Cutaneous metastases of papillary thyroid cancer: a case series

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ABSTRACT

Background: Subcutaneous metastases of papillary thyroid carcinoma (PTC) are rare, with only limited cases documented in the literature. Their presence can pose diagnostic and management challenges, particularly when mimicking benign postoperative changes.

Methods: We present a retrospective study of three consecutive cases of patients with confirmed dermal metastases from PTC identified during post-treatment surveillance. All cases of cutaneous metastases of PTC were included in this study and were managed at a single tertiary centre between 2020 and 2024.

Results: In each case, dermal metastases were detected either within previous surgical scars or within the subcutaneous tissue of the neck, highlighting their potential to present subtly and mimic scar tissue. Diagnostic confirmation was achieved via imaging and excisional biopsy, followed by histological analysis. All patients underwent surgical intervention and received adjuvant radioactive iodine therapy. One patient required systemic therapy for progressive metastatic disease.

Conclusion: Dermal metastases from PTC remain rare but clinically significant. Imaging and biopsy with specialist histopathological support play a critical role in differentiating metastases from alternative pathology.

We recommend prompt evaluation and histological examination of any new skin or subcutaneous lesion in patients with a history of PTC.

Keywords: Cutaneous metastases, papillary thyroid cancer, thyroid cancer, skin metastases.

Type of Article: CASE REPORT **Specialty:** Otolaryngology

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Introduction

Papillary thyroid carcinoma (PTC) is the commonest thyroid neoplasm, representing 80% of carcinomas originating in the thyroid [1]. Despite its excellent prognosis, regional lymph node metastases can occur in up to 50% of cases [2]. Distant metastases are less frequent (4%-23%), typically arising in the lungs, bones, and brain, and associated with poorer prognosis [3].

Cutaneous spread of papillary thyroid is rare, with literature reports suggesting a prevalence of only 0.06%–1% of patients with distant metastases [4]. Most cases of skin metastasis have been reported to develop on the scalp [5,6]. They typically present as either slow-growing nodules, erythematous papules, or ulcerated lesions [5-7], which can easily be misdiagnosed as primary skin lesions [2,8]. Furthermore, cutaneous metastasis is associated with poor prognosis within the literature, with an average survival from diagnosis of 13.07 months [5].

Currently, there is limited literature describing skin metastases from primary PTC. We present three cases of cutaneous metastases of PTC following previous surgical resection. We performed a literature review and discussed the intra-operative and diagnostic challenges of cutaneous metastasis of PTC, seeking to improve the understanding of this rare presentation.

Case 1 Presentation

A 68-year-old male presented to a district general hospital in early 2020 with a palpable 2 cm central neck firm mass. Diagnostic workup with ultrasonography confirmed an 18 × 11 × 19 mm lesion within the isthmus, graded as U4 using the British Thyroid Association U Classification [9]. Subsequent Fine-Needle Aspiration Cytology (FNAC) classified this nodule as Thy5 according to the Royal

College of Pathologists' Cytology classification [10]. He underwent an extended left hemi thyroidectomy 3 weeks following his initial presentation. After resection, a size 7 drain was placed, and the incision was closed in layers with 3-0 vicryl and 4-0 monocryl sutures.

Histology confirmed a pT2 N0 PTC. Multidisciplinary Team (MDT) discussion recommended completion of thyroidectomy and radioiodine. However, following patient discussion, he declined further surgical intervention, opting for conservative management with serial ultrasound (US) monitoring. Subsequent US in August 2020 confirmed no evidence of recurrence.

During routine follow-up in September 2022, the patient reported a 3-month history of a new small, painless nodule at the left end of his scar. US found two hypoechoic subcutaneous nodules (4 × 4 and 3 × 3 mm) within the scar, confirmed as metastatic subcutaneous PTC following FNAC (Figure 1A). Staging computed tomography (CT) in December 2022 identified a 6 mm subcutaneous mass, suggestive of metastasis (Figure 1B). The patient underwent a complete thyroidectomy with scar excision in February 2023. No drain was used, and the wound was closed in layers with dissolvable 4-0 Vicryl and 4-0 Monocryl sutures. Histology confirmed a subcutaneous PTC (pT2 R0 M1). Following an MDT discussion, the patient received radioactive iodine in June 2023.

At routine follow-up in February 2024, US showed an 8 × 10 × 13 mm hypoechoic nodule with microcalcifications and some internal vascularity arising from the left strap muscle near the left thyroid bed. CT neck and thorax further confirmed the presentation and excluded additional foci of disease. Following MDT discussion, the patient received additional radioactive iodine in June 2024.

Case 2 Presentation

A 75-year-old female initially presented to an inner-city district general hospital in 2018 with a large, right-sided symptomatic goitre. She subsequently underwent routine US in March 2018 with FNAC, which identified a 78 × 33 mm U4 nodule within the right thyroid. FNAC was classified as Thy3f, suspicious for a follicular-variant PTC. CT confirmed a multinodular goitre causing slight tracheal deviation to the right with moderate narrowing of the tracheal lumen. Diagnostic right hemithyroidectomy confirmed a non-encapsulated follicular variant PTC staged as pT3. Following MDT recommendation, the patient underwent a complete left hemithyroidectomy and received adjuvant therapy with radioactive iodine.

In March 2023, the patient re-presented with a central neck mass (Figure 2) and raised thyroglobulin antibodies (269.93 IU/ml, reference range <115 IU/ml). Her care was transferred to a tertiary centre, and staging CT in May 2023 confirmed a 6.5 × 5 mm lesion within the right

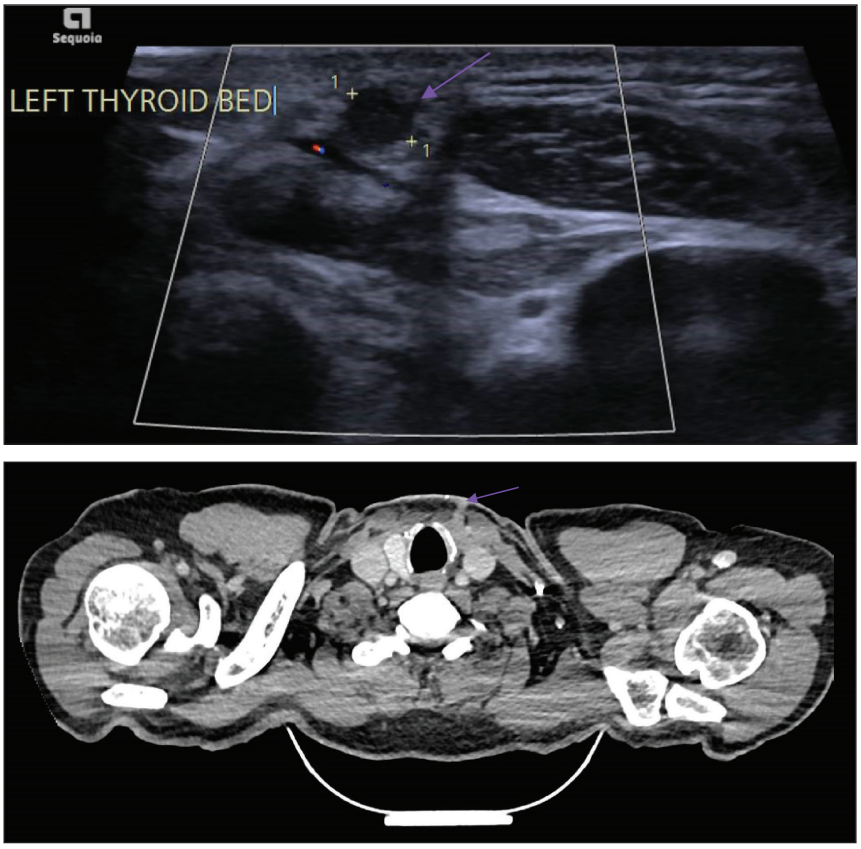

Figure 1. *A - US suggestive of an 8 × 10 × 13 mm hypoechoic nodule with microcalcification and internal vascularity. B - Axial CT demonstrating a small subcutaneous nodule just superficial to the anterior border of the left SCM.*

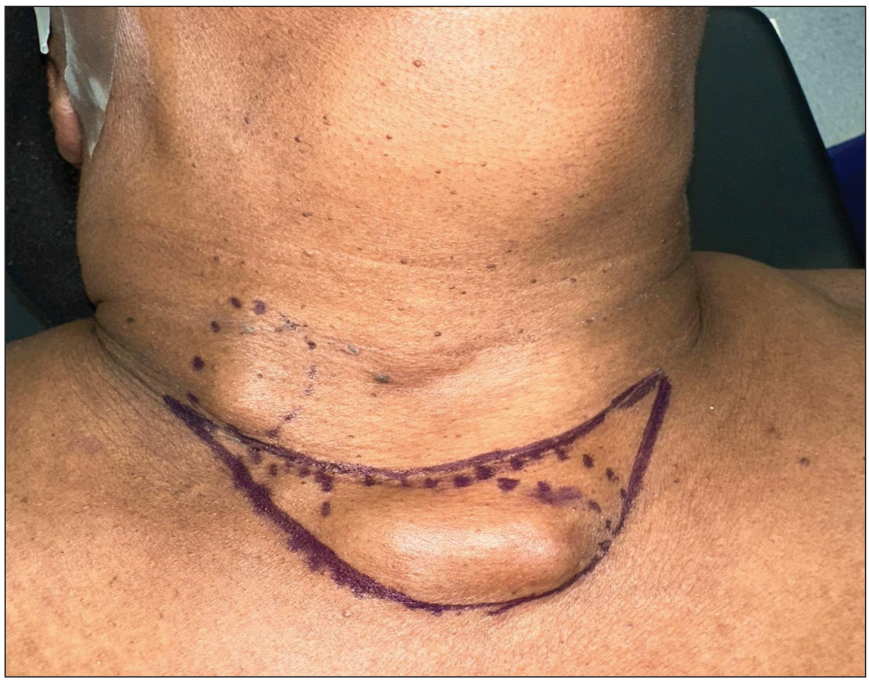

Figure 2. *Clinical presentation with pre-operative markings.*

tracheoesophageal groove and an additional 7.5 × 7.5 mm mass located inferiorly (Figure 3). A further three subcutaneous nodules were identified within the sternal notch, measuring 15, 13, and 10.5 mm in diameter. An additional 11 and 16.5 × 12.5 mm nodules were also reported within the lower aspect of the right sternocleidomastoid muscle (SCM). Finally, a small 3.5 mm nodule in the left upper lobe of the lung was identified, further suggestive of metastasis. Lung nodules were not biopsied.

Following MDT discussion, further surgical intervention was recommended, and the patient underwent central neck dissection in June 2023. Multiple subcutaneous deposits of PTC were discovered within the scar, ranging from 6 to 18 mm. A further five masses were then removed from the central neck. The wound was closed in layers using 3-0 vicryl and 4-0 prolene sutures, and no drain was required. Finally, following MDT discussion, the patient underwent radioactive iodine treatment in September 2023, and on follow-up US in October 2024, she was free of disease.

Case 3 Presentation

A 58-year-old female presented to an inner-city district general hospital in June 2023 with a rapidly growing left-sided neck lump. US and CT imaging revealed a 3.5 × 3.7 cm left thyroid nodule with early strap muscle invasion, confirmed as malignant following FNAC (Thy 5).

She underwent total thyroidectomy in August 2023. A size 7 Surgidyne drain was used, and the incision closed in layers with 3-0 vicryl and 4-0 monocryl. Histological analysis confirmed a pT3a PTC, and MDT discussion recommended adjuvant radioactive iodine ablation.

During routine follow up in January 2024, she was noted to have two small superficial subdermal nodules on the left side of the scar. Post treatment radioactive iodine imaging showed intense uptake within the anterior neck. Both thyroglobulin (12.0 ug/l, reference range <0.1 ug/l) and thyroglobulin antibodies (272 IU/ml, reference range <115 IU/ml) were elevated. Additional CT imaging identified dermal nodules suggestive of local recurrence and three pulmonary nodules suggestive of metastasis (Figure 4). In March 2024, she underwent a limited central neck dissection and local excision of subcutaneous nodules. No drain was used, and the incision was closed in layers using 3-0 vicryl and 4-0 monocryl. Her levothyroxine dose was increased further to 150 mcg daily to maintain thyroid-stimulating hormone suppression. Histology confirmed two separate deposits of metastatic PTC. The patient underwent further radioactive iodine therapy following MDT discussion.

Surveillance CT imaging in September 2024 identified progression of lung metastases, a progressive enhancing soft tissue mass (2 × 1.5 cm), and two new deposits of disease (0.5 and 0.8 cm), one of which was eroding the thyroid cartilage. She was offered laryngectomy for locoregional control or receptor tyrosine kinase inhibitor therapy with Lenvatinib. She opted for systemic therapy, which began in November 2024. Follow-up CT imaging in January 2025 showed stable disease.

Discussion

Cutaneous metastases from PTC are an exceedingly rare manifestation. We describe three cases of cutaneous metastasis of PTC, presenting 5, 24, and 60 months following initial surgery, reflecting similar rates to the literature [5]. Two of these cases were female and one male, with a mean

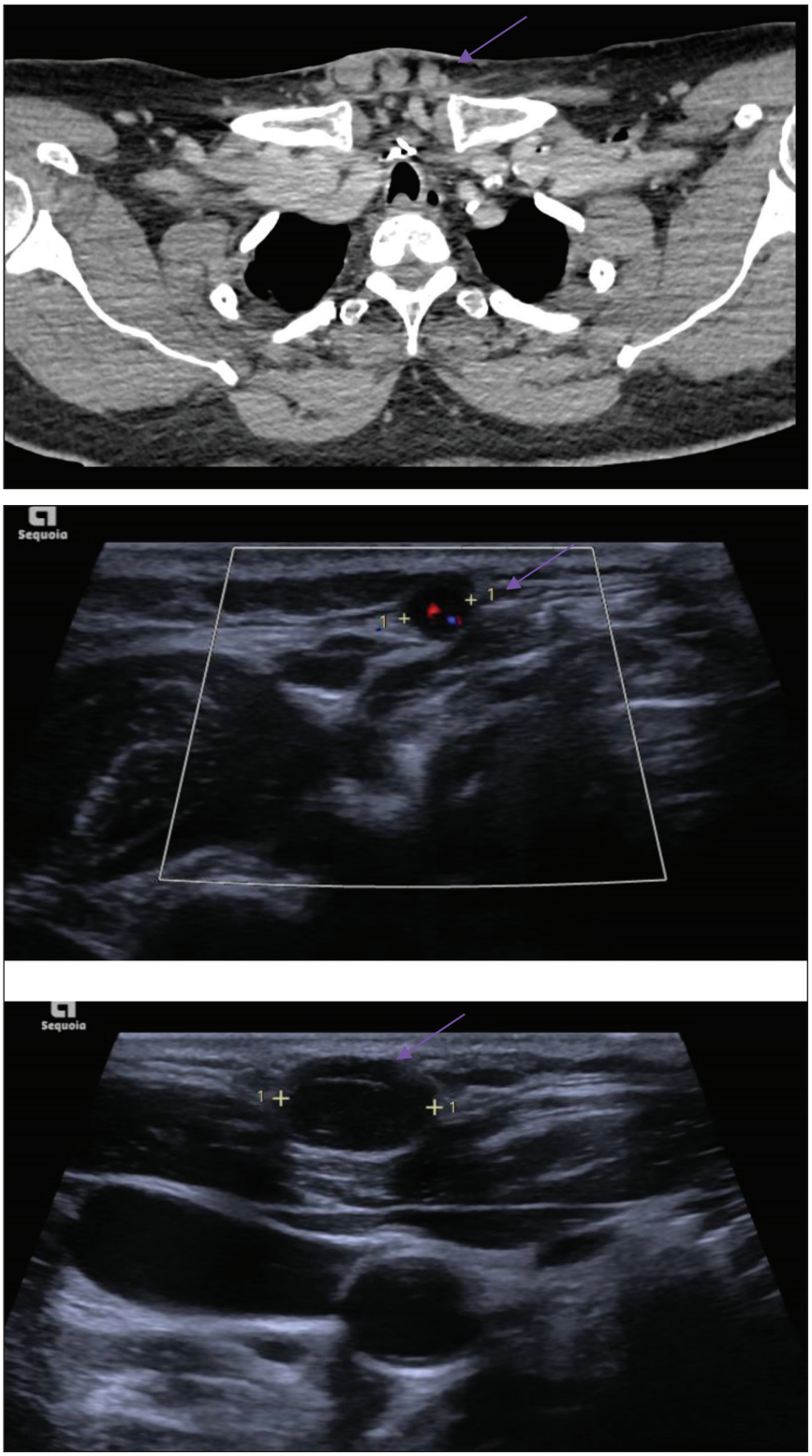

Figure 3. *A - Axial CT demonstrating multiple subcutaneous deposits within the sternal notch. B - Two US images highlighting multiple small subcutaneous metastatic deposits.*

age of 69.67 years (SD 8.80) at presentation of cutaneous metastasis. This corresponds with other reported cases, which demonstrate a female preponderance (55%) and an average age at presentation of cutaneous disease of 63.13 years and a high prevalence of PTC (47%) [5]. Although PTC has an excellent overall prognosis, distant metastases are typically associated with poor outcomes [2,5].

All three cases in this series demonstrated cutaneous recurrence within the neck, specifically in or adjacent to previous surgical scars. This contrasts with existing literature, which most commonly identifies cutaneous metastases from PTC presenting on the scalp, likely due to its rich lymphovascular network facilitating distant spread [6]. Notably, none of our cases involved a documented

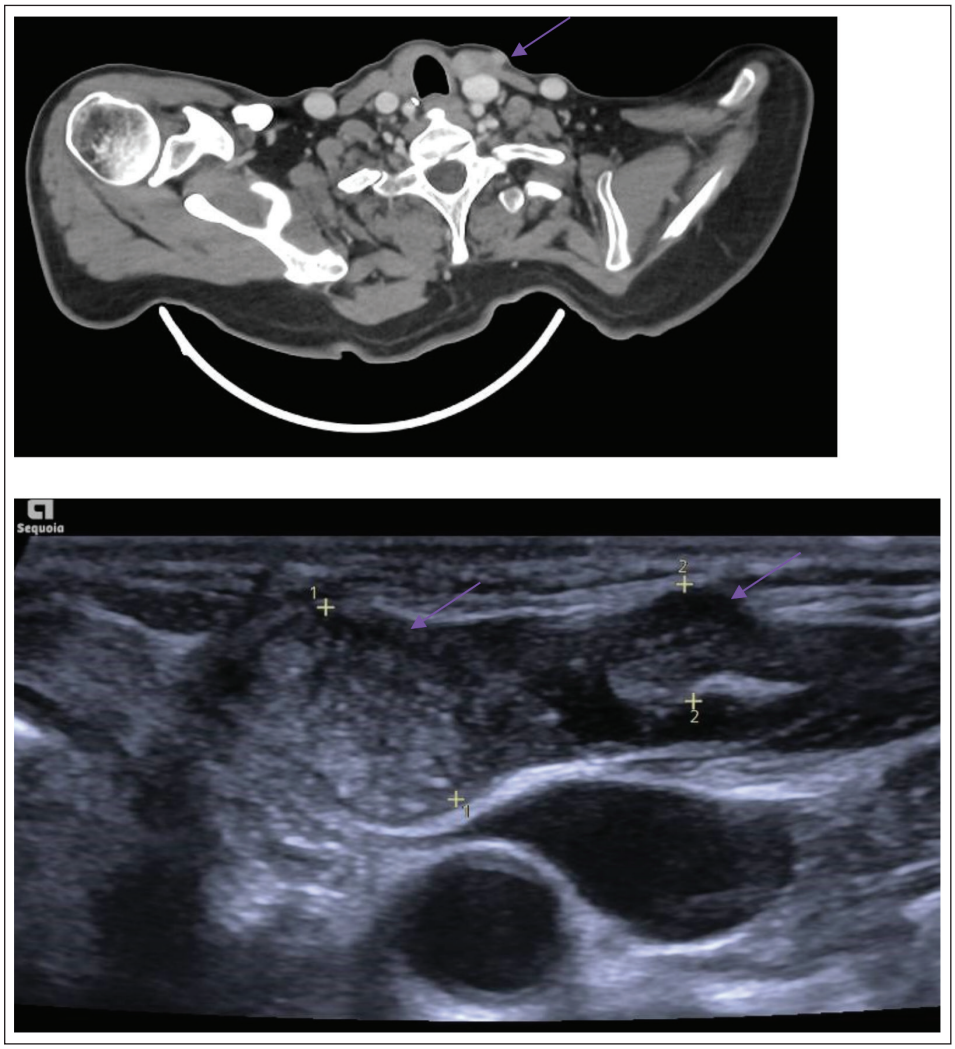

Figure 4. *A - Axial CT demonstrating subcutaneous deposit of PTC with invasion of the left anterior strap muscles. B - US suggestive of two metastatic deposits within the dermis.*

Table 1. *Summary of case characteristics.*

	Age	Time to metastases (post initial resection)	Site of metastases	Management	Outcome
Case 1	68	24 months	Surgical scar	Completion thyroidectomy, scar excision, and radioactive iodine	Ongoing monitoring (as of June 2024)
Case 2	75	60 months	Surgical scar, sternal notch, and SCM	Central neck dissection and radioactive iodine	Disease-free (as of Oct 2024)
Case 3	58	5 months	Surgical scar	Central neck dissection, radioactive iodine, and systemic therapy	Stable disease (as of Jan 2025)

intraoperative breach of the tumour capsule, raising questions regarding the pathogenesis of these recurrences. These findings challenge whether such lesions should be classified as truly distant metastasis (M1), or rather as manifestations of locoregional tumour seeding, but this remains speculative. All three patients underwent revision surgery with curative intent and exhibited only low-volume distant disease. If these cutaneous lesions represented conventional distant metastases, a more extensive metastatic burden would typically be anticipated. This discrepancy suggests other factors, including tumour dormancy, local tissue microenvironment, or surgical manipulation, may play a role in localised dermal recurrence. Importantly, this distinction is not merely academic; each patient underwent curative surgical revision, yet treatment approaches would differ significantly had these lesions been considered true systemic metastases.

Diagnosis of cutaneous metastatic PTC lesions is particularly challenging, not only due to their rare presentation but also because primary skin cancers (such as

apocrine tumours) may demonstrate similar histological features [11]. The mechanism of cutaneous metastases remains unknown. Avram et al proposed tumour cell emboli may become trapped within the rich dermal capillary network [12]. The type of tumour may also influence the risk of skin metastasis. Medullary and anaplastic thyroid cancers are known to carry a greater risk of distant metastasis, although the literature is limited reporting their spread to the skin [5,13,14]. Notably, Lim et al. [15] describe one case of anaplastic thyroid carcinoma with abdominal cutaneous spread.

PTC initially metastasizes through the lymphatic system, resulting in multifocal lesions and regional node metastasis in approximately 50% of cases [2]. Given that PTC is associated with high rates of locoregional metastases, and all three of our patients presented with recurrence associated with a previous surgical scar, it is possible that intraoperative techniques may contribute to pathology. We hypothesize that, for example, a lymph node may have become trapped within the scar during extraction, or the tumour capsule may have been breached intraoperatively. Skin contamination may have occurred whilst removing the specimen through a small incision, or along the drain site. This is particularly exemplified in case 2, where recurrent disease was found within the SCM, near to the site of typical drain insertion.

Interestingly, in the largest systematic review to date, analysis of 136 patients demonstrated that cutaneous metastases as an initial presentation were not uncommon, representing 24.26% of their study population [5]. In these cases, different modes of dissemination of disease to the skin should to be considered as there are likely multiple routes of metastases.

Conclusion and Recommendations

Cutaneous metastases of PTCs are incredibly rare and usually associated with disseminated metastatic disease [6]. They typically present as painless, slow-growing skin nodules found within the head and neck, which may be related to the rich dermal vasculature of the head and neck, or following tumour seeding after FNAC. Excision, further radioactive iodine, and suppression with levothyroxine are recommended. External beam radiation therapy has also been used in palliative instances. Given the poor prognostic association shown in the literature, it is essential to diagnose cutaneous metastasis early. Although, in this case series, the patients showed good locoregional control and stable disease with systemic therapy.

Recommendations for future practice include the prompt evaluation of any skin lesions in patient with a history of thyroid malignancy, alongside thorough examination during routine postoperative follow up. For suspected skin metastasis, evaluation with US, FNAC and CT imaging should be followed by excisional biopsy in cases of diagnostic uncertainty. Specimens should be reviewed by histopathologists who specialize in thyroid malignancies, given PTC metastasis bear similar histopathological resemblance to primary malignancies like apocrine tumours [11]. Keeping in mind a hypothesis of possible spread through surgical techniques, we careful handling of thyroid specimens remains essential to prevent tumour spillage. Ensuring an adequately sized incision may help reduce the risk of tumour seeding during specimen extraction. Additionally, surgical drains should be positioned away from the tumour bed to minimise the likelihood of cutaneous metastasis. For all revision or completion thyroid surgeries, we routinely excise the surgical scar to enhance cosmetic outcomes, and send this excised scar tissue separately for histopathological diagnosis to rule out potential cutaneous metastasis. This is not routine practice but an institution normal and a suggested recommendation. Although these remain a rare occurrence, it is critical that skin lesions be worked up appropriately and in a timely manner, especially in patients with a history of thyroid malignancy.

What is new?

Cutaneous metastases of papillary thyroid cancer is a rare finding. Although the prognosis of PTC itself is very good, cutaneous presentation is a significant poor prognostic factor with an associated average survival of 13.07 months. The mechanism of action, as well as the best approach to treatment, is still unclear due to limited data. This manuscript provides additional data to add to the pool of only 136 patients currently described in the literature.

List of Abbreviations

CT	Computed Tomography
FNAC	Fine-Needle Aspiration Cytology
MDT	Multidisciplinary Team
PTC	Papillary Thyroid Carcinoma
SCM	Sternocleidomastoid
US	Ultrasound

Conflict of interest

The authors declare that they have no conflict of interest regarding the publication of this article.

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Consent to participate

For this type of study informed consent is not required.

Consent for publication

For this type of study consent for publication is not required.

Ethical approval

Ethical approval is not required at our institution to publish an anonymous case series.

Availability of data and materials

Not applicable for this article.

Code availability

Not applicable for this article.

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Summary of the case

	Case 1	Case 2	Case 3
Patients (gender, age)	Male, 68	Female, 75	Female, 58
Final diagnosis	Cutaneous metastases of papillary thyroid cancer		
Symptoms	Nodule on scar	Central neck mass	Subdermal nodules
Intervention	Completion thyroidectomy, scar excision, and radioactive iodine	Central neck dissection and radioactive iodine	Central neck dissection, radioactive iodine, and systemic therapy
Outcome	Ongoing monitoring (as of June 2024)	Disease-free (as of Oct 2024)	Stable disease (as of Jan 2025)
Specialty	Head and Neck / Otolaryngology		