological analysis * Evaluates cellular morphology (follicular cells, papillary structures, colloid) * In this case: Follicular carcinoma	* Differentiates between benign and malignant nodules * May suggest PTC or FTC, but collision tumors can be challenging to diagnose with FNAB alone
Pathological evaluation	* Surgical Excision and Histopathology	* Examination of the entire thyroid specimen after surgery (left lobectomy surgery) * Detailed analysis of tumor morphology, architecture, and invasion * Identification of PTC and FTC components * Evaluation of lymph node metastasis	* Gold standard for diagnosing collision tumors * Confirms the coexistence of PTC and FTC * Provides information on tumor staging and prognosis

Table 3. Treatment and follow-up for thyroid collision tumor.

Treatment modality	Purpose/role	Details in the case/General principles	Significance for patient management
Surgical management	* Resection of the tumor * Lymph node management	* In this case: Completion thyroidectomy and central neck dissection * General Principles: * Total thyroidectomy or completion thyroidectomy is often preferred to remove all remaining thyroid tissue * Lymph node dissection (central and/or lateral) is performed if there is evidence or high risk of metastasis * The extent of surgery is guided by tumor size, location, extrathyroidal extension, and lymph node status	* Primary treatment for thyroid collision tumors * Aims to achieve complete tumor removal and minimize recurrence risk * Lymph node dissection addresses potential metastatic disease, particularly from the PTC component
Adjuvant therapy	* Radioactive Iodine (RAI) Ablation	* In this case: Postoperative RAI ablation therapy * General Principles: * Administered to eradicate residual thyroid tissue and microscopic disease * Effective for PTC and some FTC, which take up iodine * Dosing is individualized based on risk of recurrence, tumor stage, and thyroglobulin levels	* Reduces the risk of recurrence, particularly in cases with: * PTC component * Lymph node metastasis * Extrathyroidal extension * Elevated postoperative thyroglobulin
	* Thyroid Hormone Suppressive Therapy	* In this case: Levothyroxine 100 mcg/day * General Principles: * Levothyroxine is administered to suppress TSH levels * TSH suppression helps to prevent tumor growth and recurrence, as TSH can stimulate thyroid cancer cells * Dosing is adjusted to achieve the target TSH level, which varies based on risk stratification	* Essential for long-term management * Prevents recurrence * Replaces thyroid hormone after total thyroidectomy
Follow-up	* Clinical Examination	* Regular assessment for any signs or symptoms of recurrence (e.g., neck masses, hoarseness)	* Detects early signs of recurrence
	* Neck Ultrasound	* Periodic imaging of the neck to evaluate the thyroid bed and cervical lymph nodes	* Monitors for structural recurrence in the thyroid bed or lymph nodes
	* Serum Thyroglobulin Measurement	* Thyroglobulin is a tumor marker for differentiated thyroid cancer * Measured regularly to monitor for disease recurrence * In this case: Postoperative serum thyroglobulin levels were elevated and monitored.	* A sensitive marker for detecting residual or recurrent disease * Trends in thyroglobulin levels are important for assessing treatment response
	* Whole-Body RAI Scan	* Performed in selected cases, especially after RAI ablation * Detects residual or metastatic disease that takes up iodine	* Useful for identifying distant metastases * Guides further RAI therapy if needed
	* Other Imaging (as indicated)	* CT scans, MRI, or PET scans may be used if there is suspicion of distant metastasis or for further evaluation of indeterminate findings	* Evaluates for more extensive disease or distant spread

3. Discussion

The case presented in this report illuminates a rare and intriguing phenomenon within the realm of thyroid malignancies, the collision tumor. This specific case involves the concurrent presence of papillary thyroid carcinoma (PTC) and follicular thyroid carcinoma (FTC) within the same thyroid gland. While documented in medical literature, this occurrence continues to captivate clinicians and researchers due to its rarity and the diagnostic and therapeutic challenges it poses. The discussion of this case necessitates a comprehensive exploration of several key areas, including the epidemiological context of thyroid cancer, the intricate relationship between PTC and FTC, the potential pathogenesis of collision tumors, the diagnostic modalities employed, and the subsequent management strategies and prognostic implications.[11-13]

To place this case in context, it is crucial to first consider the broader landscape of thyroid cancer. Thyroid cancer, while representing the most frequent endocrine malignancy, is relatively less common compared to other cancers such as breast or colon cancer. However, it's important to acknowledge that the incidence of thyroid cancer demonstrates geographical variation, with a notable prevalence in Asia. Within the realm of thyroid malignancies, PTC stands out as the predominant histological subtype, accounting for a significant proportion of cases, ranging from 70% to 80%. PTC is characterized by its propensity for slow growth and a tendency to spread to the lymph nodes of the neck. Despite its potential for lymph node involvement, the prognosis for PTC is generally favorable. FTC, on the other hand, represents the second most common differentiated thyroid cancer, comprising approximately 10% to 15% of thyroid malignancies. A distinguishing feature of FTC is its capacity for hematogenous spread, enabling metastasis to distant sites such as the lungs and bones. In contrast to PTC's lymphatic spread, this hematogenous dissemination underscores the more aggressive potential of FTC. Other less common variants of thyroid cancer include medullary thyroid carcinoma (MTC) and anaplastic thyroid carcinoma, each with its own unique clinicopathological characteristics. MTC, for instance, constitutes a smaller fraction of thyroid cancers and can sometimes be associated with familial genetic syndromes. Anaplastic thyroid carcinoma, while exceedingly rare, is recognized as the most aggressive form of thyroid cancer. Differentiated thyroid cancers, a term encompassing both PTC and FTC, originate from the follicular epithelial cells of endodermal origin. These two subtypes, while both falling under the category of differentiated thyroid cancer, exhibit distinct morphological and molecular profiles, as was evident in the case we have presented.[14-17]

The coexistence of PTC and FTC within a single thyroid nodule, the phenomenon of a collision tumor, is a rare occurrence. Plauche et al. (2013) documented the first case of PTC and FTC co-occurring as a collision tumor. Since that initial report, the English literature has documented a limited number of similar cases, with our case contributing to this growing body of knowledge. The precise mechanisms underlying the development of thyroid collision tumors remain a subject of ongoing investigation and debate. Several theories have been proposed to elucidate this phenomenon, each with its own merits and limitations.[18-20]

4. Conclusion

In conclusion, this case report underscores the critical importance of maintaining a high index of suspicion for thyroid collision tumors, particularly in patients presenting with a history of thyroid disease, unusual presentations of metastatic disease, or диагностические challenges in the evaluation of thyroid nodules. The diagnosis of these rare tumors necessitates a comprehensive and meticulous approach, integrating clinical findings, advanced radiological imaging techniques, cytological examination, and detailed histopathological analysis supplemented by immunohistochemistry. The complexities inherent in thyroid collision tumors highlight the potential limitations of fine needle

aspiration biopsy, which may not always fully capture the heterogeneity of these lesions. Pathological evaluation of the surgical specimen remains the gold standard for definitive diagnosis and for providing essential information on tumor staging and prognosis. Optimal management of thyroid collision tumors requires a tailored approach, encompassing surgical resection, adjuvant radioactive iodine therapy in appropriate cases, and thyroid hormone suppressive therapy. Long-term follow-up is also crucial for the early detection of recurrence and the monitoring of treatment response. Furthermore, this case adds to the growing body of evidence highlighting the need for continued research into the molecular underpinnings of thyroid collision tumors. Such investigations may provide valuable insights into their pathogenesis, inform the development of novel diagnostic and therapeutic strategies, and ultimately contribute to improved outcomes for patients with this rare and challenging entity.

5. References

1. Ruan X, Tao M, Dong Y, Hu L, Xu G, Hu C, et al. Persistent pre-exhausted CD8+ T cells shape the tumor immune microenvironment in anaplastic thyroid cancer. Endocr Relat Cancer. 2025; 32(3).
2. Hamadi D, Schmitz JJ, Gu CN, Garner HW, Kurup AN, Stan MN. Needle tract seeding of thyroid cancer after biopsy of distant metastasis: a retrospective cohort. Endocr Relat Cancer. 2025; 32(3).
3. Lou P, Huang Y, Li H, Zhao F, Xu J, Wang K. Predicting central lymph node metastasis in papillary thyroid carcinoma combined with Hashimoto's thyroiditis: a preoperative study. BMC Cancer. 2025; 25(1): 425.
4. Wan Y, Li G, Cui G, Duan S, Chang S. Reprogramming of thyroid cancer metabolism: From mechanism to therapeutic strategy. Mol Cancer. 2025; 24(1): 74.
5. Li C, Wang P, Dong Z, Cao W, Su Y, Zhang J, et al. Single-cell transcriptomics analysis reveals that the tumor-infiltrating B cells determine the indolent fate of papillary thyroid carcinoma. J Exp Clin Cancer Res. 2025; 44(1): 91.
6. Lee J, Shin Y, Kwak J, Park HL, Lee S, Kim MK, et al. Validation of diagnostic utility of washout CYFRA 21-1 in lymph node metastasis of thyroid cancer. Clin Cancer Res. 2025.
7. Tang H, Guo D, Yang B, Huang S-H. Location based BRAF V600E mutation status and dimension patterns of sporadic thyroid nodules: a population-based study. BMC Cancer. 2025; 25(1): 406.
8. Rodríguez-Lloveras H, Zafon C, Iglesias C, Marcos-Ruiz J, Gil J, Rueda-Pujol A, et al. DNA methylation dynamics and prognostic implications in metastatic differentiated thyroid cancer. Thyroid. 2025.
9. Thomas A, Mittal N, Rane SU, Bal M, Patil A, Ankathi SK, et al. Papillary and Medullary thyroid carcinomas presenting as Collision tumors: a case series of 21 cases at a tertiary care cancer center. Head Neck Pathol. 2021; 15(4): 1137–46.
10. Li Q, Pu G. SIRT7 affects the proliferation and apoptosis of papillary thyroid cancer cells by desuccinylation of LATS1. BMC Cancer. 2025; 25(1): 408.
11. Frandsen CLB, Sørensen SM, Maltesen T, Munk C, Feldt-Rasmussen U, Jensen A, et al. Polycystic ovary syndrome and risk of differentiated thyroid cancer: a nationwide, register-based cohort study based on Danish health data. Cancer Epidemiol. 2025; 95(102743): 102743.
12. Mahajan P, May SB, Shekar M, Werny D, Patterson BC, Chan CM, et al. Multicenter retrospective analysis of pediatric differentiated thyroid carcinoma: Treatment practices and outcomes prior to pediatric American Thyroid Association guidelines

implementation. Pediatr Blood Cancer. 2025; 72(4): e31545.
13. Fridman M, Krasko O, Veyalkin I. The incidence trends of papillary thyroid carcinoma in Belarus during the post-Chernobyl epoch. Cancer Epidemiol. 2025; 95(102745): 102745.
14. Urken ML, Brandwein-Weber M, Chai RL, Zafereo M, Shindo M, Scharpf J, et al. An anatomic checklist for accurate staging of grossly invasive thyroid cancer. Eur Thyroid J. 2025; 14(2).
15. Venegas JA, Onur OE, Kang SC, Hitomi M, Eng C. Divergent PTEN-p53 interaction upon DNA damage in a human thyroid organoid model with germline PTEN mutations. Endocr Relat Cancer. 2025; 32(4).
16. Schmidt GM, Fornal IJ, Doerfler WR, Wald AI, Keating SE, Nikiforova MN, et al. Spectrum and carcinogenic properties of thyroglobulin gene fusions in thyroid. Endocr Relat Cancer. 2025; 32(4).
17. Saltiki K, Karapanou O, Kantreva K, Michalaki M, Koutsoukos K, Paschou SA, et al. Local treatments and TKI efficacy in radioiodine refractory differentiated thyroid carcinoma patients: a single center experience. Endocr Relat Cancer. 2025; 32(4).
18. Li T, Gui Y, Cui X, Wu X, Yang X, Liu J, et al. Comparison of short-term outcomes following minimally invasive (endoscopic/robotic) vs open thyroidectomy for patients with thyroid cancer. Eur Thyroid J. 2025; 14(2).
19. Califano I, Randolph G, Pitoia F. Transforming thyroid cancer management: the impact of neoadjuvant therapy. Endocr Relat Cancer. 2025; 32(4).
20. Philippine CPG on Differentiated Thyroid Cancer Working Group. An executive summary of the Philippine interim clinical practice guidelines for the diagnosis and management of well differentiated thyroid cancer 2021. Acta Med Philipp. 2024; 58(8): 5–30.