

Papillary Thyroid Carcinoma Arising in a Branchial Cleft Cyst with Regional Lymph Node Metastasis: A Rare Histopathological Entity

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| Received: 07.03.2026 | Accepted: 20.04.2026 | Published: 22.04.2026

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Abstract

Case Report

Branchial cleft cysts (BCC) are common birth defects that happen on the side of the neck, but it is very rare for these cysts to turn into cancer. Papillary thyroid carcinoma that comes from thyroid tissue that isn't supposed to be there in a BCC is very hard to spot and is not often thought about before surgery. We report a 48-year-old man who presented with a long-standing painless swelling in the lateral aspect of the neck. Fine-needle aspiration cytology (FNAC) didn't help, and imaging showed a complicated cystic lesion that looked like a BCC. The lesion was surgically excised along with evaluation of the regional lymph nodes. Histopathological examination showed papillary carcinoma coming from the cyst wall. It was characterized by arborizing papillae with fibrovascular cores, nuclear features that were typical, psammoma bodies, focal thyroid follicle formation, and metastasis to nearby lymph nodes. The patient continues to be free of disease during follow-up. This reported case illustrates the limitations of preoperative investigations in lateral cervical cystic lesions and emphasizes the significance of histopathological examination.

Keywords: Branchial cleft cyst, Lateral cervical cyst, Papillary thyroid carcinoma, Ectopic thyroid tissue, Histopathology.

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INTRODUCTION

Common congenital abnormalities of the lateral neck, BCC typically manifest as benign, painless cystic swellings. They are most frequently identified in young adults and are caused by partial destruction of the branchial apparatus during embryonic development. It is very uncommon for a BCC to undergo malignant transformation, and when it does, it poses significant diagnostic and treatment challenges.

Although rare, ectopic thyroid tissue can develop along the typical route of thyroid embryologic migration and is vulnerable to the same pathological processes as the thyroid gland's normal location, including malignant transformation. The extremely rare condition known as papillary thyroid carcinoma (PTC), which develops from ectopic thyroid tissue inside a BCC, is often clinically identical to a benign cystic neck lesion. Because radiological imaging and FNAC frequently yield ambiguous or deceptive results in lesions that are primarily cystic, preoperative diagnosis is still difficult.

In addition to highlighting the limitations of preoperative diagnostic modalities, this report aims to present a rare case of PTC that developed within a BCC with associated regional lymph node metastasis. It also emphasizes the critical role that histopathological examination plays in making a definitive diagnosis.

CASE REPORT

A 48-year-old man arrived with a gradually growing, painless swelling in the left lateral aspect of his neck. The swelling had been there for about ten years, with a discernible increase in size during the previous two years. There was no history of systemic illness, trauma, or radiation. A firm, non-tender, well-defined mass measuring about 3.0 cm at the level of the cricoid cartilage in the left lateral cervical region was discovered during a clinical examination. Thyroid function tests showed a euthyroid state, and routine laboratory tests were within normal ranges.

Ultrasonography of the neck revealed a large complex cystic lesion measuring 3.3 × 5.0 × 6.6 cm in

the left upper to mid-cervical region, containing dense internal echoes and an eccentric heteroechoic mural nodule measuring 1.4×1.0 cm with internal calcific foci. Both lobes of thyroid appeared normal in size, shape, position, echogenicity and echotexture in the ultrasonography. The imaging impression favoured a complex cervical cystic lesion. Contrast-enhanced computed tomography demonstrated a well-defined cystic lesion located deep to the sternocleidomastoid muscle on the left side, with eccentric enhancing areas and focal calcification, suggestive of an infected BCC, with neoplastic transformation considered less likely.

FNAC performed on the cystic swelling showed features suspicious for malignancy; however, no

definitive diagnosis was established preoperatively. Based on the clinical and radiological findings, the patient underwent surgical excision of the cyst along with left level IV cervical lymph node dissection. Papillary carcinoma arising within a BCC was not considered in the preoperative differential diagnosis.

Gross examination of the excised specimen revealed a globular, encapsulated cystic mass measuring $3.5 \times 5 \times 7$ cm. On cut section, brown fluid was oozed out, and a papillary growth measuring 1.5×1.5 cm was identified arising from the cyst wall. Five lymph nodes were retrieved, the largest measuring 1.2×1.0 cm (**Figure 1**).

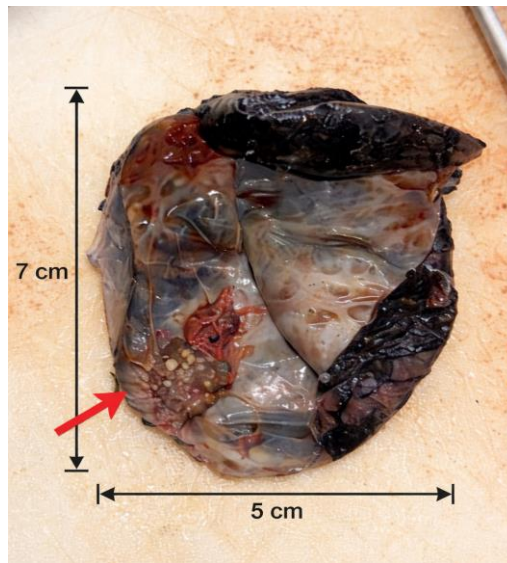
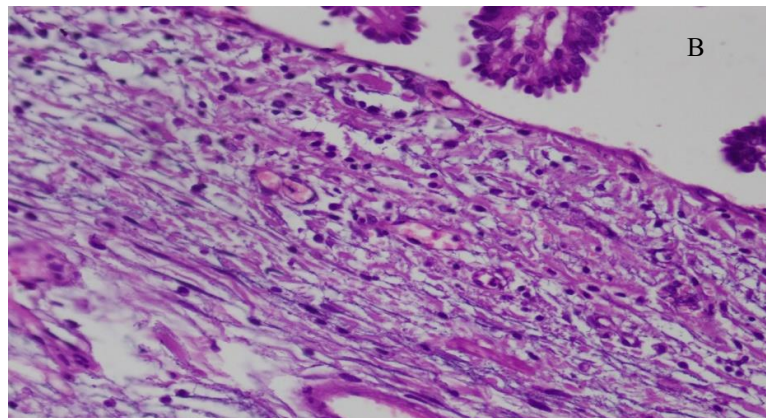
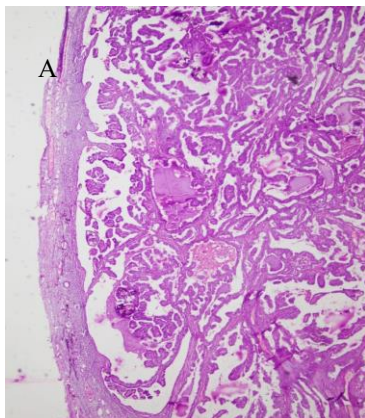


Figure 1: Gross specimen of the excised cystic lesion showing a smooth outer surface; cut section reveals friable papillary excrescences projecting into the cyst lumen (Red arrow)

Multiple sections examined under a microscope revealed malignant tumor tissue organized in intricate arborizing papillae with delicate fibrovascular cores emerging from a fibrocollagenous cyst wall. Dense lymphoplasmacytic infiltration was visible in the cyst wall (**Figure 2A, B**). The tumor cells were columnar and had a moderate amount of cytoplasm along with nuclear

crowding, overlapping (**Figure 2C**). The nuclei showed optically clear ("Orphan Annie eye"), nuclear grooving, and intranuclear pseudoinclusions (**Figure 3A, B**). Psammoma bodies were found. These histomorphological characteristics suggested a thyroid origin and were consistent with PTC.



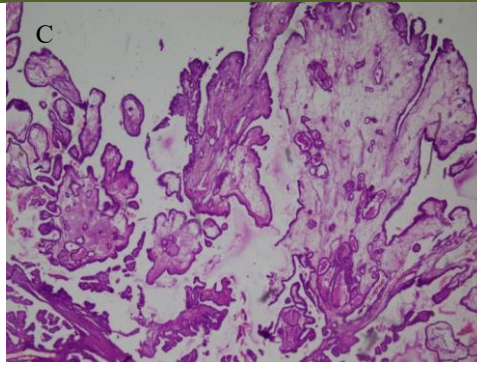


Figure 2: Histopathological features of papillary carcinoma arising in a branchial cleft cyst. (A) Arborizing papillary structures arising from the cyst wall (H&E, ×40). (B) Fibrocollagenous cyst wall with dense lymphoplasmacytic infiltrate. (H&E, ×400). (C) Area adjacent to branchial cyst wall. (H&E, ×100)

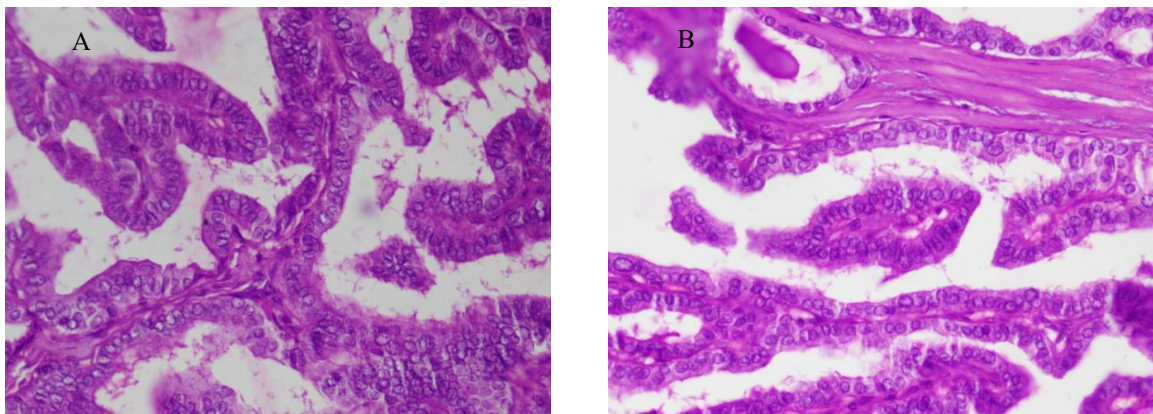


Figure 3: Cytomorphological features of papillary thyroid carcinoma. (A) Orphan Annie eye nuclei. (B) Ground-glass appearing, ovoid nuclei in lining epithelium (H&E, ×400)

Two of the five removed lymph nodes had carcinoma metastases, and the other lymph nodes had sinus histiocytosis, fibrosis, and reactive alterations

(*Figure 4A, B*). The recovery period was uneventful. The patient is still disease-free and shows no signs of recurrence at 6 months of follow-up.

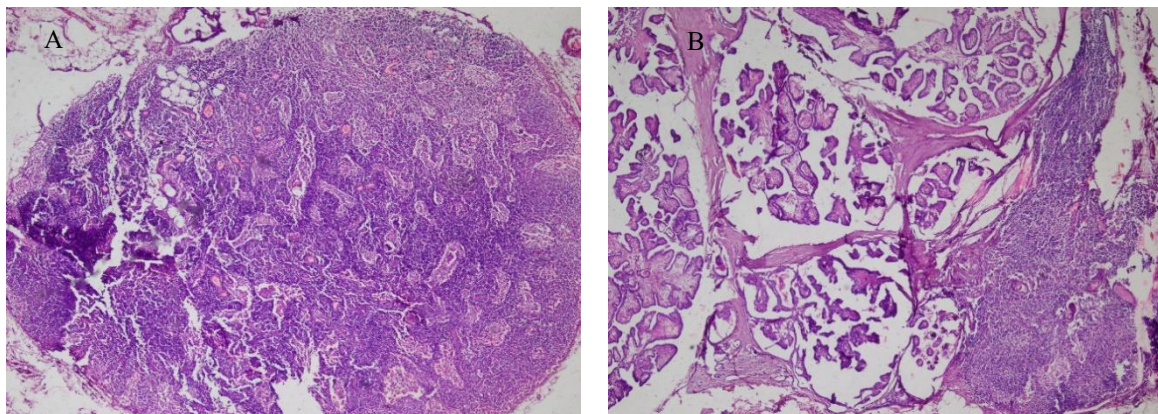


Figure 4: Lymph node completely replaced by PTC. (A) Metastatic deposit of papillary carcinoma in lymph node, section from other tissue piece received (H&E, ×40). (B) Lymph node showing metastatic tumor (H&E, ×100)

DISCUSSION

The thyroid gland originates from a central endodermal structure at the base of the tongue and from paired lateral structures derived from the fourth branchial pouches. Aberrations during embryologic migration may result in ectopic thyroid tissue, most commonly along the thyroglossal duct tract and rarely at other sites, including

branchial cleft remnants. Ectopic thyroid tissue can undergo the same pathological processes as the orthotopic thyroid gland, including malignant transformation [1].

Papillary thyroid cancer originating from a BCC is an exceptionally uncommon entity. The majority of carcinomas arising in ectopic thyroid tissue occur within

thyroglossal duct cysts, while involvement of BCC is exceedingly uncommon. Fewer than 20 cases of PTC arising in a BCC have been reported in the literature, with only a limited number classified as primary tumors rather than metastatic deposits from an occult thyroid primary [2,3,4].

A major diagnostic challenge lies in differentiating primary PTC arising from ectopic thyroid tissue within a BCC from cystic lymph node metastasis of an occult thyroid carcinoma. Since, this has significant implications for surgical care and prognosis, this difference is crucial. According to several reports, most instances are first misidentified as benign BCC based only on clinical and radiological evaluation [5].

Due to sampling error and cellular material dilution, FNAC has poor sensitivity in primarily cystic lesions, and radiological findings in lateral cervical cystic lesions are typically vague. In this instance, imaging and FNAC failed to provide a definitive preoperative diagnosis. Histopathological investigation continues to be the standard for a definitive diagnosis, as evidenced by similar diagnostic limitations observed in other cases that have been previously reported. [6,7].

Histologically, PTC originating from a BCC exhibits characteristics indistinguishable from typical PTC, including intricate papillary architecture with fibrovascular cores, distinctive nuclear features, psammoma bodies, and sporadic thyroid follicle formation. A fibrocollagenous cyst wall with lymphoid tissue inside it points to a BCC origin. In this case, there was no normal thyroid tissue found in the cyst wall. This is probably because it was completely replaced by cancerous epithelium [3,8].

Regional lymph node metastasis is rare, but it has been seen in some cases, which means it has real malignant potential [2,9]. There is no record of distant metastasis. There have been reports of an occult thyroid primary being found later than expected during follow-up, which supports the need for thorough thyroid evaluation and long-term monitoring [10].

Because of this, a diagnosis of papillary thyroid carcinoma in a lateral cervical cystic lesion requires complete surgical removal and examination of the regional lymph nodes. The type of thyroid surgery must be adjusted to lower the chance of the thyroid being affected at the same time or later on, and to make postoperative monitoring easier.

CONCLUSION

Papillary thyroid carcinoma arising in a branchial cleft cyst is rare and is frequently not suspected prior to surgical excision. FNAC and radiological imaging often can't give a clear diagnosis because these

lesions are mostly cystic. It is still important to confirm with a histopathological exam. Recognizing this rare possibility in lateral cervical cystic masses enables proper surgical excision with regional lymph node assessment, thereby facilitating accurate diagnosis and effective management.

Funding: This study received no external funding.

Competing Interests: The authors declare no potential conflict of interest.

Consent: Informed consent was obtained from the patient for publication of this case report and any accompanying images.

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