

Tracheal reconstruction with free composite cartilage graft: a case report*

Serbest kompozit kartilaj greft ile trakeal rekonstrüksiyon: Olgü sunumu

Harun CANSIZ, Murat YENER, Levent DEREKÖYLÜ

Tracheal resection followed by an end-to-end anastomosis has been the method of choice for the treatment of tracheal neoplasms. We hereby report a 40-year-old female patient in whom we performed reconstruction with composite nasal septal cartilage graft following one-staged tracheal resection. Histopathologic diagnosis was well-differentiated adenoid cystic carcinoma. Fiberoptic and biopsy examinations made within the first postoperative month showed no residual or recurrent tumor at the resection site. The patient received radiotherapy postoperatively. She has been free of disease for 18 months. To our knowledge, the use of composite nasal septal cartilage graft in the reconstruction of tracheal tumors has not been previously reported.

Key Words: Carcinoma, adenoid cystic/surgery; cartilage/transplantation; nasal mucosa/transplantation; nasal septum/transplantation; trachea/surgery; tracheal neoplasms/surgery; transplantation, autologous.

Trakeal tümörlerde kabul edilen tedavi yöntemi rezeksiyon ve uc-uca anastomozdur. Kırk yaşındaki bir kadın hastada görülen trakeal tümör nedeniyle, bilinen tedavi yönteminden farklı olarak, lateral rezeksiyondan sonra aynı seansta kompozit nazal septal kırdak ile rekonstrüksiyon uyguladık. Çıkarılan materyalin histopatolojik tanısı iyi diferansiye adenoid kistik karsinom idi. Ameliyattan sonra ilk ay içinde yapılan fiberoptik ve biyopsi incelemelerinde rezeksiyon bölgesinde tümör kalıntısı ya da tekrarlama görülmedi. Ameliyattan sonra radyoterapi uygulanan hasta 18 aydır hastalıksız izlenmektedir. Literatür araştırmamızda, trakeal tümörlerin tedavisinde kompozit nazal septal kartilaj grefti ile rekonstrüksiyon kullanımına rastlamadık.

Anahtar Sözcükler: Karsinom, adenoid kistik/cerrahi; kartilaj/transplantasyon; nazal mukoza/transplantasyon; nazal septum/transplantasyon; trakea/cerrahi; trakeal neoplazmlar/cerrahi; transplantasyon/otolog.

Laryngotracheal reconstruction is a challenging problem that often requires multidisciplinary approach. A considerable amount of experience and

knowledge has been accumulated concerning surgical techniques and utilization of reconstruction materials both for tumors and stenosis of the laryngotracheal

◆ Department of Otolaryngology and Head & Neck Surgery, İstanbul University Cerrahpaşa Medicine Faculty, İstanbul, Turkey.

◆ Received: April 10, 2002. Accepted for publication: June 20, 2002.

◆ Correspondence: Dr. Harun Cansız, Cerrahpaşa Tıp Fakültesi KBB Anabilim Dalı, Kocamustafapaşa, 34303 İstanbul, Turkey.
Tel: +90 212 - 586 15 19 Fax: +90 212 - 588 75 15
e-mail: hcansiz@turk.net

* Presented at a monthly meeting of Ear Nose and Throat Diseases Society of İstanbul Medicine Faculty, İstanbul University (October 26, 2001; İstanbul, Turkey).

◆ İstanbul Üniversitesi Cerrahpaşa Tıp Fakültesi Kulak Burun Boğaz Hastalıkları Anabilim Dalı, İstanbul.

◆ Dergiye geliş tarihi: 10 Nisan 2002. Yayın için kabul tarihi: 20 Haziran 2002.

◆ İletişim adresi: Dr. Harun Cansız, Cerrahpaşa Tıp Fakültesi KBB Anabilim Dalı, Kocamustafapaşa, 34303 İstanbul.
Tel: 0212 - 586 15 19 Faks: 0212 - 588 75 15
e-posta: hcansiz@turk.net

* İstanbul Tıp Fakültesi Erişkin ve Çocuk KBB Hastalıkları, Baş-Boyun Cerrahisi ve İletişim Bozuklukları Derneği'nin aylık bilimsel toplantısında sunulmuştur (26 Ekim 2001, İstanbul).

region. Although the spectrum of laryngeal surgery ranges widely from microsurgical removal of the layers of the vocal cords to subtotal laryngectomy followed by the use of a variety of reconstruction materials, tracheal tumors have almost invariably been treated by segmental tracheal resection and end-to-end anastomosis.^[1-3]

Free composite cartilage graft, especially nasal septal cartilage with mucosa is a valuable material in the reconstruction after laryngotracheal stenosis and partial laryngectomy operations.^[4-7] The experience accumulated concerning the use of composite nasal septal cartilage has stimulated the authors to utilize this valuable graft material in the reconstruction of tracheal tumors where adverse conditions such as extensive scar tissue, radiation fibrosis, ankylosing spondylitis, or advanced age sometimes pose difficulties in maintaining longitudinal tracheal flexibility and in performing an end-to-end anastomosis.

This case report illustrates the use of nasal septal cartilage with mucosa in the treatment of a patient with a tracheal tumor. To our knowledge, this is the first report on the use of composite nasal septal cartilage graft in the reconstruction of tracheal tumors.

CASE REPORT

A forty-year-old woman presented with dyspnea which bothered her for six months. She was a heavy smoker. Her chest x-ray appeared normal; however, computed tomography showed a mass within the tracheal lumen (Fig. 1). On bronchoscopic examination, the mass appeared in the upper trachea with

smooth borders, obstructing most of the tracheal lumen. A biopsy obtained from the mass enabled a histopathologic diagnosis of adenoid cystic carcinoma and surgery was planned. Following a cervical collar incision, the tumor appeared both inside and outside the trachea at the level from the fourth to the seventh tracheal rings, measuring 1.5x2 centimeters (Fig. 2). It had smooth borders and exhibited an "hourglass" appearance. The tumor was confined to the anterior and right lateral walls of the trachea. A complete dissection was performed leaving safe margins while carefully protecting the innominate artery and the vein, and the recurrent laryngeal nerves. The tumor-free margins of resection were confirmed by intraoperative frozen section examination. The defect was repaired with the use of nasal septal cartilage with mucosa, 2.5x3 cm in size. The graft was secured using interrupted 5/0 Vicryl sutures (Fig. 3). Postoperatively, the patient stayed in the intensive care unit for two days, during which the graft was monitored by fiberoptic endoscopic examinations. Discharge from the hospital was on the seventh postoperative day with no complications and need for tracheotomy. Histopathologic diagnosis was well-differentiated adenoid cystic carcinoma. Fiberoptic and biopsy examinations and showed no residual or recurrent tumor at the resection site. She received radiotherapy postoperatively. She has been free of disease for 18 months.

Surgical technique

Anesthesia is usually by inhalation preferably of halothane, particularly if there is a high degree of obstruction. A rigid bronchoscope should be made available so that an emergency airway can be estab-

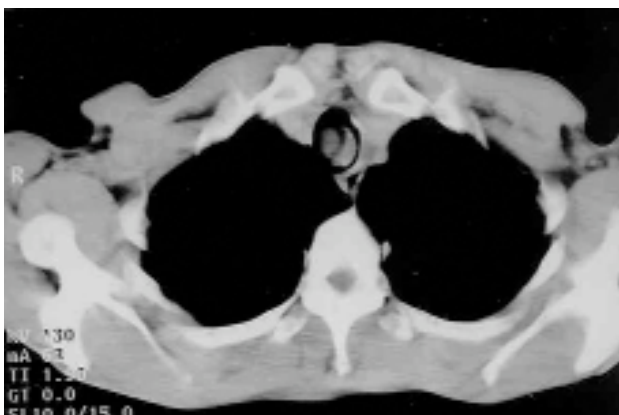


Fig. 1 – Preoperative computed tomographic view of the tumor.

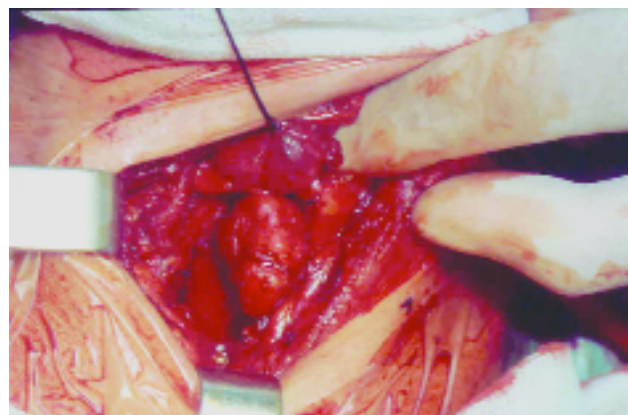


Fig. 2 – Perioperative view of the extratracheal portion of the tumor.

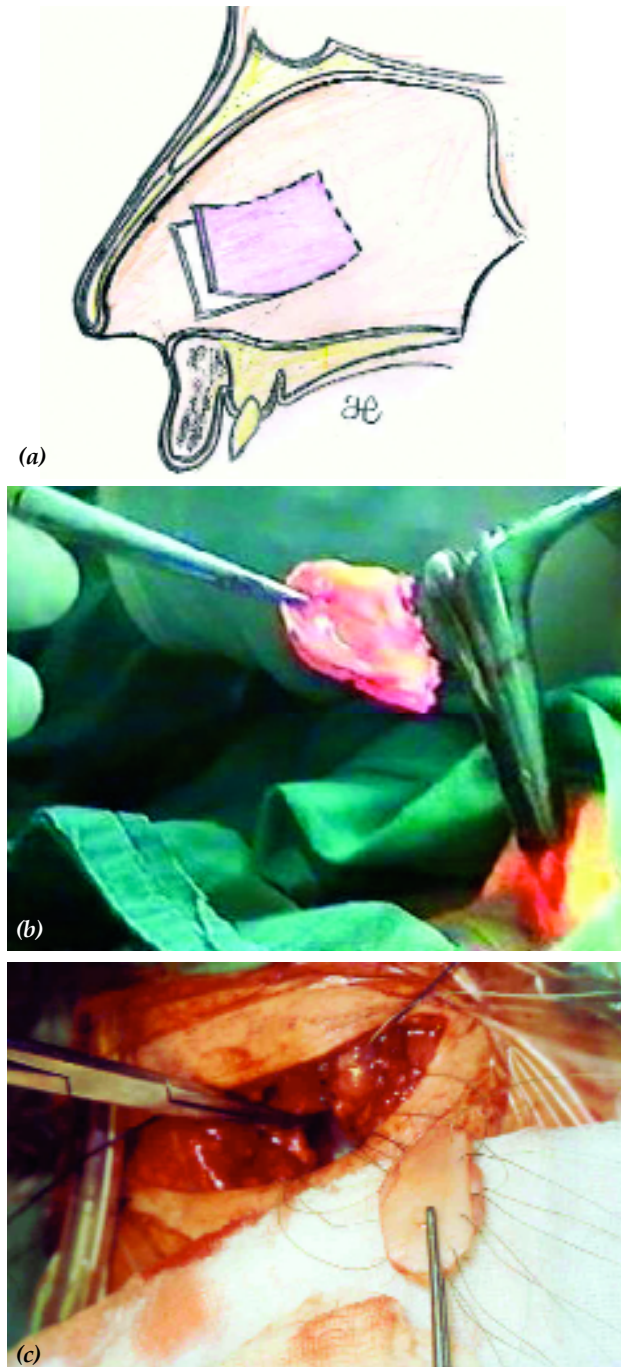


Fig. 3 – (a,b) Preparation of the nasal septal cartilage graft and **(c)** use of the graft in the tracheal defect repair.

lished at any time. Intubation is accomplished with the use of either (i) a normal endotracheal tube located just superior to the stenotic site if adequate ventilation is to be supplied, (ii) a small-diameter endotracheal tube under the guide of a flexible bronchoscope, or (iii) jet ventilation until the resection of the

tumor has been completed. Depending on the localization of the tumor, a transcervical or combined cervico-mediastinal approach may be employed. After an adequate extension of the neck has been obtained, a collar incision is mostly preferred to expose structures from the tongue base to the mediastinum. The flap is elevated in the subplatysmal plane and the anterior border of the sternocleidomastoid muscle is visualized. The strap muscles are elevated in the midline and the thyroid isthmus is divided and ligated. The anterior wall of the trachea is dissected. In order to expose the involved site of the trachea, sternotomy or thoracotomy may be necessary. Special attention must be given during lateral wall dissection to avoid potential damage to the recurrent laryngeal nerves. If the localization of the tumor is difficult, or to avoid excessive tissue resection, endotracheal tube may be removed so that the site of the lesion is precisely determined by transillumination via the light of a rigid bronchoscope or directly by a flexible bronchoscope while the patient is ventilated by jet ventilation. The lateral tracheal resection is accomplished with distal and proximal incisions through the areas of normal lumen. We used frozen section analysis to ensure disease-free surgical margins. After an oncologically safe tracheal resection, nasal septal cartilage with mucosa is prepared in accordance with the shape and size of the defect and the graft is placed and fixed with interrupted absorbable sutures. The nasal septum is a good source of cartilage graft of varying size, which may sometimes be as large as 15 square centimetres. The wound is then closed in layers with absorbable sutures. No tracheostomy is needed, nor is a feeding tube. Oral feeding can be initiated on the second postoperative day. Recovery is rapid; the patient may be discharged within five to seven days postoperatively, including one or two days of intensive care.

DISCUSSION

Tracheal tumors are extremely rare and their treatment is available only in a few institutions. The rarity of these tumors may result in delay in diagnosis and inappropriate treatment. Although physicians have been familiar with these tumors for more than two hundred years, tracheal resection with primary anastomosis was not performed until 1957.^[8] This procedure was modified and popularized by Grillo et al. in 1964.^[8] Anastomosis has hitherto been considered the

sole surgical procedure for tracheal tumors because it is the most physiological method for reconstructing an airway, with its full diameter and mucociliary function restored. In adults, segmental resection followed by primary anastomosis appears to be the method of choice for reconstruction of tracheal defects up to approximately 6 cm in size, and it is possible to reconstruct a segment of less than 3 cm without the need for a releasing technique.^[1-3,9] Apart from this surgical technique, Okahara et al.^[10] reported the use of endoscopic Nd:YAG laser combined with postoperative radiotherapy.

In our literature review, we did not encounter the use of free cartilage with epithelium for tracheal defects after tumor resection. Free composite cartilage grafts, however, have been successfully used in laryngotracheal stenosis and laryngeal tumors for more than 30 years.^[4-7,11-13] Moreover, the use of vascularized cartilage grafts have been described because of possible risks of free grafts for necrosis.^[14,15]

Laurian and Zohar^[11] reported the first clinical use of free cartilage with epithelium in 1981. In 1970 Drettner and Lindholm^[12] used composite nasal septal cartilage grafts to repair window defects in canine trachea and observed histologic changes in the graft epithelium after one year. These authors concluded that the use of nasal septal cartilage with epithelium might be appropriate in human trachea. In 1972, Wilflingseder^[13] reported six cases in which tracheal and subglottic stenoses were repaired with composite nasal septal grafts. Butcher and Dunham^[4] used composite nasal septal cartilage graft in the reconstruction of 12 extended partial laryngectomies in 1984.

Since 1982, we have used composite nasal septal cartilage graft in the reconstruction of defects created after partial laryngectomies, in laryngotracheal stenosis, and in stenosis occurring after partial laryngectomy operations. Our experience with the use of composite septal cartilage grafts in 12 cases was previously presented.^[6] In the light of our experience and clinical and experimental studies, we extended its use to the reconstruction of tracheal defects after tumor resection. We evaluated surgical margins through intraoperative frozen section analysis. Monitorization of epithelization and the graft survival by means of frequent endoscopic examinations and flexible bronchoscopic visualizations did not show any deterioration, nor did any

postoperative complications occur. Previous clinical and experimental data about the use of free cartilage grafts in laryngotracheal reconstruction did not address any problems concerning graft nourishment. Moreover, in the absence of a potential infection source such as tracheostomy the risk for graft necrosis is much less, and the risk associated with the use of free cartilage graft is no more than that associated with end-to-end anastomosis. Among significant postoperative benefits are shortened hospital stay (5 to 7 days), rapid return of the patient to daily activities, and no need for a 10-day period of head flexion.

Based on our accumulated experience and on other clinical and experimental data, the use of nasal septal cartilage with epithelium may be extended to the repair of defects after selected tracheal tumor resection.

REFERENCES

1. Grillo HC. Reconstruction of the trachea. Experience in 100 consecutive cases. *Thorax* 1973;28:667-79.
2. Montgomery WW. Suprahyoid release for tracheal anastomosis. *Arch Otolaryngol* 1974;99:255-60.
3. Gavilan J, Toledano A, Cerdeira A, Herranz J. Tracheal resection and anastomosis. *Oper Tech Otolaryngol Head Neck Surg* 1997;8:122-9.
4. Butcher RB 2nd, Dunham M. Composite nasal septal cartilage graft for reconstruction after extended frontolateral hemilaryngectomy. *Laryngoscope* 1984;94:959-62.
5. Zohar Y, Shvilli I, Laurian N. Laryngeal reconstruction by composite nasoseptal graft after extended partial laryngectomy. Twelve-year follow-up. *Arch Otolaryngol Head Neck Surg* 1988;114:868-71.
6. Şekercioğlu N, Cansız H, Güneş M. Reconstruction with composite nasal septal cartilage and auricular cartilage in extended partial laryngectomy. *J Laryngol Otol* 1996;110:739-41.
7. Toohill RJ. Panel discussion: the management of advanced laryngotracheal stenosis. Composite nasal septal graft in the management of advanced laryngotracheal stenosis. *Laryngoscope* 1981;91:233-7.
8. Azar T, Abdul-Karim FW, Tucker HM. Adenoid cystic carcinoma of the trachea. *Laryngoscope* 1998;108:1297-300.
9. Stamatis G. Extensive tracheal resections and reconstruction. *Oper Tech Otolaryngol Head Neck Surg* 1997;8:142-8.
10. Okahara M, Segawa Y, Takigawa N, Maeda Y, Takata I, Kataoka M, et al. Primary adenoid cystic carcinoma of the trachea effectively treated with the endoscopic Nd-YAG laser followed by radiation. *Intern Med* 1996;35:146-9.
11. Laurian N, Zohar Y. Laryngeal reconstruction by composite nasal mucoseptal graft after partial laryngectomy.

- Three years follow-up. *Laryngoscope* 1981;91:609-16.
12. Drettner B, Lindholm CE. Experimental tracheal reconstruction with composite graft from nasal septum. *Acta Otolaryngol* 1970;70:401-7.
 13. Wilflingseder P. Rekonstruktion der Trachea durch ein Segmenttransplantat vom Nasenseptum. *Wien Klin Wochenschr* 1972;84:226-9.
 14. Cavadas PC, Bonanad E, Baena-Montilla P, Vera-Sempere FJ. Prefabrication of a free flap for tracheal reconstruction: an experimental study. Preliminary report. *Plast Reconstr Surg* 1996;98:1052-62.
 15. Ergin NT, Koç C, Demirhan B, Dal T. Tracheal reconstruction with a vascularized cartilage flap in rabbits. *Ann Otol Rhinol Laryngol* 1998;107:571-4.