

Emergency management of a patient with severe airway obstruction resulting from poorly differentiated thyroid carcinoma: A case report

RONG YANG¹, XIONGFEI YU¹, LIANG MA² and FUSHENG WU¹

Departments of ¹Surgical Oncology and ²Cardio-Thoracic Surgery, The First Affiliated Hospital, Zhejiang University College of Medicine, Hangzhou, Zhejiang, P.R. China

Received April 10, 2012; Accepted July 18, 2012

DOI: 10.3892/ol.2012.827

Abstract. We present a case of a life-threatening almost complete airway obstruction resulting from poorly differentiated thyroid carcinoma in a 48-year-old male. Airway obstruction may lead to unexpected mortality by suffocation and patients with poorly differentiated thyroid carcinoma usually have a fast deterioration and fatal outcome. In the case presented, we describe a safe and effective treatment strategy. Assisted by femoro-femoral cardiopulmonary bypass oxygenation, a tracheal stent was implanted successfully. Following surgery there were no complications, and chemoradiotherapy resulted in the relief of obstructing symptoms and improved the quality of life of the patient. This case indicates that femoro-femoral cardiopulmonary bypass provides adequate oxygen support to undergo further management and that tracheal stent implant is an effective emergent measure to relieve severe airway obstruction in patients with poorly differentiated thyroid carcinoma.

Introduction

Poorly differentiated thyroid carcinoma is a relatively rare disease. At present, it is thought to be an intermediate entity in the progression of well-differentiated thyroid carcinoma to anaplastic thyroid carcinoma (1,2). As patients with poorly differentiated thyroid carcinoma usually have a fast deterioration and fatal outcome, this carcinoma presents surgeons with challenging treatment options. Furthermore, when the carcinoma invades the trachea and results in airway obstruction,

the situation is an emergency and may be complicated. Therefore, an appropriate treatment strategy is necessary. In the current study, we present a case of an almost complete airway obstruction resulting from the invasion of poorly differentiated thyroid carcinoma. The anesthetist considered intubation to be dangerous as it had the potential to cause rupture and embolism of the tumor and lead to asphyxia. With the support of cardiopulmonary bypass oxygenation, we successfully implanted a tracheal stent under the guidance of flexible fiber optic bronchoscope. The patient's respiratory function improved and no complications occurred. Furthermore, subsequent concurrent chemoradiotherapy reduced the size of the tumor and prolonged the survival time of the patient.

Case report

Patient data. A 48-year-old male presented with dyspnea and intermittent stridor for three months. He also complained of a cough and experienced a slight loss of voice. Therefore he attended a local hospital where the physician misdiagnosed the condition as asthma and administered the corresponding treatment. Unfortunately, the dyspnea worsened gradually, and a month later the patient became hoarse. Thus, the patient was referred to our hospital. Informed consent was obtained from the patient prior to the study. The ethics committee of Zhejiang University College of Medicine, Zhejiang, China approved the study.

Palpation of the neck revealed a diffuse and firm goiter without tenderness. Neck and chest computed tomography (CT) scan showed an approximately 6.5-cm goiter in two lateral lobes of the thyroid gland, firmly wrapping the trachea. The goiter had invaded and protruded into the tracheal lumen and the narrowest internal diameter was 3 mm (Fig. 1). The goiter extended down the trachea into the chest and caused narrowing in a 5-cm stretch of the trachea. Laryngoscopy revealed impaired mobility of the left vocal cords. The results of the thyroid function test were within normal limits. The day after admission, the patient presented with a sudden onset of orthopnea and hemoptysis without an evident cause. After holding group consultations, we selected emergency treatment with the family's consent.

Correspondence to: Professor Fusheng Wu, Department of Surgical Oncology, The First Affiliated Hospital, Zhejiang University College of Medicine, 79 Qingchun Road, Hangzhou, Zhejiang 310003, P.R. China
E-mail: wufusheng1962@hotmail.com

Key words: thyroid cancer, airway obstruction, cardiopulmonary bypass, stents

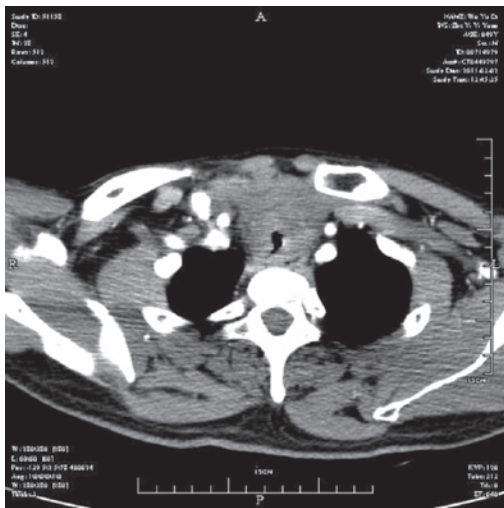


Figure 1. CT scan showing the tumor had compressed and invaded the trachea. The narrowest stenosis was 0.3 cm in diameter (Mar. 2, 2011). CT, computed tomography.

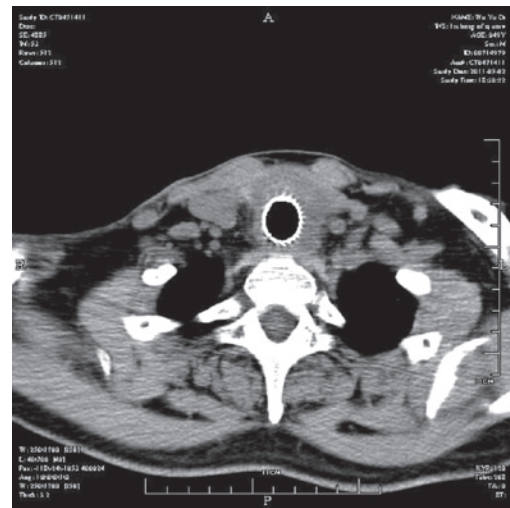


Figure 3. CT scan after two cycles of concurrent chemoradiotherapy showing that the stent was successfully implanted and open to maintain patency of the tracheal lumen (May 2, 2011). CT, computed tomography.

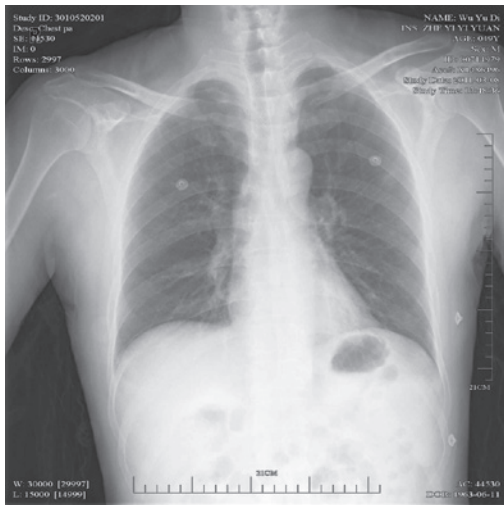


Figure 2. Chest radiograph scan showing the position of the tracheal stent (Mar. 10, 2011).

Management procedure. As the intubation was unable to pass through the narrowest part of the trachea, conventional general anesthesia by tracheal intubation could not be carried out and it was also unsafe, as intubation may have resulted in suffocation and mortality. As the tumor had invaded the trachea and extended to the substernal area, tracheotomy alone may not have been sufficient to relieve the breathing difficulties. Suffocation may also have occurred when undergoing flexible bronchoscopy. Therefore, extracorporeal oxygenation support was thought to be necessary for the patient.

The patient was sedated with intravenous diazepam. Under local anesthesia with lidocaine, a femoro-femoral cardiopulmonary bypass was started; venous drainage was obtained by right femoral vein cut-down and arterial inflow was obtained by right femoral artery cut-down. Through the cardiopulmonary bypass system, the level of arterial oxygen saturation (SaO_2) was maintained at $>90\%$ throughout the procedure. The patient was intravenously anesthetized and

flexible tracheoscopy was performed, which revealed a severe narrowing of the trachea at 5 cm from the vocal cords with invasion by tumor tissue, and the narrowest stenosis was 0.3 cm in diameter. Attempts to traverse the stenosis with a bronchoscope were unsuccessful. Incisional biopsy was performed guided by a bronchoscope and tumor tissue was acquired. Fast-frozen pathology revealed poorly differentiated thyroid carcinoma. Therefore, it was decided to insert a tracheal stent to treat the compromised airway instead of performing a surgical tumor resection. A guide-wire was inserted through the fiber optic bronchoscope into the trachea stenosis. Then the bronchoscope was moved away, and an 18x60-mm stent was inserted into the trachea under fluoroscopic control. Finally, the distal end of the stent was located across the stricture to normal trachea tissue. The patient experienced neither dyspnea nor stridor, the respiratory function was significantly improved and there were no complications following stent insertion (e.g., migration, retention of secretions). Furthermore, a chest radiograph scan revealed that the stent was successfully implanted in the trachea (Fig. 2).

Subsequently, the patient was scheduled for three cycles of concurrent chemoradiotherapy and three cycles of chemotherapy alone.

Results. Immunohistochemical analyses revealed that the tumor was a poorly differentiated carcinoma with positive expression of CK14 and P63 and negative expression of TTF-1 (thyroid transcription factor-1) and SP-A (surfactant protein-A). Subsequently, the patient was scheduled for concurrent chemoradiotherapy. After two cycles of concurrent chemoradiotherapy, a cervical CT scan revealed that the size of the tumor was significantly reduced, the stent was open to maintain patency of the lumen and there was no granulation tissue or other abnormal lesions in the tracheal lumen (Fig. 3). Six months after surgery, a CT scan showed that there were no tumor recurrences in the trachea (Fig. 4).

To date, the patient has survived for ten months and finished chemoradiotherapy. A CT scan showed that the thyroid tumor appeared to be more localized and reduced, compared with

tumor had invaded a 5-cm stretch of the trachea and extended to the substernal area, tracheal resection and reconstruction was not only difficult but also dangerous. Tracheal stent implantation is an effective palliative treatment for patients with malignant tracheal obstruction, especially for inoperable patients (8-10). It significantly relieves acute dyspnea caused by local tumor compression or invasion and improves the quality of life of patients. The stent may also function as a bridge until further curative treatment may be administered. As expected, this patient's symptoms, including dyspnea and stridor, were significantly relieved through the placing of a self-expanding metallic stent. At present, the application of the non-membrane coated metallic stent is somewhat controversial in malignant airway obstruction. Certain experts consider that, unlike a covered stent, non-membrane coated metallic stents are unable to hinder the overgrowth of granulation tissue, leading to difficulties with intubation or ventilation (11). However, others have reported (8) that tumors do not grow into the non-membrane coated metallic stent as easily as expected, as, unlike the uncoated stent, the covered stent does not compress the tumor. On the contrary, the non-membrane coated stent results in the avascular necrosis of the tumor.

As the stent implantation keeps the respiratory tract open, this provides time to undergo further management of the tumor (10,12). Adjuvant therapy and/or chemotherapy appear to be effective in patients with poorly differentiated thyroid carcinoma. In particular, endoluminal brachytherapy may reduce the risk of granulation tissue formation above and below the mesh stents and neoplastic infiltration through the mesh into the lumen (13). In the present study, after two cycles of concurrent chemoradiotherapy, the size of the tumor was significantly reduced, the stent was open to maintain the patency of the lumen and there was no granulation tissue or other abnormal lesions in the tracheal lumen.

In conclusion, for patients with serious tracheal obstruction secondary to a malignant tumor, femoro-femoral cardiopulmonary bypass provides adequate oxygen support to facilitate further management, such as tumor resection or chemoradiotherapy, so as to reduce or cure the tumor. Tracheal stent implanting is an effective emergent measure to relieve tracheal obstruction.

Acknowledgements

We thank Xuefen Wang, Department of Pulmonary Medicine, and Liping Shi, Department of Extracorporeal Circulation, The First Affiliated Hospital, Zhejiang University College of Medicine for providing technological assistance.

References

1. Patel KN and Shaha AR: Poorly differentiated and anaplastic thyroid cancer. *Cancer Control* 13: 119-128, 2006.
2. Sanders EM Jr, LiVolsi VA, Brierley J, *et al*: An evidence-based review of poorly differentiated thyroid cancer. *World J Surg* 31: 934-945, 2007.
3. Volante M, Collini P, Nikiforov YE, *et al*: Poorly differentiated thyroid carcinoma: the Turin proposal for the use of uniform diagnostic criteria and an algorithmic diagnostic approach. *Am J Surg Pathol* 31: 1256-1264, 2007.
4. Sendasgupta C, Sengupta G, Ghosh K, Munshi A and Goswami A: Femoro-femoral cardiopulmonary bypass for the resection of an anterior mediastinal mass. *Indian J Anaesth* 54: 565-568, 2010.
5. Tyagi I, Goyal A, Syal R, Agarwal SK and Tewari P: Emergency cardiopulmonary bypass for impassable airway. *J Laryngol Otol* 120: 687-690, 2006.
6. Pinsonneault C, Fortier J and Donati F: Tracheal resection and reconstruction. *Can J Anaesth* 46: 439-455, 1999.
7. Price DL, Wong RJ and Randolph GW: Invasive thyroid cancer: management of the trachea and esophagus. *Otolaryngol Clin North Am* 41: 1155-1168, ix-x, 2008.
8. Ma G, Wang DF, Su QG, *et al*: Tracheal stent implantation for the treatment of tumor-induced acute airway stenosis. *Ai Zheng* 27: 851-855, 2008 (In Chinese).
9. Mroz RM, Kordecki K, Kozlowski MD, *et al*: Severe respiratory distress caused by central airway obstruction treated with self-expandable metallic stents. *J Physiol Pharmacol* 59 (Suppl 6): 491-497, 2008.
10. Kim JH, Shin JH, Song HY, *et al*: Palliative treatment of inoperable malignant tracheobronchial obstruction: temporary stenting combined with radiation therapy and/or chemotherapy. *AJR Am J Roentgenol* 193: W38-42, 2009.
11. Davis N, Madden BP, Sheth A and Crerar-Gilbert AJ: Airway management of patients with tracheobronchial stents. *Br J Anaesth* 96: 132-135, 2006.
12. Lemaire A, Burfeind WR, Toloza E, *et al*: Outcomes of tracheobronchial stents in patients with malignant airway disease. *Ann Thorac Surg* 80: 434-437; discussion 437-438, 2005.
13. Yerushalmi R, Fenig E, Shitrit D, *et al*: Endobronchial stent for malignant airway obstructions. *Isr Med Assoc J* 8: 615-617, 2006.