

## Tracheal resection for thyroid cancer

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### Abstract

**Introduction:** Thyroid cancers infiltrating the upper aerodigestive tract are not uncommon. The management of these cases can be demanding, with a high level of surgical skill required to achieve adequate primary resection and reconstruction.

**Materials and methods:** This study was a single institution series of seven patients, managed over two years, who underwent tracheal resection for advanced thyroid cancer. All patients were older than 45 years (range, 45–65 years) and were predominantly male (six of seven). All patients presented to us with a swelling in the neck. Fine needle aspiration cytology detected thyroid cancer in all patients. None of the patients required a tracheostomy prior to surgery; however, they all had varying levels of airway compromise. One patient had lung metastasis at presentation. In all patients, the airway was successfully secured with fibre-optic assisted intubation prior to surgery. All patients underwent a total thyroidectomy with tracheal resection and anastomosis. Montgomery's suprahyoid release was utilised to achieve adequate laryngeal drop. None of the patients required a tracheostomy in the post-operative period. All patients received adjuvant therapy with either radioiodine ablation and/or radiotherapy.

**Conclusion:** Tracheal resection and primary reconstruction is a feasible surgical procedure for patients with thyroid cancer infiltrating the upper aerodigestive tract, with good clinical outcomes. However, the morbidity of the procedure mandates careful case selection, airway management and meticulous surgical technique.

**Key words:** Thyroid Neoplasms; Carcinoma; Pathology; Trachea; Surgical Procedures, Operative

### Introduction

Most patients with thyroid cancer have well differentiated histology and an excellent prognosis.

However, small subsets of patients have adverse factors which carry a poor prognosis. Extrathyroidal spread is one such factor, and has the greatest negative impact on prognosis. The incidence of extrathyroidal spread varies from 6 to 13 per cent.<sup>1</sup> The 10-year survival rate for encapsulated thyroid cancer is about 91 per cent, but this drops to 45 per cent when extracapsular spread occurs.<sup>2</sup> Involvement of the trachea occurs in about one-third of locally advanced thyroid cancers.<sup>3</sup> Autopsy studies have shown that respiratory obstruction was the immediate cause of death in 50 per cent of patients with thyroid cancer.<sup>4</sup> In well selected patients, complete excision of the disease can enable long survival and optimum palliation.

### Materials and methods

This was a retrospective study conducted in the head and neck oncology department at the Kidwai Memorial Institute of Oncology from 2006 to 2008.

We included seven patients with thyroid cancer with infiltration of the trachea, who were managed surgically. Of these seven patients, six were male and one was female. The mean age was 54 years (range, 45 to 65 years).

All patients presented with swelling in the neck. Other symptoms noted were breathlessness (four patients), hoarseness of voice (four patients) and dysphagia (one patient).

On examination, the tumour size ranged between 3 to 6 cms. Two of the seven patients had palpable neck nodes.

Upon laryngoscopic examination, the vocal folds were either fixed (one patient), restricted (three patients) or mobile (three patients).

All patients underwent contrast-enhanced computed tomography (CT) scanning of the neck and thorax, ultrasound of the abdomen, and liver function tests. One patient was found to have pulmonary metastasis. Fine needle aspiration cytology revealed papillary carcinoma in five patients and poorly differentiated carcinoma in the other two. Bronchoscopy was performed in

all patients to assess the site and extent of tracheal invasion. Tracheostomy was avoided prior to surgery.

The decision to undertake tracheal resection was made when the patient was medically fit and when it appeared to be feasible to completely resect the airway disease.

#### *Anaesthetic considerations*

A careful joint review of all imaging was undertaken by the surgical and anaesthetic team. Under topical anaesthesia, with the help of a fibre-optic bronchoscope, nasotracheal intubation was performed in all patients. In each case, the fibre-optic bronchoscope was navigated past the obstructing tumour to reach the distal normal trachea. The endotracheal tube was gently advanced over the bronchoscope into the distal trachea. No tracheostomy was required prior to surgery in any patient.

#### *Surgical highlights*

All patients underwent total thyroidectomy with central compartment clearance.

The trachea was isolated with the thyroid by cutting the strap muscles low in the neck and identifying both recurrent laryngeal nerves definitively. The central compartment was cleared, after careful identification and preservation of the contralateral parathyroid with their blood supply. Care was taken to avoid inadvertent injury to the peri-oesophageal tissues, and a 1.5 to 2 cm margin was given to the trachea infiltrated by the thyroid neoplasm. Care was taken not to injure the internal branch of the superior laryngeal nerve. Functional neck dissection was performed in two patients with enlarged nodes. Tracheal segmental resection (three to five rings) and end-to-end anastomosis was feasible in all seven patients (Figures 1 and 2). Montgomery's suprahyoid release was utilised to achieve adequate laryngeal drop, to facilitate a safe anastomosis (Figure 3).

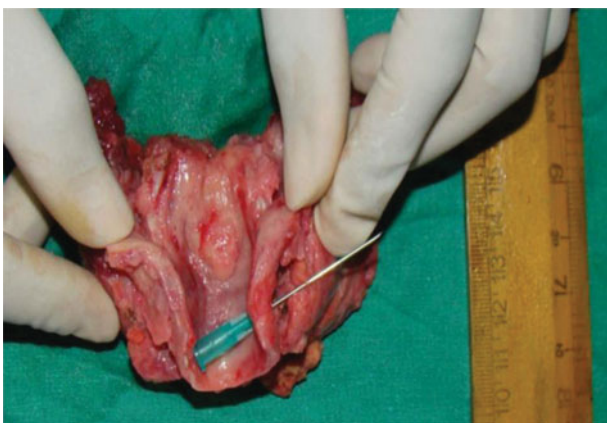


FIG. 1

Resected specimen showing tracheal infiltration (Shin stage IV).



FIG. 2

Operative field following en bloc removal of tumour and trachea.

A low pressure cuff endotracheal tube was left in situ following surgery, and removed successfully after 24 hours.

#### **Results**

We encountered one major complication in one patient, which resulted in mortality. This patient had bilateral enlarged lymph nodes and required bilateral neck dissection along with extirpation of the tumour and trachea. The patient developed significant chyle leakage in the immediate post-operative period, which resulted in septicaemia and death.

We did not encounter any other major complications such as haemorrhage, stridor or anastomotic dehiscence. No patient required a tracheostomy.

Hypocalcaemia was seen in all seven patients; this was transient in four patients and long-standing (i.e. more than three months' duration) in three patients.

One patient, who had suffered prior vocal fold palsy, had transient symptoms of aspiration. She underwent percutaneous endoscopic gastrostomy to tide over the aspiration, which resolved spontaneously over four months.

Histopathological examination revealed papillary carcinoma in three patients, poorly differentiated carcinoma in three patients, and poorly differentiated carcinoma with an undifferentiated component in one patient. The central compartment nodes were positive in one patient.

The length of trachea involved ranged from 3 to 5 cm, with all resected margins free of tumour. According to Shin and colleagues' staging system, tracheal involvement was stage II in two patients, stage III

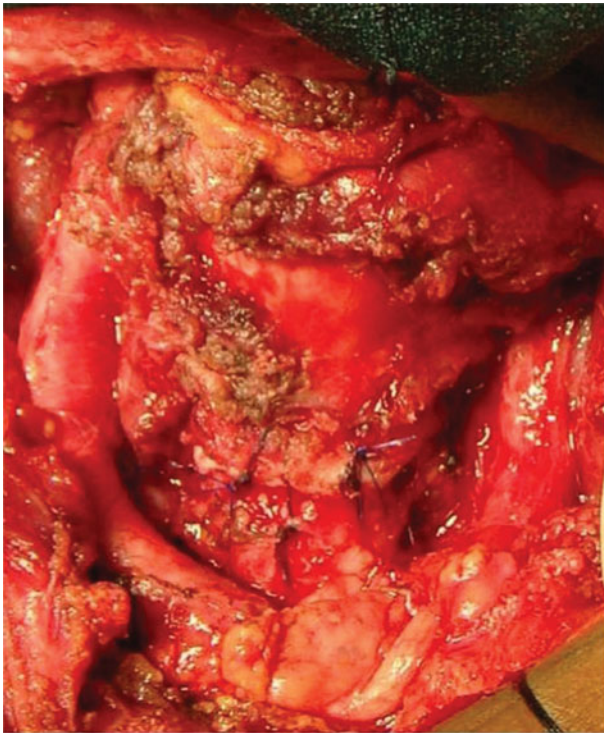


FIG. 3

Tracheal anastomosis following suprahyoid release.

in three patients and stage IV in two patients.<sup>5</sup> In one patient, the neoplasm extended superiorly to involve up to 40 per cent of the cricoid cartilage.

Post-operative radioiodine was administered to five patients.

External beam radiotherapy was administered to two patients (one patient received both radioiodine and radiotherapy). Both patients received 54 Gy to the neck and superior mediastinum, after bronchoscopic evaluation of the anastomotic site.

Our follow-up period ranged from three months to two years. All patients were kept under close surveillance, and were disease-free at the time of writing.

#### Functional outcome

All patients had an intact airway during their treatment. All but one patient had return of normal deglutition. One patient had symptoms of aspiration which resolved four months after the surgery.

#### Discussion

Adverse prognostic factors affect a small subset of patients with thyroid cancer, reducing the otherwise generally excellent prognosis for this tumour. Of these adverse prognostic factors, which include age, tumour histology, size, extrathyroidal spread and distant metastasis,<sup>6</sup> extrathyroidal spread is the most deleterious.<sup>2</sup> Although infrequent, extrathyroidal spread can involve the strap muscles, recurrent laryngeal nerve, trachea, oesophagus, lateral neck structures and larynx.<sup>7</sup>

Tracheal involvement occurs in about one-third of these patients. Respiratory obstruction is known to be the leading cause of death in thyroid cancer patients.

Surgery remains the main modality of treatment for thyroid cancer patients with tracheal involvement, the goal being complete resection with negative margins. However, the operative mortality and morbidity in these patients are considerable.<sup>7</sup>

This has led to more conservative approaches, in the form of shaving or peeling techniques. Following these approaches, the use of radioiodine ablation and external beam radiotherapy becomes necessary to tackle the residual microscopic disease. In appropriately selected patients, Cody and Shah found no local recurrences in those undergoing shave procedures.<sup>8</sup> McCaffrey and Lipton noted similar local control rates and survival following shave procedures for early lesions with insignificant intraluminal extension, when compared with radical procedures.<sup>9</sup> However, various other studies have shown higher recurrence rates and poorer survival for patients undergoing lesser surgery for tracheal involvement. Gaissert *et al.* found that early airway resection provided a better disease-free interval and overall survival, compared with shave procedures and resection for recurrences.<sup>10</sup> There are several other reports which concur that leaving behind gross disease leads to higher recurrence rates and poorer survival; these authors therefore conclude that more aggressive approaches are required.<sup>11,12</sup>

- **Extrathyroidal spread of thyroid cancer is not uncommon**
- **Respiratory obstruction is the leading cause of death in advanced thyroid cancer**
- **Extensive surgery can result in increased morbidity and mortality**
- **Careful airway management is essential in these patients**
- **Proper case selection and meticulous surgery can provide good results**

In our case review, we found that all our patients presented with signs and symptoms of locally advanced disease. Tracheal involvement and extent were confirmed by CT scan and bronchoscopy. The neoplasms were predominantly Shin's stage II to IV, with one lesion extending onto the cricoid cartilage. We found that several factors played an important role in reducing the morbidity of surgery (due to tracheostomy, anastomotic complications, haemorrhage etc). These factors were: performance status of the patient, expedition of surgery, careful attention to the airway in the peri-operative period, and meticulous anastomotic technique.

Tracheostomy is best avoided in these patients, as its secretions contaminate the surgical wound and delay wound healing.<sup>13</sup> In unavoidable circumstances, careful planning, with the help of imaging and

bronchoscopy, will be required to determine the best site for tracheostomy.

### Conclusion

Extrathyroidal spread of thyroid cancer, especially with tracheal involvement, is not uncommon. Surgical management of these patients is required, as respiratory obstruction is the leading cause of death in advanced thyroid cancer. Shave procedures may be adequate for superficial lesions. Although there is a risk of increased morbidity, resection of the tumour with negative margins appears to be essential in order to lower the recurrence risk and improve survival. The present study confirms the safety and effectiveness of segmental tracheal resection; in our patients, this procedure provided excellent disease control and palliation.

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