Case Report

Metastatic Papillary Thyroid Microcarcinoma Mimicking Brachial Cleft Cyst: A Case Report

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Abstract

Background: Papillary thyroid carcinoma (PTC) is the most prevalent and well-differentiated thyroid cancer, with tumors measuring ≤10 mm categorized as papillary thyroid microcarcinoma (PTMC) according to the World Health Organization. This case emphasizes a branchial cleft cyst (BCC) that was initially considered benign but was subsequently discovered to contain metastatic PTC.

Case Description: This case involves a 35-year-old woman with a three-year history of right-sided neck swelling and breathing difficulty, initially presumed to have a BCC based on clinical findings and FNAC. Surgical removal of the cystic mass confirmed a type 2 BCC; however, continued symptoms led to further imaging and thyroid evaluation, which revealed a small nodule. Histopathology confirmed a unifocal PTMC in the right lobe. The case underscores the importance of considering hidden malignancy in seemingly benign lateral neck masses.

Conclusion: Although PTMC typically follows an indolent course, cystic lymph node metastases may signal aggressive behavior. Misdiagnosis as benign neck cysts can delay appropriate treatment. This case highlights the importance of a thorough evaluation of adult-onset lateral neck masses and advocates for early surgical intervention to facilitate accurate diagnosis and optimal management.

Keywords: Papillary Thyroid Microcarcinoma (C563277), Metastasis (D009362), Branchial Cleft Cyst (D001935), Thyroidectomy (D013965).

Introduction

Papillary thyroid carcinoma is the most common and well-differentiated form of thyroid cancer. When the tumor measures 10mm or less in diameter, it is classified as papillary thyroid microcarcinoma by the World Health Organization (WHO).[1] Although the overall survival rate for PTC is as high as 90% when detected early, delays in recognizing metastases, such as those concealed under a seemingly benign brachial cleft cyst, are linked to unfavorable results.[2]

Brachial cleft cysts are the most prevalent congenital masses in the lateral neck. While typically benign, there have been instances of carcinoma arising from cystic cells or metastasis from head and neck cancers.[3] The most frequent site is beneath the mandible, slightly in front of the sternocleidomastoid, though it may happen at any point along the path of the second brachial apparatus.[4] Brachial cleft cysts are seldom found in conjunction with a PTC. Instances of PTC metastasizing to an associated BCC, leading to PTC diagnosis only after BCC removal, are exceedingly uncommon in medical literature.[5] This case report emphasizes a distinct event in which a BCC, initially considered benign based on fine needle aspiration biopsy (FNAB), was subsequently discovered to contain metastatic PTC following surgical removal. The results are discussed in the context of ongoing studies on this rare phenomenon.

This case report follows CARE 2013 guidelines.[6] It describes a very unusual presentation of papillary thyroid microcarcinoma that appeared as a lateral neck cyst initially thought to be a benign branchial cleft cyst, and to highlight the significance of considering metastatic thyroid carcinoma in the differential diagnosis of cystic neck masses—even when FNAB indicates a benign condition.

Case Presentation

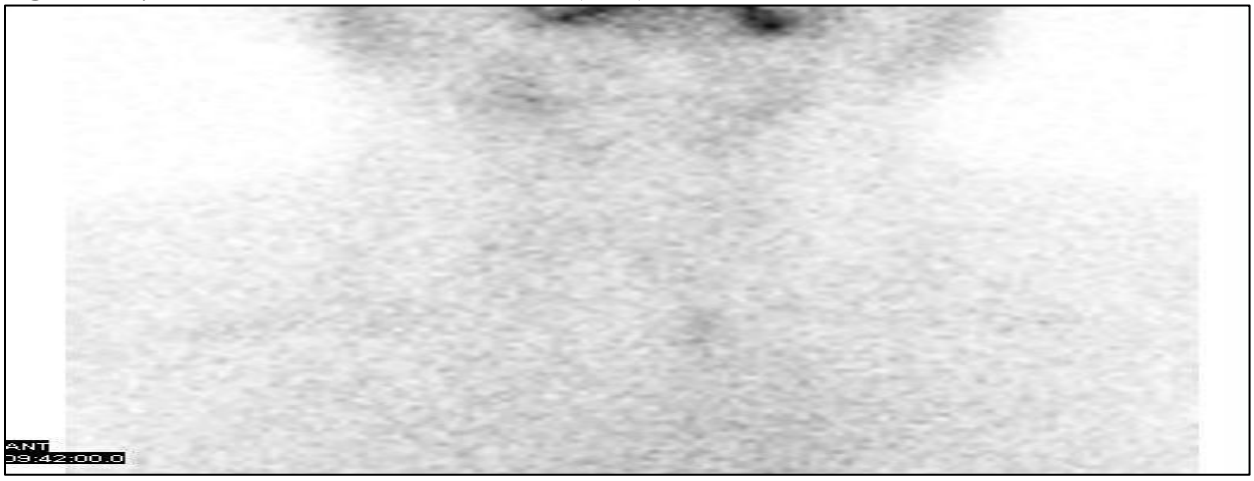
History: We present the case of a 35-year-old woman who presented in the OPD of NORI, Islamabad, in September 2024 with the symptoms of dyspnea and swelling in the neck on the right side for the past 3 years. The patient had no documented history of smoking or alcohol use and did not have any comorbid conditions.

Examination and Investigations: During the clinical evaluation, a branchial cleft cyst was presumed. After confirmation of cystic content via FNAC, neck exploration was performed under general anesthesia. With an initial diagnosis of BCC, the cystic mass located medial to the sternocleidomastoid (SCM) muscle was removed. On the CECT neck, a well-defined, rounded, thin-walled cystic area was noted anterior to the carotid arteries in the submandibular region, along with prominent cervical lymph nodes, representing a type 2 brachial cleft cyst. After one and a half months, the patient presented again with unresolved previous complaints. On CECT neck and chest, a normally sized thyroid gland with a tiny hypodense nodule measuring 3.6 * 4.2mm in size is noted in the right lobe, and a few small sub-centimeter-sized cervical lymph nodes were noted. The largest was noted on the left side at level V, varying 7.4mm in short axis dimension, and the largest on the left side was measuring 7.2mm in size at level II. The chest findings were unremarkable. Ultrasound thyroid

correlation with thyroid scan was suggested. Normal-sized thyroid gland with a nodule of TR-3 and a nodule of TR-2 morphology, both in the right lobe. Ultrasound-guided FNAC of the right lobe of the thyroid TIRAD III nodule was done under aseptic conditions. It was suggestive of atypia with undetermined significance. Histopathology of the thyroid gland, cut surface showed a greyish white nodule in the middle of the right lobe measuring 0.5*0.4cm, a diagnosis of unifocal papillary thyroid microcarcinoma was made.

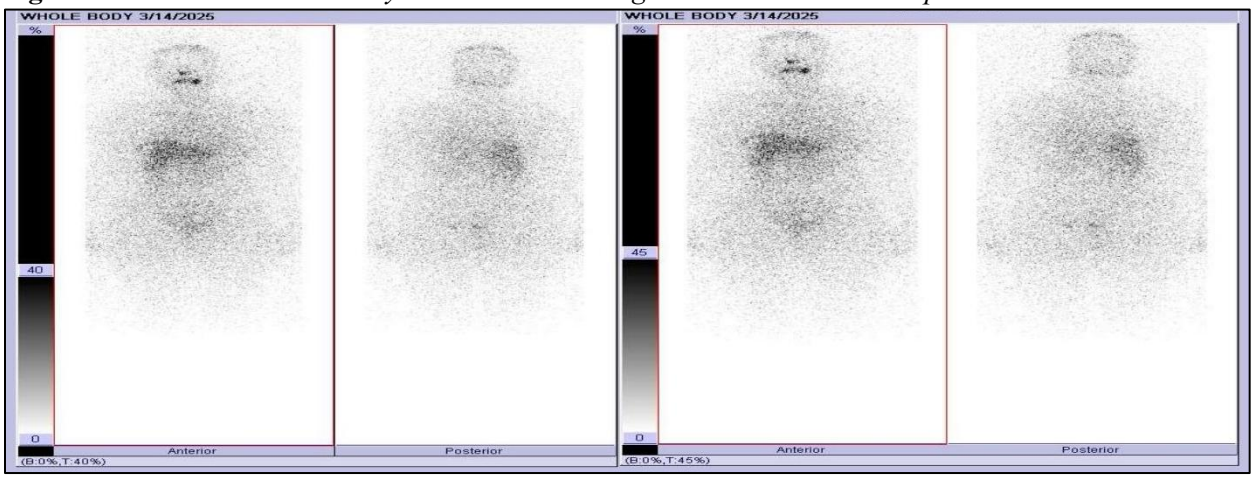
Treatment and Outcome: Radioactive Iodine (RAI) supplemental treatment is often suggested for patients with high-risk differentiated thyroid cancer. The dose was selected on the basis of cervical lymph node metastases, which is a recognized risk factor. According to both the literature and the Society of Nuclear Medicine and Molecular Imaging (SNMMI) therapy guidelines, 150 mCi is the typical dose for such cases. In this present case, the patient received a dose of 5630 MBq (150 mCi) of RAI.

Figure 1 *Thyroid Scan Done with Pertechnetate (Tco4)*



Note. Post-thyroidectomy thyroid scan shows no residual thyroid tissue

Figure 2 *Iodine-131 Whole Body Scan Demonstrating Post-Ablative Iodine Uptake*



Note. The iodine whole-body scan shows physiological uptake in the liver, oral cavity, and urinary bladder. No residual thyroid tissue uptake was seen.

Discussion

We demonstrated an unusual manifestation of metastatic papillary thyroid microcarcinoma resembling a branchial cleft cyst, a diagnostic challenge. Branchial cysts are often misdiagnosed and are not commonly considered in the initial differential diagnosis. Physicians should keep branchial cysts in mind when evaluating any patient with a neck swelling, regardless of its level of pain.

Second branchial anomalies are most identified during the first and second decades of life. An accurate diagnosis relies on a thorough medical history, comprehensive physical examination, and appropriate imaging studies. The definitive treatment is complete surgical removal of the anomaly. When fully exercised, the likelihood of recurrence is low.[7]

Papillary thyroid microcarcinoma (PTMC) is characterized as a type of papillary thyroid cancer that is 1 centimeter or smaller in size, and it generally shows slow progression with a low death rate of under 1%. Loco-regional spread is seen in about 2% to 6% of cases, while distant metastases occur in roughly 1% to 2%, particularly when tumors exceed 5 mm in size. The existence of large cystic lymph nodes on the opposite side of the neck may indicate a more aggressive form of the disease, challenging its typically indolent nature and highlighting the need for more intensive treatment and close follow-up.[8] Importantly, cystic lymph node metastases from PTC are frequently misdiagnosed as benign lesions, such as second branchial cleft cysts, leading to potential delays in appropriate management. Thus, in the presence of an isolated large cystic neck mass, particularly in adults, a malignant etiology must always be considered.[9]

The standard therapy for high-risk metastatic PTC involves complete thyroid removal together with cervical lymph node surgery. This approach not only reduces the chances of recurrence and further metastasis but also supports effective postoperative management, including radioactive iodine (RAI) ablation and prolonged monitoring through thyroglobulin and thyroglobulin antibody levels. The identification of lymph node metastases shifts the treatment objective from merely ablating thyroid remnants to providing adjuvant therapy aimed at eradicating microscopic disease and minimizing the risk of cancer recurrence.[10] This case illustrates the significance of considering metastatic thyroid carcinoma in the differential diagnosis of adult-onset lateral neck cysts, even when imaging and cytology suggest a benign etiology. Given that PTC metastases can present in cystic form, and FNAC may yield false-negative results in such settings, clinicians ought to keep a strong level of suspicion, especially in adult patients without a history of congenital cysts. Further research is warranted to elucidate the molecular mechanisms driving this rare phenomenon.

According to American Thyroid Association (ATA) guidelines, low-risk PTMC may be eligible for active surveillance. However, the existence of lymph node metastasis or aggressive features precludes such an approach and necessitates definitive surgical treatment. Early surgical excision of the suspicious cyst enables a timely diagnosis,

guiding appropriate thyroidectomy and follow-up.

Conclusion

Metastatic dissemination of papillary thyroid carcinoma within a second brachial cleft cyst is an exceptionally uncommon occurrence, with only a few instances previously reported in the literature. PTMC can present aggressively, warranting total thyroidectomy, neck dissection, and RAI therapy in selective cases. Close follow-up with neck ultrasonography is essential, as most recurrences occur in the neck. Regular FNAB and serum thyroglobulin monitoring can aid in early detection of recurrence. Further investigation is warranted to explore the influence of diagnostic and treatment options in the context of this uncommon clinical presentation.

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