Case Report

Case series of endoscopic treatment of post-intubation tracheal stenosis

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ABSTRACT

Introduction: Benign tracheal stenosis is a common problem encountered after tracheal intubation or tracheostomy. It can be managed by surgical or nonsurgical techniques. This case series describes the outcome of 11 cases of endobronchial treatment for complex tracheal stenoses.

Methods: A retrospective study was carried out in two hospitals in Lebanon. Patients were contacted on a regular basis for 6 months and asked about the presence of dyspnea and its characteristics.

Results: The most common presenting symptom was inspiratory stridor. Five patients (45.45%) were not satisfied after the bronchoscopic intervention. Six patients (54.55%) were satisfied with the outcome. All were initially treated with argon plasma coagulation and dilation. If any persistent symptoms were present, stenting was done. Three patients had a stent placement. Failure of stenting occurred with two patients. None of the satisfied patients had any early symptoms.

Conclusion: Bronchoscopic interventions yielded acceptable results when treating complex stenoses. More data is still needed to guide physicians for better approaches. When confronting complex tracheal stenosis, a multidisciplinary approach between surgical and nonsurgical doctors is preferred to choose the best medical care.

1. Introduction

Benign tracheal stenosis is a common problem encountered after tracheal intubation or tracheostomy. It can be managed by surgical or nonsurgical techniques, such as interventional bronchoscopic dilation, endoluminal treatment with lasers, and stenting [1–7]. Stenoses are classified as simple or complex. A simple stenosis is defined as a short stenosis, involving less than 1 cm of the trachea, without evidence of tracheomalacia or loss of cartilaginous support. A complex stenosis is defined as having one of the following features: extensive scarring involving more than 1 cm of the trachea, varying degrees of cartilage involvement, circumferential contraction scarring, association with malacia [3,4] (see Figs. 1 and 2).

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Some studies argue that tracheal sleeve resection is the definitive treatment, particularly for complex stenosis [4]. However, there is no proven or definitive agreement for the endobronchial treatment of complex tracheal stenoses. Bronchoscopic management has been reported in some studies to have satisfactory success in selected patients [8].

Our case series describes the outcome of 11 cases of endobronchial treatment for complex tracheal stenoses.

Patients were considered to have a successful treatment when no symptoms reemerged 6 months after the last interventional procedure or the last follow-up.

2. Study population and design

A retrospective study was carried out in two hospitals in Lebanon: Geitaoui Lebanese Hospital and Saint Joseph Hospital from January 2016 to December 2020.

Patients with complex stenosis undergoing endoscopic treatment were selected. They were contacted on a regular basis for 6 months and asked about the presence of dyspnea and its characteristics (at rest, at exertion, threshold). They were also asked about their satisfaction after the procedure.

Bronchoscopic techniques: diagnosis was made by flexible bronchoscopy which allowed defining the type, localization and extent of the stenosis. Rigid bronchoscopy was performed after intubating the patient under general anesthesia. For each case, the physician decided whether the patient needs dilation, argon plasma coagulation, stent placement, or a combination of the procedures.

3. Results

A total of 11 patients were enrolled in the period from January 2016 to December 2020. Their ages ranged from 25 to 75 years. All patients were intubated for at least 1 month. The most common presenting symptom was inspiratory stridor, followed by persistent dyspnea after extubation, chest pain and cough. All of our patients had a stenosis involving 80% of the tracheal diameter. Their lengths were 2 cm or more with or without tracheomalacia. The characteristics of the patients are presented in (Table 1).

Five patients (45.45%) were not satisfied after the bronchoscopic intervention; one of them was not satisfied even after surgery. Six patients (54.55%) were satisfied with the outcome. All the patients were initially treated with argon plasma coagulation and dilation then reassessed. If any persistent or severe symptoms were present after the initial intervention, stenting was done. Four of them were supposed to be treated with stenting. However, one patient could not afford the procedure and was referred to surgery, and the remaining three patients had a stent placement. Two of them needed multiple bronchoscopic interventions due to failure of stenting and developed multiple respiratory tract infections afterwards. Both patients were not satisfied with the results.

Two out of the 5 patients that were not satisfied after bronchoscopic procedure had early symptoms within 2 weeks (persistent dyspnea or stridor), and 4 were referred to surgical intervention. None of the satisfied patients had any early symptoms.
4. Discussion

Data in the literature is solid when discussing the treatment of simple tracheal stenosis, however when complex stenosis treatment is argued, surgical approach often is recommended. Bronchoscopic treatment should be considered as an acceptable therapeutic method for selected complex stenosis cases.

One study reported 69% success rate for complex stenosis with endoluminal treatment [7]. This is slightly more than what we reported in our study and could be due to significantly lower number of patients selected in our study. Another study reported acceptable and favorable outcome in treatment of simple and complex tracheal stenosis where they had a 100% success rate for weblike stenosis and a 22% success rate for complex stenosis with endoscopic treatment [3]. This diversity seen in the results may be because of the differences in treatment algorithms and in definition of stenotic regions. One study found that endoscopic dilatation and mitomycin application is not an effective treatment in the management of post-intubation tracheal stenosis [9].

The surgical approach had shown better results than bronchoscopic intervention when treating complex tracheal stenosis with a 75% success rate after failure of the bronchoscopic approach. This success is slightly less than what was seen in different studies concerning surgical treatment reporting 5%–15% failure rates [7,10,11]. This variation would be due to the diversities in the definition of the operation success and the duration of follow up. Furthermore, physicians in discussion with patients chose bronchoscopic ap-
| Patient | Age (years) | Past medical history | Reason for Intubation | Stenosis | Procedure | Result |
|---------|-------------|----------------------|-----------------------|----------|-----------|--------|
| 1       | 65          | HTN, aortic dissection | Aortic dissection complicated by severe sepsis | 2.5 cm from vocal cords 1 cm length 70% luminal obstruction | Argon plasma dilatation Stenting followed After several months, surgical approach | Failure of argon plasma and stenting Success with surgical approach |
| 2       | 43          | None                 | Gunshot injury causing tetraplegia and respiratory failure | 2 cm from the vocal cords 1.5 cm length 90% luminal obstruction | Ablation by argon and mechanical dilatation Insertion of metallic stent | Success However multiple respiratory infection |
| 3       | 25          | None                 | Severe burn and inhalation injury | 1 cm from the vocal cords 1 cm length 80% luminal obstruction | Multiple endoscopic ablations with argon and stenting Followed by surgery | Failure due to stent replacement and restenosis Success after surgery |
| 4       | 37          | None                 | Severe burn and inhalation injury | 2 cm from the vocal cords 2 cm length 90% luminal obstruction | Argon plasma ablation and mechanical dilatation Followed by surgery | Failure of endoscopic procedure and of surgical procedure |
| 5       | 67          | HTN, DL, DM, CAD post-stenting, cholecystectomy | Post-cholecystectomy complicated by severe sepsis | 3 cm from the vocal cords 1.5 cm length 80% luminal obstruction | Argon plasma ablation and mechanical dilatation Could not afford stenting Followed by surgery | Failure of endoscopic approach Success after surgical approach |
| 6       | 26          | None                 | Post MVA | 3 cm from the vocal cords 1 cm length 90% luminal obstruction | Argon plasma ablation with mechanical dilatation | Success |
| 7       | 40          | None                 | Post MVA | 2 cm from the vocal cords 1.5 cm length 80% luminal obstruction | Multiple endoscopic procedure including stenting | Success |
| 8       | 58          | HTN                  | Severe sepsis and septic shock with respiratory failure | 1 cm from the vocal cords 2 cm length 80% luminal obstruction | Multiple endoscopic procedure including stenting | Success |
| 9       | 39          | None                 | Severe burn and inhalation injury | 2 cm from the vocal cords 1.5 cm length 80% luminal obstruction | Argon plasma ablation with mechanical dilatation | Success |
| 10      | 66          | HTN, DM              | Severe sepsis and septic shock with respiratory failure | 5 cm from the vocal cord 2 cm length 80% luminal obstruction | Argon plasma dilatation with mechanical dilatation | Failure |
| 11      | 35          | None                 | Severe burn and inhalation injury | 2.5 cm from vocal cords 2 cm length 70% luminal obstruction | Argon plasma Ablation with mechanical dilatation | Success |
proach as their first act because of the mortality benefit over the surgical treatment knowing the lower success rate of the endoscopic approach.

Our study has many limitations. It relies on a retrospective analysis of the patients’ presentations from their medical files. In addition, the small number of patients would have affected the results of our study. The small number of patients prevented any correlation of the characteristics of the stenosis or of the patient with the final outcomes. Furthermore, the cost of the stent placement in Lebanon is high, and therefore, almost all patients afforded only the placement of 1 stent and could not afford another one. This means that only one attempt through a bronchoscopic approach was made before referral to surgery. Also, the unavailability of custom-made stents, designed according to the length of the stenosis and tracheal diameter of the patients could sometimes lead to earlier failure which would cause early referral to surgery.

5. Conclusion

There is no clear approach to treatment of patients with benign tracheal stenosis. Generally, the surgical approach is preferred for complex stenoses. However, multiple studies have shown that bronchoscopic interventions have yielded acceptable results when treating complex stenoses alternative to surgical approach. Indeed, more data is still needed to guide physicians for better generalized approach. In addition, when confronting complex tracheal stenosis, we prefer a multidisciplinary approach between surgical and nonsurgical doctors to choose the best medical care for these patients.

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