Section: Surgery

Case Report

BREATH UNDER SIEGE: TRACHEAL INVASION BY RECURRENT PAPILLARY THYROID CARCINOMA

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Received *: 20/06/2025*
Received in revised form *: 05/08/2025*
Accepted *: 28/08/2025*

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DOI: 10.70034/ijmedph.2025.3.459

Source of Support: Nil,
Conflict of Interest: None declared

Int J Med Pub Health
2025; 15 (3); 2497-2500

ABSTRACT

Background: Papillary thyroid carcinoma (PTC) is the most common thyroid malignancy, generally associated with an indolent course and favourable long-term prognosis. However, locally aggressive disease with aerodigestive tract invasion and multiple recurrences pose significant diagnostic and therapeutic challenges.

Case Presentation: We report the case of a 67-year-old female with a history of multifocal PTC, initially managed in 2016 with total thyroidectomy, left modified radical neck dissection (MRND), and right selective neck dissection. Histopathology revealed multifocal PTC with positive resection margins and nodal metastasis. She underwent two sessions of radioactive iodine (RAI) ablation. Surveillance imaging was initially negative. In 2020, she developed a right neck recurrence confirmed by fine-needle aspiration cytology (FNAC) as metastatic PTC. She underwent right MRND followed by a third session of RAI. Four years later, she presented with elevated thyroglobulin levels, negative iodine uptake, and PET-CT evidence of a metabolically active midline thyroid bed lesion invading the trachea, associated with right cervical nodal disease. Bronchoscopy revealed an intraluminal tracheal mass causing luminal narrowing and contact bleeding, along with right vocal cord palsy. She underwent tracheostomy under local anaesthesia, completion right MRND and partial tracheal resection involving the right anterolateral first tracheal ring. Reconstruction was performed using a right strap muscle flap, and a Portex tracheostomy tube was placed.

Conclusion: This case highlights the potential for late aggressive recurrence of PTC, including direct tracheal invasion, even after apparently adequate initial management. Surveillance should incorporate multimodality imaging and serum thyroglobulin monitoring. In cases with airway involvement, surgical resection with tracheal reconstruction can achieve local control and palliate airway compromise. Multidisciplinary management is critical in optimizing outcomes in advanced, recurrent PTC.

Keywords: Papillary thyroid carcinoma (PTC), Thyroid cancer, Total thyroidectomy, Radioactive iodine.

INTRODUCTION

Papillary thyroid carcinoma (PTC) is the most common histological type of thyroid malignancy, accounting for approximately 80–85% of all thyroid cancers.[1,2] Over the past three decades, its reported incidence has risen steadily across the globe, a trend attributed both to improved detection through high-resolution ultrasonography and fine-needle aspiration cytology, as well as a genuine increase in disease occurrence.[3,4] Despite this rising incidence, mortality from PTC has remained relatively stable,

underscoring its typically indolent course and favourable prognosis, with 10-year disease-specific survival rates exceeding 90% in most patient cohorts.[5,6]

Surgical resection remains the mainstay of treatment, with either total thyroidectomy or lobectomy and the role of adjuvant radioactive iodine (RAI) therapy has shifted toward selective use in intermediate and high-risk cases, guided by updated American Thyroid Association (ATA) guidelines. Long-term follow-up using serum thyroglobulin levels and neck ultrasonography is crucial, given the possibility of late recurrences even in low-risk patients.

The occurrence of upper aerodigestive tract invasion, including tracheal involvement, is rare—estimated at 0.5–1.5% of cases.[7,8] However, when such invasion is present, it significantly increases surgical complexity, perioperative morbidity, and disease-specific mortality.[9]

This report presents a case of recurrent PTC with tracheal invasion, managed surgically with partial tracheal resection and flap reconstruction, highlighting diagnostic challenges, management decisions and a brief review of relevant literature.

Case Presentation

A 67-year-old female presented in 2016 with a two-year history of anterior neck swelling associated with occasional dyspnoea but no symptoms suggestive of thyroid dysfunction. Examination revealed a 3×3 cm hard nodule in the right thyroid lobe and bilateral sub centimetric cervical lymph nodes, the largest measuring 3×2 cm in the left neck.

She underwent total thyroidectomy with left MRND and right neck dissection in 2016. Intraoperatively, the tumor was noted to densely infiltrate the midline trachea. Histopathology showed multifocal PTC with positive surgical margins and metastatic cervical lymph nodes. Postoperative whole-body iodine scan demonstrated tracer uptake in the thyroid bed, and she received two sessions of RAI therapy. Follow-up scans revealed no abnormal uptake.

Four years later, she presented with a 2×1 cm right neck swelling and multiple small cervical nodes at levels 3 and 4. FNAC confirmed metastatic PTC. She underwent right MRND in 2020, with histopathology confirming metastasis in 1/16 lymph nodes. She received a third RAI therapy, with subsequent negative whole-body iodine scans.

During routine follow-up after 7 years in 2023, her serum thyroglobulin levels were elevated. Neck ultrasound revealed a lobulated hypoechoic midline lesion. Iodine scan showed no uptake, but PET-CT detected a metabolically active lesion infiltrating the trachea, causing luminal narrowing, along with necrotic right cervical lymph nodes. Bronchoscopy revealed right vocal cord palsy and an intraluminal tracheal lesion with contact bleeding.

She underwent tracheostomy under local anaesthesia, completion right MRND (levels 4 & 5), partial tracheal resection (right anterolateral first ring), right strap muscle flap closure of the tracheal defect, and Portex tracheostomy tube placement. (figure 1) figure.[2]

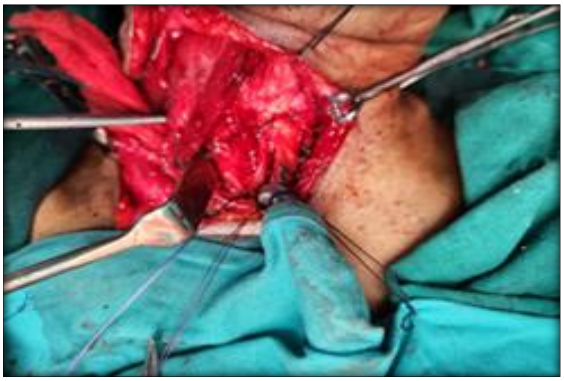

Figure 1: Intra-op picture showing tracheal defect

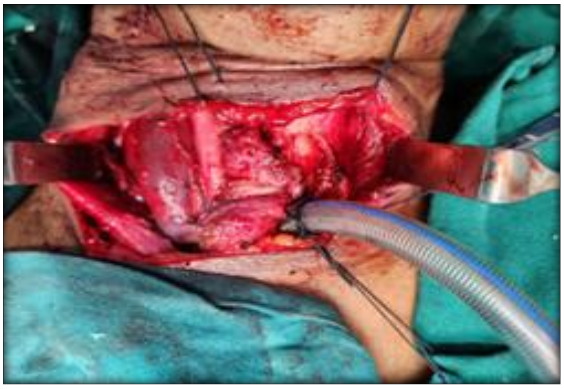

Figure 2: Intra-op picture of defect closure with right strap muscle

Postoperative course was uneventful, and she was discharged on day 6 with tracheostomy tube in situ. Weaned off from tracheostomy within 1 month. Histopathology showed Metastatic PTC in 3/10 nodes; tracheal cartilage positive for PTC with positive superior and inferior margins. Patient is under follow-up with general surgery and radiotherapy teams; planned for adjuvant external beam radiotherapy.

DISCUSSION

Papillary thyroid carcinoma (PTC) is a differentiated thyroid malignancy characterized by excellent prognosis, with reported 10-year survival rates exceeding 90% in most patients. The occurrence of upper aerodigestive tract invasion, including tracheal involvement, is rare—estimated at 0.5–1.5% of cases. However, when such invasion is present, it significantly increases surgical complexity, perioperative morbidity and disease-specific mortality.

Extrathyroidal extension (ETE) is an established adverse prognostic factor in PTC and is included in most major staging systems, including the American Joint Committee on Cancer (AJCC) TNM classification.[10,11]. The reported incidence of ETE in PTC varies between 5% and 34%, depending on

diagnostic definitions, histopathologic assessment and tumor aggressiveness.[12,13] ETE is further classified into minimal (microscopic invasion beyond the thyroid capsule) and gross (macroscopic invasion into surrounding structures such as strap muscles, trachea, oesophagus, or recurrent laryngeal nerve). Gross ETE, especially into the trachea or larynx, is associated with higher rates of locoregional recurrence and disease-specific mortality. According to the AJCC 8th edition TNM staging system,[14] tumour classification in thyroid carcinoma incorporates both size and extent of invasion:

- T1: ≤2 cm confined to thyroid.
- T2: >2–4 cm confined to thyroid.
- T3a: >4 cm confined to thyroid.
- T3b: Gross ETE invading strap muscles.
- T4a: Invasion into subcutaneous soft tissue, larynx, trachea, esophagus or recurrent laryngeal nerve;
- T4b: Invasion into prevertebral fascia, encasement of carotid artery or mediastinal vessels.

Nodal staging ranges from N0 (no metastasis) to N1a/N1b, depending on the compartment involved, while distant metastasis is designated as M0 (absent) or M1 (present). Notably, age is a strong prognostic determinant; patients <55 years are staged simply as Stage I (M0) or Stage II (M1), whereas those ≥55 years follow a more granular stage distribution.[14]

When assessing the depth of tracheal invasion, the classification by Shin and McCaffrey is widely adopted,[15]

- Stage I: Tumor abutting but not invading tracheal perichondrium;
- Stage II: Invasion into cartilage;
- Stage III: Penetration into submucosa;
- Stage IV: Full-thickness penetration with intraluminal disease.

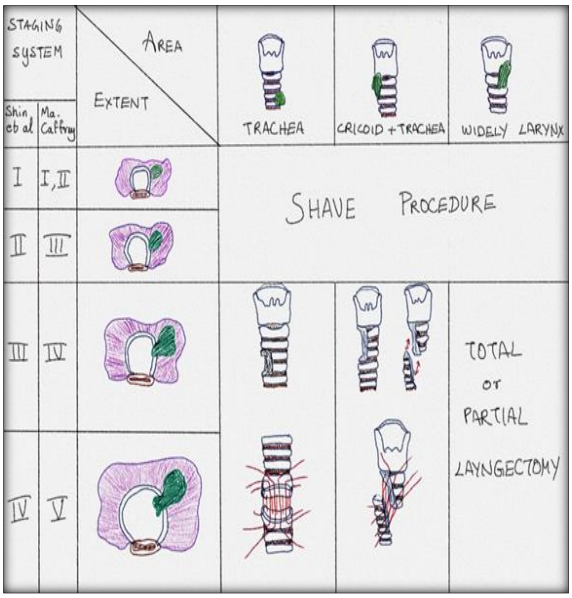

Figure 3: Surgical management depends on invasion depth

- **Shave excision** (partial-thickness resection) for Stage I–II lesions without mucosal involvement;
- **Window resection** for limited full-thickness involvement, closed primarily or reconstructed with local muscle flaps (strap muscles, sternocleidomastoid, or pectoralis major);
- **Circumferential (segmental) tracheal resection with primary anastomosis** for extensive disease, limited by the ability to resect up to ~5–6 cm of trachea while maintaining tension-free repair;
- **Total laryngectomy with permanent tracheostomy** reserved for extensive laryngotracheal invasion or non-reconstructable airway defects.[16,17,18]

While aggressive surgical intervention can achieve local control, complication risks include airway dehiscence, anastomotic stenosis, wound infection and haemorrhage. Therefore, multidisciplinary decision-making involving endocrine surgeons, otolaryngologists, anaesthesiologists and radiation oncologists is critical.

Adjuvant radioactive iodine therapy and, in select cases, external beam radiotherapy may improve locoregional control when high-risk features are present.[19] Prognostic factors influencing outcomes include patient age, tumor size, ETE extent, completeness of resection, nodal burden and presence of distant metastases.

CONCLUSION

Papillary thyroid carcinoma is treated by removal of the thyroid gland primarily and depending upon the extent, it might be added on with lymph node dissection, radiation or radioactive iodine therapy as indicated.[11] Loco-regional recurrence of papillary thyroid carcinoma is rare and occurs in approximately 5% of patients in large series,[12] with even rarer chances of dedifferentiation to anaplastic thyroid carcinomas, all of which increase the morbidity and mortality of patients if not treated promptly. Hence regular and watchful follow up in patients are essential and improve their survival.

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