

Surgical Treatment of Benign Tracheal Stenosis: Analysis of Twenty-One Patients

Benign Trakeal Stenozda Cerrahi Tedavi: Yirmibir Olgunun Analizi

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ABSTRACT

Objective: The objective of this study was to retrospectively evaluate 21 cases of tracheal stenosis that underwent surgery due to benign tracheal stenosis.

Methods: A total of 21 patients who underwent surgery due to benign tracheal stenosis in our clinic between 2010 and 2017 were retrospectively evaluated. The patients were analyzed in terms of age, gender, surgical indication, surgical approach, comorbidities, length of the trachea resected, postoperative complications, the duration of hospitalization and development of restenosis.

Results: Out of 21 patients, 12 were male and nine female. Surgical indication was postintubation tracheal stenosis in 15 patients. The mean age was 39.6 (10-83) and the mean length of resection was 3.33 cm. Collar incision was performed in 16, collar and sternotomy incision in 3, and sternotomy incision in 2 patients. Complication rates were high in patients with comorbidity.

Conclusion: Tracheal surgery is mostly applied due to benign disease in addition to the malignant diseases of the tracheal surgery is mostly performed with low rates of morbidity and mortality, and the outcomes are usually satisfactory.

Key Words: Trachea, benign stenosis, surgery,

Received: 03.03.2018

Accepted: 04.29.2018

ÖZET

Amaç: Bu çalışmanın amacı benign trakeal stenoz nedeniyle opere edilen 21 trakeal stenoz vakasını retrospektif olarak değerlendirmektir.

Yöntemler: 2010-2017 yılları arasında kliniğimizde benign trakeal stenoz nedeniyle opere edilen toplam 21 hasta retrospektif olarak değerlendirildi. Hastalar yaş, cinsiyet, cerrahi endikasyon, cerrahi yaklaşım, komorbiditeler, rezeke edilen trakeanın uzunluğu, postoperatif komplikasyonlar, hastanede yatış süresi ve restenoz gelişimi açısından analiz edildi.

Bulgular: Yirmibir hastanın 12'si erkek, 9'u kadındı. Cerrahi endikasyon 15 hastada postintubasyon trakeal stenoz idi. Ortalama yaş 39.6 (10-83) ve ortalama rezeksiyon uzunluğu 3.33 cm olarak bulundu. 16 hastada collar, 3 hastada collar ve sternotomi insizyonu, 2 hastada sternotomi insizyonu yapıldı. Komorbiditeye sahip hastalarda komplikasyon oranları anlamlı olarak yüksek bulundu.

Sonuç: Trakeal cerrahi, çoğunlukla benign hastalıklar nedeniyle uygulanır, malign hastalıklara göre çoğunlukla düşük morbidite ve mortalite oranları ile yapılır ve sonuçlar genellikle tatmin edicidir.

Anahtar Sözcükler: trakea, benign stenoz, cerrahi

Geliş Tarihi: 03.03.2018

Kabul Tarihi: 29.04.2018

INTRODUCTION

Although today in parallel with the technological advancements endoscopic techniques are used in the diseases of trachea, tracheal surgery is still relevant and performed in many patients. Recently, the incidence of benign tracheal diseases has been higher than expected, especially due to the increased number of patients treated in intensive care units (1). The rates of tracheal damage following nasal / orotracheal intubation or tracheostomy vary between 0.6% and 21% (1, 2). Grillo et al. reported tracheal resection and end-to-end anastomosis as the gold standard treatment option for the stenoses resulted from this damage (2). Surgery also plays an important role in the treatment of patients who developed tracheoesophageal fistulas as a complication from tracheostomy or orotracheal intubation (3, 4). In addition, stenosis may occur following surgical repair in patients with tracheal rupture caused by traumas or intubation, and surgery may be needed in later times (5).

MATERIAL and METHODS

Out of 29 patients who underwent tracheal surgery in our clinic since 2010, a total of 21 patients operated due to benign causes were retrospectively studied. Patients were evaluated for age, gender, cause of resection, surgical approach, length of resection, comorbidities, postop complications, duration of hospitalization, and development of restenosis.

When patients undergone resection due to benign causes were analyzed; postintubation tracheal stenosis (n: 15), tracheoesophageal fistulas (n: 2), tracheal rupture (n: 1), tracheoinnominate artery fistula (n: 1), restenosis after resection of tracheal carcinoma (n:1), and tracheal necrosis developed posttracheostomy (n:1) were found as the causes of resection.

All patients were radiologically evaluated before operation with two-dimensional chest radiography, neck CT, thorax CT and virtual bronchoscopy (Figure 1). Rigid bronchoscopy was performed in all patients before resection.

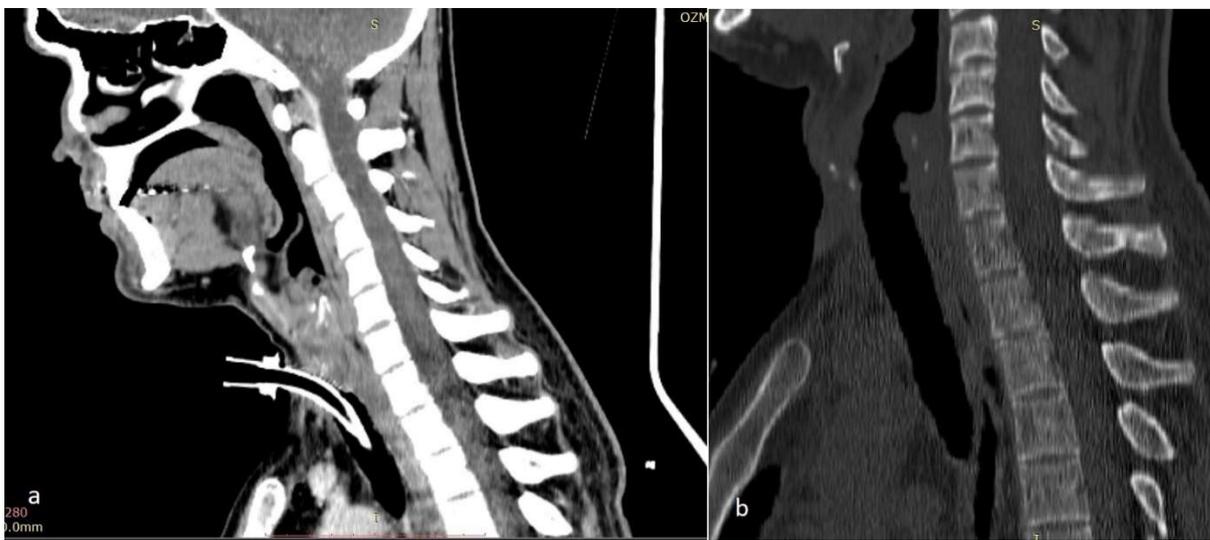


Figure 1. Collar incision, sternotomy, and combination of collar and sternotomy were preferred during operation. Majority of patients underwent tracheal resection and end-to-end anastomosis (Figure 2). Carinoplasty was chosen in one and primary repair in one patient.



Figure 2.

Preoperative preparations were carried out with anesthesia team. Orotracheal intubation was performed in majority of patients. One patient was ventilated with LMA. The trachea was sutured continuously in posterior and interrupted in anterior aspect. 3/0 polyglactin 910, 3/0 and 4/0 polydioxanone were used as suture material. To reduce the tension on the anastomosis line, a guardian suture was made under the chin.

Chi square analysis and Fisher exact test, Kruskal Wallis test and Mann Whitney U test were used in evaluation of the patients. Statistical analyses were made using SPSS 20.0 software at 95% confidence interval.

RESULTS

The most common indication for tracheal stenosis was postintubation tracheal stenosis (Table 1). The most common symptom was shortness of breath. The mean age was 39.6 (10-83) years. Of all patients, 16 were approached with collar incision, 3 with collar + sternotomy, and 2 with sternotomy alone. It was seen in the bronchoscopy performed before resection that 90.4% had stenosis in upper one third of the trachea (n: 19), while hyoid membrane was involved in the subglottic stenosis in one patient.

Table 1 : Patient characteristics

Age	Mean 37,7 (Range10-83)
Gender	
F	%42,8 (n:9)
M	%57,1 (n:12)
Resection reasons	
Postintubation tracheal stenosis	%71,4 (n:15)
Other (Trauma, TEF, tracheostomy and necrosis)	%28,5 (n:6)
Stenosis level	
1/3 upper trachea	%90,4 (n:19)
1/3 medium trachea	%4,7 (n:1)
1/3 lower trachea	%4,7 (n:1)
Incision	
Servical	%76,1 (n:16)
Servical + sternotomy	%14,2 (n:3)
Sternotomy	%9,5 (n:2)
Resection Length	3,34 cm (SD 0,90)
F	3.15 cm (SD 0.76)
M	3.51 cm (SD 1,01)
Comorbidity	%47,6 (n:10)
Postoperative Complication Presence	%38 (n:8)
Restenosis Development	%9,5 (n:2)
Postoperative Hospitalization Period	16,05 days (SD 12,87)
F	17,83 days (SD 13,71)
M	9,53 days (SD 12,37)

Histories of patients revealed comorbidities in 10 patients (e.g. hypertension, coronary artery disease, cerebrovascular disease, hypothyroidism, diabetes mellitus, neuromuscular disease and myasthenia gravis). One patient had esophageal corrosion. Postoperative complications were developed in nine of 11 patients with comorbidities. Three of patients who undergone resection were died within postoperative one month. One patient whose past history included prolonged intensive care, and diagnoses of diabetes mellitus, Parkinson disease and hypoxic respiratory failure died due to sepsis following intensive care support for a long time.

The patient with a stenosis level in the 1/3 lower trachea, was a female patient who undergone tracheal resection 20 years ago and developed benign stenosis on the anastomosis line. This patient underwent carinoplasty with sternotomy. She developed restenosis in the postoperative month six. She was referred for stenting after intermittent tracheal dilatation. The mean length of resection was 3.15 cm in female and 3.51 cm in male patients. The mean length was 3.34 cm (SD 0.90) in total. Minor separation in the anastomosis line as seen in only two of the patients who underwent resection and end-to-end stenosis. One of the cases developed wound site infection. After the infection was controlled with regular dressing and antibiotherapy and improvement was observed. In the other patient, tracheal necrosis occurred and the patient was followed-up with tracheostomy following re-operation.

DISCUSSION

The most common cause of benign tracheal stenosis is postintubation tracheal stenosis, although numerous reasons have been reported in the literature including systemic disorders such as toxic inhalations, thoracic trauma, tracheobronchial tuberculosis and more rarely relapsing polychondritis, Wegener granulomatosis or amyloidosis (6-7-8). Postintubation tracheal stenosis is defined as healing of the ischemic transmural damage in the trachea from endotracheal tube or tracheostomy cannulas, with cicatrix tissue. The time of stenosis development is approximately 3-6 weeks but it may be longer or shorter. Despite duration of intubation may be associated with development of stenosis, stenosis may also occur in intubations that can be expressed in hours. The assumed factor for stenosis is decrease or lost of regional blood flow due to cuff pressure caused of endotracheal tube or tracheostomy tube.

Predisposing factors also play a role in the development of tracheal stenosis. In their study, Nikolaos et al. defined hypertension, diabetes mellitus, obesity and female gender as typical profile. Several publications reported the prevalence of tracheal stenosis in patients with comorbidities such as diabetes mellitus (DM) and cardiovascular diseases between 10% and 23% for DM and between 17.5% and 46% for cardiovascular diseases (9-10-11).

Comorbidities may be predisposing factors for the development of tracheal stenosis as well as important factors postoperation both for postoperative complications and mortality. In our study, a when patients with comorbidity were examined, a significant correlation was found in terms of postoperative correlations. Examining with Chi-square analysis and Fisher exact test, no complications were seen in 77.8% of patients without comorbidity, while complications were observed in 22.2% of these patients. No complication was seen in 33.3% of patients with comorbidity, while there were complications in 66.6% of these patients (Chi square= 0.022; p=0.030<0.05). When the correlation with comorbidities and mortality was examined; while all of the patients without comorbidities were alive, 36.4% of patients with comorbidity were lost and 63.6% of these patients were alive. There was a significant correlation between comorbidity and mortality (Chi square= 5.856; p=0.024<0.05). The mean duration of postoperative hospitalization was 16.95 days.

One of the complications encountered in tracheal surgery is postoperative development of stricture due to granulation tissue. This proportional to the traction in the anastomosis area and the surgical suture used is also important. The most important cause of traction pressure is the length of the resected trachea. Various factors including the length of resected trachea, previously existing tracheal device, tracheal resection and medical comorbidities such as diabetes and obesity have been shown to increase the risk for anastomotic complications (12, 13).

In our study, the most common complication was development of restenosis in long-term, while major separation was not seen. The mean length of the resected trachea was 3.34 cm (sd: 0.90); 9.5% (n: 2) of the patients developed restenosis in long term and the mean length of resection was found as 2.85 cm (sd: 0.49) in patients who anastomotic complications developed; Wright reported granulation tissue in the anastomosis in 7 patients (1%), restenosis in 37 patients (4%), and separation in 37 patients (4%) (14). Although complications are uncommon in tracheal surgery, care should be paid because these complications may cause mortal outcomes. Airway stabilization of the patient, evaluation with bronchoscopy and opening a transient tracheostomy are an important component in management of the complications. However, the importance of preoperative evaluation and perioperative multidisciplinary approach has been stated in the literature (15).

Recently, alternative treatment methods are increasingly being tested in tracheal stenosis. Brichet et al. recognized endobronchial dilatation with ND laser and stent implantation as the first therapeutic approach in postintubation tracheal stenosis (11). However, it should be kept in mind that previous tracheal intervention and devices affect the surgical success level in patients eligible for surgery. In their study conducted in 1995, Grillo reported that laser therapy failed by 23-43%, and conservative method may be successful only in selected correct cases (2). In a study by Cosano et al. dyspnea was reported to disappear in 96% of patients (25).

The overall opinion in the literature is that interventional methods such as laser, electrocoagulation or stent implantation can be accepted as an alternative in patients who are not eligible for surgery and those accepted as inoperable due to impaired general status, instable disease etc. (16-18).

Collar incision which is a cervical incision is preferred in patients with benign tracheal stenosis. In his 589-case series Wright preferred collar incision by 79.6%, mediastinal by 20.0%, and thoracic by 0.5 (14). In our study, we preferred collar incision by 76.1%, collar + sternotomy by 14.2, and sternotomy incision by 9.5%. Collar incision has been described as the best method in approach to the trachea (2).

There are numerous evidence suggesting that tracheal resection and anastomosis are the best methods in terms of long term results in the treatment of postintubation tracheal stenosis (2-19-20-21-22). Some studies have reported high success rates (71-97%) in carefully selected patients (23-24). Grillo et al. reported a success rate of 93.7% in tracheal resection (2). Evaluating long-term results, success rate of our clinic as found as 77.7%. Today tracheal resection is currently recognized as the definitive treatment method for postintubation tracheal stenosis.

Conflict of interest

No conflict of interest was declared by the authors.

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