

# A 90-Year-Old Woman with Trachea-Invading Thyroid Cancer Requiring Four-Ring Resection of Cervical Trachea Because of Airway Stenosis

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The patient was a 90-year-old woman with chief complaints of hemoptysis and wheezing. Cervical computed tomography (CT) scans revealed a mass (2.5×2.0 cm) in the right lobe of the thyroid. The mass was exposed into the tracheal lumen, causing marked stenosis of the airway. When examined by bronchoscopy, the maximal degree of airway stenosis was about 75% of the tracheal cross section. During surgery, a resection of the right lobe of the thyroid was combined with a resection of the second to fifth cartilage ring of the cervical trachea for the purpose of complete resection of the thyroid cancer. During the same operation, the trachea was reconstructed by end-to-end anastomosis. For 1 week after surgery, a Mini-Trach II tube was left inserted to aspirate sputum, and the neck was kept bent forward (in the position of flexion). When sleeve resection of the trachea and subsequent end-to-end anastomosis are being performed, it is essential to manipulate the trachea in a protective manner, to preserve the nourishing vessels, to perform operative manipulation aseptically, to appropriately move the trachea, and to ensure reliable suturing with the goal of minimizing the incidence of complications such as anastomotic failure and stenosis of the anastomosed area. Although the patient was in advanced old age, her postoperative course was uneventful. (*Ann Thorac Cardiovasc Surg* 2007; 13: 341–344)

**Key words:** thyroid cancer, tracheal invasion, airway stenosis, tracheal sleeve resection, end-to-end anastomosis

## Introduction

Invasion of the trachea by thyroid cancer causes dyspnea, often leading to fatal outcomes. For radical local treatment in such cases, a resection of the thyroid cancer needs to be combined with a resection of the trachea. Following recent advances in operative techniques pertaining to trachea and bronchi, the results of sleeve resection of the

trachea and subsequent end-to-end anastomosis have improved. As a result, surgery has been actively performed even in cases of thyroid cancer invading the trachea.<sup>1)</sup> We recently encountered a 90-year-old woman with trachea-invading thyroid cancer. We treated this case by a resection of the cancer in combination with a resection of four rings of the cervical trachea and subsequent tracheal reconstruction. Her postoperative course was uneventful. This case will be presented in this paper, with reference to the literature.

## Case Report

The patient was a 90-year-old woman. She first became aware of hemoptysis in June 2002. In October 2004, hemoptysis occurred again, accompanied by wheezing. She

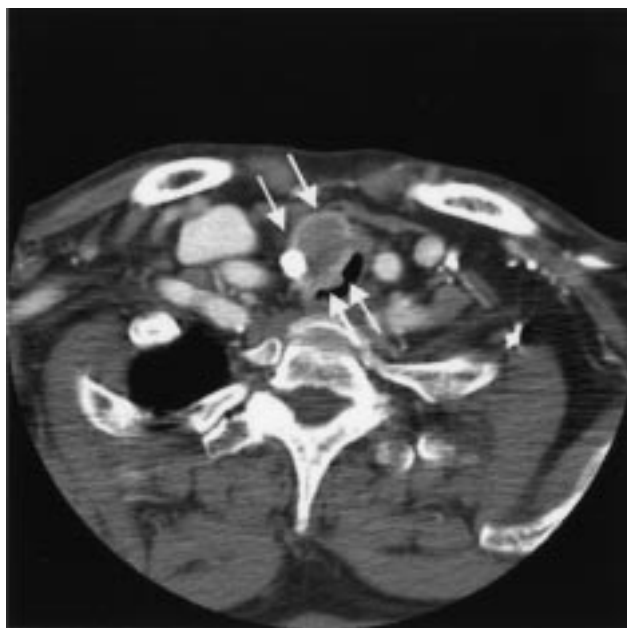
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consulted a nearby clinic and underwent a detailed examination. She was diagnosed as having tracheal invasion of thyroid cancer. She was referred and admitted to our department to receive surgery.

Cervical computed tomography (CT) scans (Fig. 1) revealed a mass (2.5×2.0 cm), accompanied by calcification, in the right lobe of the thyroid. The mass compressed the trachea and protruded into the tracheal lumen. Bronchoscopy (Fig. 2) disclosed a hemorrhagic mass (2.0 cm in diameter) assuming an elevated form on the right wall of the trachea about 1.5 cm distal to the vocal cord. The degree of airway stenosis was rated as about 75% of the tracheal cross section at maximum. On the basis of these results, the patient was diagnosed as having a thyroid cancer 2.5 cm in diameter that had invaded the cervical trachea and was exposed into the tracheal lumen. Because the patient was in advanced old age, we considered inserting a stent to secure the airway. However, because of possible airway bleeding, we selected to perform complete resection of the thyroid cancer, combined with resection and reconstruction of the trachea. Surgery was performed on February 8, 2005.

During surgery, particular care was exercised when intubating the trachea to introduce anesthesia. We were ready to perform a tracheostomy if the tip of the tracheal tube could not be advanced beyond the stenosed area, but there was no particular resistance when the tube passed through this area. Surgery was started with a collar incision around the neck. Because the brachiocephalic artery was tortuous and located in the vicinity of the trachea, ministernotomy<sup>2)</sup> (a median incision of the upper sternum alone) was additionally performed to ensure a safe operative field. The ligament between the fifth and sixth tracheal cartilages was transected sharply with a knife. The oral end of the trachea was then transected at the level of the ligament between the first and second tracheal cartilages. At that time, the right lobe of the thyroid (including thyroid cancer), and four rings of the trachea were resected; the regional lymph nodes were then dissected. The mediastinal side of the trachea was manually mobilized. The membranous portion was first sutured, and the tracheal tube was then withdrawn and a sterile tube inserted again in a retrograde manner from the operative field toward the oral cavity. We then made every effort to continue the surgery in an aseptic manner. Interrupted sutures were performed on the cartilaginous portion to complete anastomosis around the full circumference of the trachea. Immediately after surgery, the tube was withdrawn from the trachea. Then a Mini-Trach II



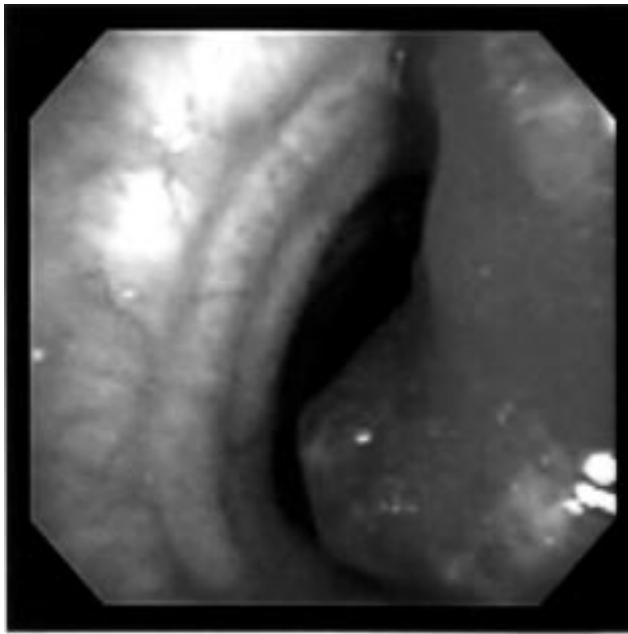
**Fig. 1.** Cervical computed tomography (CT) scans reveal a mass (2.5×2.0 cm), accompanied by calcification, in the right lobe of the thyroid. This mass compresses the trachea and protrudes into the tracheal lumen, causing marked stenosis of the airway.

was percutaneously inserted by puncture into the trachea for postoperative sputum aspiration. For 1 week after surgery, the neck was kept bent forward. On the 7th postoperative day, the neck position of flexion was released, and oral nutrition was started. On the 10th postoperative day, the Mini-Trach II was removed. Her postoperative course was uneventful. Bronchoscopy on the 24th postoperative day revealed the anastomosed site of the trachea to be in good condition (Fig. 3). The patient was discharged on the 28th postoperative day. At present (1 year and 10 months after surgery), the patient is in a good condition with no sign of recurrence.

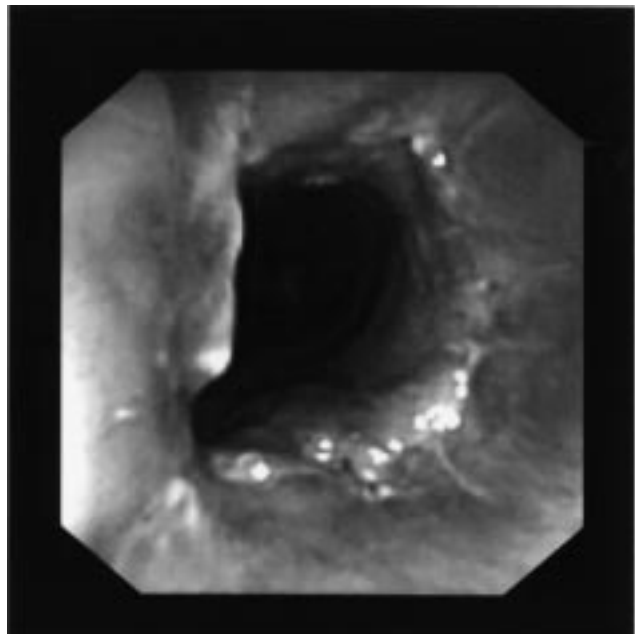
Histopathologically, the tumor, 2.5×1.3×1.0 cm in size, was diagnosed as a follicular variant of papillary carcinoma. It had spread from the thyroid parenchyma, primarily invading the ligament between the tracheal cartilages. It was exposed into the tracheal lumen (Fig. 4). Surgical margins were tumor-free, and no metastasis was found in the dissected lymph nodes.

## Discussion

Organs surrounding the thyroid that can be directly invaded by thyroid cancer include the trachea, esophagus, common carotid artery, and so on. Among them the fre-



**Fig. 2.** Bronchoscopy on admission discloses a hemorrhagic mass (2.0 cm in diameter) assuming an elevated form on the right wall of the trachea about 1.5 cm distal to the vocal cord, causing the airway to be narrowed.



**Fig. 3.** Bronchoscopy on the 24th postoperative day reveals the anastomosed site of the trachea to be in good condition.

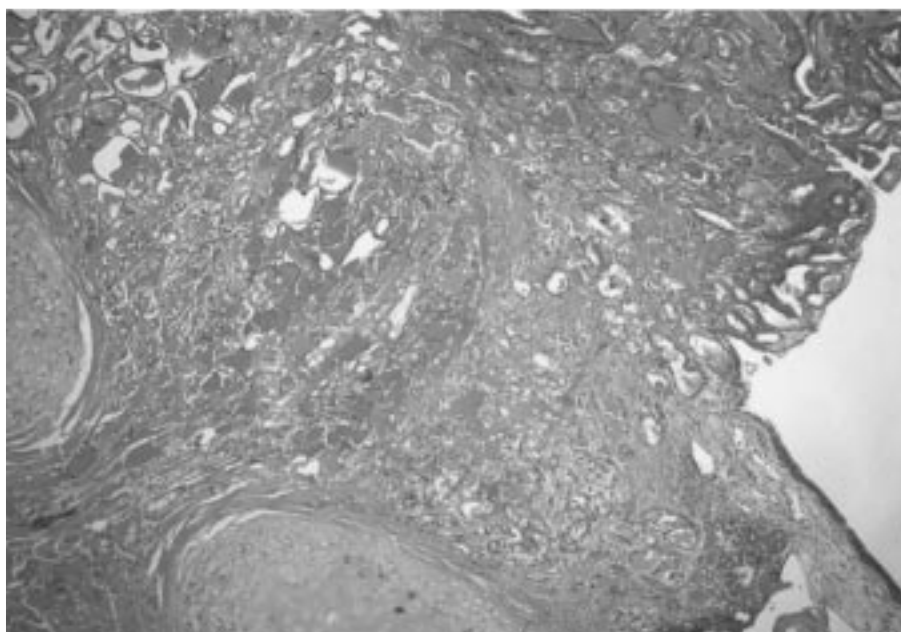
quency of invasion is particularly high in the trachea. If cancer invasion remains within the tracheal perichondrium, local recurrence may be avoided by shaving.<sup>3)</sup> However, when invasion is deeper, the results of treatment are reported to be poorer following shaving than following extended resection.<sup>4)</sup> An invasion of the trachea by thyroid cancer can cause symptoms such as hemoptysis and dyspnea, and it is not rare that a patient dies of airway obstruction as a result of tracheal invasion. To avoid such fatal complications, attempts have been made to resect and reconstruct the trachea simultaneously with a resection of thyroid cancer.<sup>1,5,6)</sup> In cases of thyroid cancer where the tracheal cartilage has been destroyed or the tumor has invaded deeply beyond the intercartilaginous ligament, a sleeve resection of the trachea and subsequent end-to-end anastomosis are often performed. In recent years, tracheoplasty in cases of thyroid cancer is reported to be promising not only as a means of securing the airway, but also as a procedure for radical surgery.<sup>7)</sup>

Sleeve resection of the trachea and subsequent end-to-end anastomosis are advantageous because the quality of life (QOL) is quite high; they are performed during a single operation, and the moistening effect of mucosa can be preserved, since the mucosa on the tracheal lumen is retained. Another advantage is that an adequate surgical

margin can be taken with this procedure. Disadvantages may include postoperative palsy of the recurrent nerve, vocal cord edema, stenosis of the anastomosed area, and anastomotic failure (i.e., problems related to airway management). Another disadvantage is that the patient needs to keep the neck bent for a certain period after surgery so that the anastomosed site of the airway can be protected.

Here are four important intraoperative points to ensure safe reconstruction of the trachea: (1) aseptic operative manipulations, (2) preservation of blood supply to the trachea, (3) reduction of tension to the anastomosed area, and (4) reliable suturing. To keep the operative field clean during anastomosis of the trachea, the possibly contaminated tube, which has passed through the oral cavity while anesthesia was being introduced, needs to be replaced with a sterile tube inserted in a retrograde manner from the operative field. To preserve the arteries supplying the trachea, freeing should be confined to the anterior and lateral walls of the trachea, avoiding freeing of the membranous portion. Thus freeing and mobilization of the trachea are performed down to the bifurcation of the trachea to minimize the tension on the anastomosed area. In the end, a suturing of the trachea is performed in a reliable manner to avoid injuries of the tracheal cartilages.

Our experience with the present case indicates that



**Fig. 4.** The tumor has spread from the thyroid parenchyma, primarily invading the ligament between the tracheal cartilages. It is exposed into the tracheal lumen (H&E; original magnification,  $\times 40$ ).

good postoperative QOL and long-term survival can be expected of patients with trachea-invading thyroid cancer causing airway stenosis if the tumors (including those affecting the trachea) are resected completely, even when the patient is in advanced old age, such as the 90-year-old woman presented in this paper. This operative procedure is recommended for chest surgeons with adequate skills.

In conclusion, successful radical surgery was possible for trachea-invading thyroid cancer of this aged woman by a resection of the thyroid cancer combined with a resection of four rings of tracheal cartilage and subsequent reconstruction. This case has been presented in this paper with reference to the literature.

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