

Case Report / Olgu Sunumu

## Successful tracheal necrosis management using a pedicle pectoralis flap: A case report

*Pectoralis pedikül flep kullanılarak trakeal nekrozun başarılı tedavisi: Olgu sunumu*

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### ABSTRACT

Thyroidectomy is considered an overall low-risk procedure. However, severe life-threatening complications, including tracheal necrosis may occur postoperatively. A 45-year-old male patient was referred to our clinic for papillary thyroid carcinoma surgery. The patient had mediastinitis signs and symptoms seven days after total thyroidectomy. Subsequent imaging demonstrated air leak and with mediastinitis as the primary diagnosis, and the patient underwent reoperation. During the operation, four necrotic tracheal rings were found to be the source of air leak. Due to tissue inflammation and infection, neither primary repair with tracheal resection and anastomosis, nor strap muscle plugging procedure were feasible. Therefore, a pedicle flap derived from the right pectoralis major muscle was transferred to the necrotic trachea. The patient's clinical condition improved after the operation and subsequent bronchoscopies confirmed healing of trachea. During six-month follow-up, no complications were observed. In conclusion, the technique discussed in the current report shows promising outcomes for reconstructing large tracheal defects in inflammatory conditions where primary repair techniques are not suitable.

**Keywords:** Pectoralis muscle, thyroidectomy, trachea.

Thyroidectomy is considered an overall low-risk procedure. However, the incidence of life-threatening postoperative complications, including tracheal necrosis, is not unlikely.<sup>[1]</sup> A number of predisposing factors have been proposed such as high pressure of the endotracheal tube cuff, prolonged intubation period, altered blood perfusion to the

### ÖZ

Tiroidektomi genel olarak düşük riskli bir işlem olarak bilinmektedir. Ancak ameliyat sonrasında trakeal nekroz dahil olmak üzere yaşamı tehdit eden ciddi komplikasyonlar görülebilir. Kırk beş yaşında erkek hasta papiller tiroid karsinom cerrahisi için kliniğimize başvurdu. Hastada total tiroidektomiden yedi gün sonra mediastinit bulgu ve semptomları izlendi. Takiben yapılan görüntüleme çalışmasında primer mediastinit tanısı ile birlikte hava kaçağı gözlemlendi ve hasta yeniden ameliyata alındı. Ameliyat sırasında hava kaçağının nedeninin dört nekrotik trakeal halka olduğu tespit edildi. Dokudaki enflamasyon ve enfeksiyon nedeniyle ne trakeal rezeksiyon ve anastomoz ile primer onarım, ne de kası bantlama yoluyla kapatma işlemi uygundu. Bu nedenle, sağ pektoralis majör kasından elde edilen bir pedikül flep, nekrotik trakeaya nakledildi. Ameliyat sonrasında hastanın klinik durumu düzeldi ve takiben yapılan bronkoskopilerde trakeal iyileşme doğrulandı. Altı aylık takipte, herhangi bir komplikasyon gözlenmedi. Sonuç olarak, bu makalede tartışılan teknik, primer tekniklerin uygun olmadığı enflamasyonlu durumlarda büyük trakeal defektlerin rekonstrüksiyonunda ümit verici sonuçlar göstermektedir.

**Anahtar sözcükler:** Pektoralis kası, tiroidektomi, trakea.

injury site, and infections.<sup>[2]</sup> For the treatment of these complications, both conservative and surgical procedures are used.<sup>[2,3]</sup>

In the current report, we present a novel management technique for tracheal necrosis, using the pedicle pectoralis flap which was performed successfully in a patient with a papillary thyroid carcinoma (PTC).

Received: April 12, 2019 Accepted: October 13, 2019 Published online: July 28, 2020

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### Cite this article as:

Eftekar N, Borjian A, Rafieian S, Borjian MA, Sahebi MA. Successful tracheal necrosis management using a pedicle pectoralis flap: A case report. Turk Gogus Kalp Dama 2020;28(3):547-551

## CASE REPORT

A 45-year-old male patient was referred to our surgery clinic with a chief complaint of an asymmetrical neck mass for the past two years. His past medical history was non-specific for any comorbidities and his most recent documented thyroid function test results were within normal ranges. His family history was also unremarkable. Ultrasonography showed diffuse thyroid enlargement with bilateral lymphadenopathy at the levels of II, V, VI, and VII. Fine needle aspiration biopsy result was reported as a PTC. Surgery was decided. A written informed consent was obtained from the patient. He, then, underwent total thyroidectomy, bilateral neck and mediastinal lymph node dissection through the collar incision and partial sternotomy. The pathology report also confirmed the diagnosis of a PTC with the involvement of upper mediastinal and central lymph nodes (Levels VI and VII) and bilateral involvement of lateral lymph nodes (Levels II, IV, and V on both sides) (T2N1bM0 - Stage II).

Six days after surgery, oral temperature increased to 37.9°C; however, his respiratory condition was stable and his arterial blood gas (ABG) indices were normal. On Day 7, oral temperature reached 38.8°C and he developed signs of neck pneumoderma. Immediately, a thoracic computed tomography scan was performed

which indicated signs of air leak. The patient's clinical condition became worsened and he developed moderate respiratory distress (respiratory rate: 29/min, on room air O<sub>2</sub> saturation: 78%). Another ABG sample was taken from the patient which showed a partial pressure of oxygen in arterial blood (PaO<sub>2</sub>) of 44 mmHg and partial pressure of carbon dioxide (PCO<sub>2</sub>) of 29 mmHg (on room air). The patient was initiated supplementary O<sub>2</sub> with a reservoir mask (flow rate: 8 to 10 L/min). Then, his O<sub>2</sub> saturation increased to 92% and, with close cardiopulmonary monitoring, he was transferred to the operation room emergently. Due to improvement of O<sub>2</sub> saturation and to avoid further tracheal damage, the patient was not intubated in the ward. In the operating room, another ABG sample was taken from the patient which showed an O<sub>2</sub> saturation of 92%, PaO<sub>2</sub> of 62 mmHg, and PCO<sub>2</sub> of 31 mmHg. The patient was, then, intubated and underwent reoperation under mechanical ventilation.

During the operation, the source of the air leak was found to be the necrosis of lateral aspects of four tracheal rings. Due to the tissue inflammation and infection, neither primary repair with tracheal resection and anastomosis, nor strap muscle plugging were feasible (Figure 1). Therefore, a pedicle flap derived from the right pectoralis major muscle (with maximal care to preserve the vascular pedicle) was transferred



**Figure 1.** Necrotic lateral aspects of tracheal rings and mediastinitis in the patient with respiratory distress, emphysema, and fever.



**Figure 2.** Transferring pectoralis pedicle flap to the site of tracheal necrosis to cover defect (Part 1).



**Figure 3.** Transferring pectoralis pedicle flap to the site of tracheal necrosis to cover defect (Part 2).



**Figure 4.** Transferring pectoralis pedicle flap to the site of tracheal necrosis to cover defect (Part 3).

to the necrotic trachea and anterior mediastinum (Figures 2-4). A No. 7 tracheostomy tube (Portex®, cuffed, N. 7, internal diameter: 7 mm, outer diameter: 9 mm, length: 62 mm) (Smiths Medical ASD Inc.,

Minneapolis, MN, USA) was inserted through an intact ring (Figure 5). The stoma was, then, sealed using the right pectoralis major muscle. A percutaneous endoscopic gastrostomy tube was also inserted.

Two days later, bronchoscopy showed tissue repair and alleviating inflammation. Three days after the reoperation, there was a significant reduction in pneumoderma and tissue inflammation with improved



**Figure 5.** Inserting tracheal tube through intact rings after flap transfer.



**Figure 6.** Bronchoscopy on Day 20 after tracheal repair showing signs of tissue healing and no further necrosis.

clinical condition. Another bronchoscopy on Day 20 demonstrated granulation tissue formation with no further necrosis, air leak, or inflammation. Therefore, tracheostomy tube was removed (Figure 6). The patient received radioactive iodine treatment with I131 (150 mCi) as the adjuvant treatment. The patient was discharged one day after tracheostomy removal (Day 21). During a six-month follow-up period, he demonstrated no signs and symptoms indicating complications such as a stricture or fistula.

## DISCUSSION

To date, a number of studies have focused on using muscular flaps in tracheal repair, among which is a report by Meyer et al.<sup>[4]</sup> who discussed the outcomes of 13 large intrathoracic airway defects closure using extra-thoracic muscle flaps (latissimus dorsi and serratus anterior). The authors reported that follow-up bronchoscopies showed epithelialization of the repair site with no signs of stenosis, dehiscence, or fistulas.<sup>[4]</sup> In a case report, Lin et al.<sup>[5]</sup> also presented the reconstruction of a membranous tracheal defect using an intercostal muscle flap. In their case, follow-up bronchoscopy showed favorable results of the aforementioned technique with minor complications. Similarly, Naamee et al.<sup>[3]</sup> reported promising outcomes after using pedicle intercostal muscle flaps for tracheal reconstruction on a large necrotic site, where a pulmonary patch was not feasible. In addition, Escott and Pooching<sup>[6]</sup> reported a successful technique using the myovascular flap and tissue-bonding agent in a case of posterior tracheal perforation after thyroidectomy. In another report, Golger et al.<sup>[2]</sup> presented a case of tracheal necrosis after thyroidectomy, where three necrotic tracheal rings were excised and anastomosis was not possible due to large defects. Instead, a T-tube was inserted and tissue repair was performed around it.

A report of total tracheal resection in a patient with adenoid cystic carcinoma, and subsequent tracheal reconstruction using the radial forearm free flap was first presented by Beldholm et al.<sup>[7]</sup> The authors discussed the favorable function of the reconstructed trachea in their patient, emphasizing the potential of this reconstruction technique, when primary anastomosis was not possible. In another report by Thomet et al.,<sup>[8]</sup> two cases of successful tracheal reconstruction using the free radial forearm flaps harvested from the rib cartilage (a modified technique) were discussed. The authors reported satisfactory results in both cases without any complications including stenosis, fistula formation, prolonged stenting, or necrosis at 26-month and 44-month follow-up visits. He et al.<sup>[9]</sup> also reported a similar technique to our study, in which they repaired

tracheal defect after resection of an inflammatory myofibroblastic tumor in the thoracic trachea. The authors concluded that using a myocutaneous flap was a safe reconstructive technique for large tracheal defects. In our patient, due to delayed diagnosis, severe inflammation and infection in the necrotic site and fragile tissues, tracheal resection and anastomosis or strap muscle plugging were not feasible. Therefore, a pedicle pectoralis major flap was used to cover the necrotic rings. The main difference between our study and the case reported by He et al.<sup>[9]</sup> is that the aforementioned report is a reconstruction of thoracic trachea after tumor resection in a sterile environment with minimal inflammation and necrosis. However, in our case, reconstruction was performed in the cervical trachea in an inflammatory environment with fragile tissues.

In conclusion, the technique discussed in the current report shows promising outcomes for reconstructing large tracheal defects in inflammatory conditions where primary repair techniques are not suitable with favorable tissue repair and infection, inflammation, and air leak control. To the best of our knowledge, this is the first case in which a pectoralis flap was used in a such setting. Since tracheal necrosis may be accompanied by other conditions which potentially makes primary repair unfavorable, we believe that this technique may be useful in similar scenarios. However, further studies are needed to examine the efficacy and long-term outcomes of this technique.

### Acknowledgement

We would like to acknowledge the technical support and collaboration of Cancer Institute of Tehran Imam Khomeini Hospital Complex, during the course of this study.

### Declaration of conflicting interests

The authors declared no conflicts of interest with respect to the authorship and/or publication of this article.

### Funding

The authors received no financial support for the research and/or authorship of this article.

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