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Original Article

Tracheal disease management: curative surgery or palliative interventions

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Abstract: Introduction: Tracheal surgery is the lastly developed and one of the most challenging parts of thoracic surgery. So, we have conducted a retrospective study of our experience in the treatment of tracheal surgical diseases. Methods: The records of tracheal diseases patients were reviewed retrospectively. The patients were grouped into 2. The first is the curative surgery group who underwent trachea resection, while the second is the palliative interventions group who underwent bronchoscopy, endobronchial lesion resection, dilatation and/or stent placement. Results: Forty-eight patients underwent 51 operations during a four-year period. Overall 47% of the interventions were in curative resection group and 53% were in bronchoscopic palliation group. Twelve percent of the patients [16% of resection group, 7% of bronchoscopic palliation group] were complicated postoperatively. Conclusion: Major airway reconstruction is the best way of managing airway pathologies with high success rate and low morbidity. Palliative bronchoscopic interventions are chosen if the lesion is not resectable, or patients have high risk of comorbidity or failed to accept the major operation.

Keywords: Trachea resection, airway reconstruction, tracheal stent placement

Introduction

The surgical procedures of the trachea have developed more slowly than most other divisions of thoracic surgery, due to the rarity of tracheal tumors [1, 2]. Traumatic, neoplastic and inflammatory pathologies are the most common tracheal pathologies that can be treated surgically [2, 3].

The type of treatment depends on some factors related with patient and pathology. Patient related factors are patient age, clinical condition, the state of their lungs, concomitant diseases and patient's choice. Pathology related factors are lesion's length, location, neighboring organ involvement and histology [4, 5]. Surgical options are divided into curative open surgery and palliative bronchoscopic techniques including laser, cryotherapy, cauterization, dilatation and stent placement [4].

We have conducted a retrospective study of our experience in the treatment of tracheal surgical diseases. We analyzed the indications for curative surgery and palliative bronchoscopic interventions.

Methods

Forty-eight patients were operated by a single surgeon in 2 different centers between 2012 and 2016. The records of the patients were reviewed retrospectively. The ages, sex, diagnosis, operation types and postoperative complications were evaluated. The patients were grouped into 2; first is the curative surgery group who underwent trachea and bronchial resection mostly with end to end anastomosis, second is the palliative interventions group who underwent interventions such as bronchoscopy, endobronchial lesion resection, dilatation and/or stent placement. The results were discussed in the light of current literature.

Operational strategy

Trachea resection and end to end anastomosis: Upper half tracheal resections were performed via coller incision, lower tracheal and bronchial

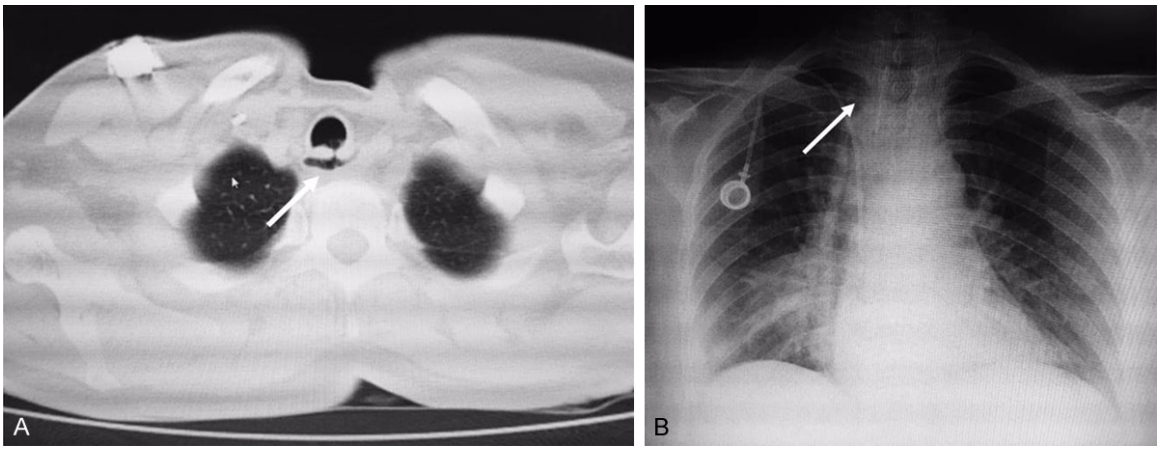

Figure 1. A: Preoperative thorax CT presenting the tracheoesophageal fistula in a previously operated esophagial carcinoma patient; B: Postoperative Chest x-ray presenting tracheal covered self expandable metallic stent.

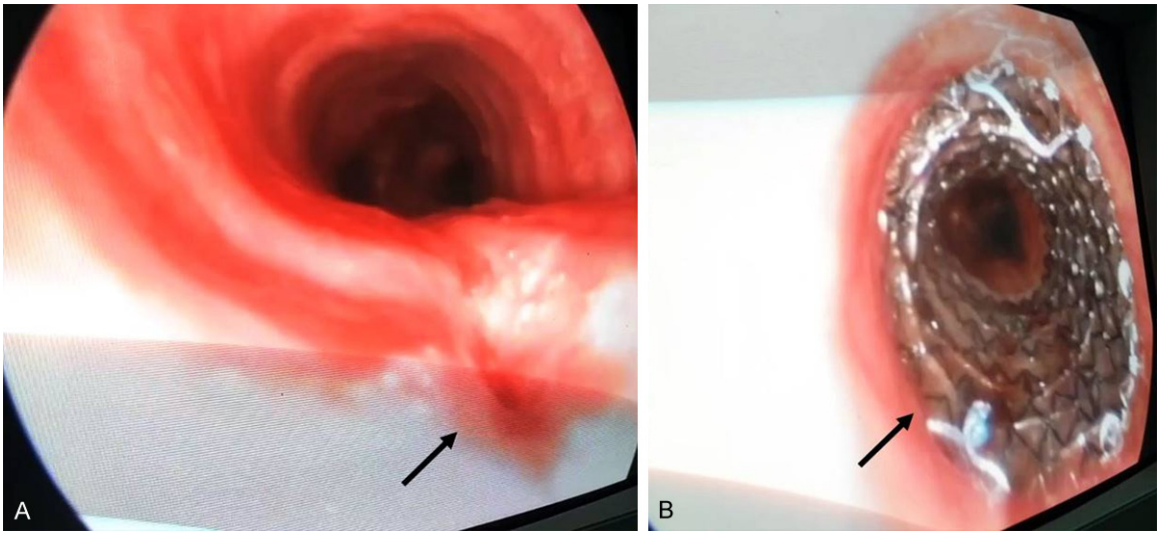

Figure 2. Bronchoscopic view of (A) tracheoesophageal fistula; (B) tracheal covered self expandable metallic stent.

resections via right thoracotomy. Lateral traction sutures of 2-0 polyglactin (Vicryl, Ethicon, Somerville, NJ) are placed in the proximal and distal segments of the tracheal wall. The trachea was cut in whole layer and pathological segment was resected. The anastomosis was performed with 3 continuous suture technique (1 continuous suture for posterior membranous wall, 1 for right anterolateral wall, 1 for left anterolateral wall). Polydiaxanone (PDS, Ethicon, Somerville, NJ) sutures were used for anastomosis. Chin stitches were used in all collar incision patients. All patients had control bronchoscopy at the 7th day and chin sutures were removed.

Stent application

All stents were settled via rigid bronchoscopy. Mechanical dilatation and mechanical endobronchial tumor clearance were performed in stenosis and malignancy patients. Covered self expandable metallic stents or silicon stents were used according to the availability. All patients inhaled cold vapor postoperatively. Postoperative checking was done with chest x-rays and bronchoscopy if needed.

Results

Forty-eight patients underwent 51 operations during a four-year period. Of the patients, 16

were female and 32 male with a mean age of 41.5 (6 months-86 years). Preoperative diagnosis were 23 postintubation tracheal stenosis, 17 tracheal malignancy, 3 bronchopleural fistula, 3 tracheoesophageal fistula (**Figure 1**), 1 idiopathic tracheal stenosis, 1 congenital vascular ring. Nineteen patients underwent trachea resection and end to end anastomosis, 1 patient underwent left main bronchus resection and end to end anastomosis. Twenty-five patients had tracheal stent application (**Figure 2**) and 2 patients t tube. Three patients had partial tracheal wall resection with tracheoplasty and 1 had tracheoesophageal fistula closure. Overall 24 (47%) of the interventions were in curative resection group and 27 (53%) were in bronchoscopic palliation group. Six patients (12%) [4 (16%) in the resection group, 2 (7%) in the bronchoscopic palliation group] were complicated postoperatively; 2 stent displacement, 1 anastomostic dehiscence, 1 hemothorax, 1 pneumonia, 1 incisional skin infection.

Discussion

Tracheal stenosis usually occurs secondary to prolonged intubation, prior tracheostomy, malignancy, trauma, irradiation, infection or idiopathic inflammatory conditions [1, 2]. About 10% of the previously intubated patients have tracheal stenosis [1, 2, 6]. The overinflated cuffs of the endotracheal tubes cause mucosal ischemia and necrosis on the tracheal wall and a wound healing with stricture occurs inside the lumen. The risk of tracheal stenosis rises with the prolongation of the intubation. Subglottic tracheal stenosis represents the most challenging area for tracheal resection and reconstruction because it is the narrowest part of airway and is close to the vocal cords and recurrent laryngeal nerve insertions [2, 7, 8].

Currently a wide variety of interventions are available for management of tracheal stenosis from bronchopscopic interventions such as sequential tracheal dilatation and to major airway reconstruction including, laryngotracheoplasty, tracheal resection and cricotracheal resection. Tracheal dilatation may be successful when the tracheal stenosis is diagnosed early and the stricture is limited in distance. Major airway reconstruction is a definitive treatment and is usually performed as a single-stage procedure as described by Grillo and coworkers [1, 2]. Because of its high success rate (71-95%) and minimal morbidity [9], we always preferred major airway reconstruction if the pathology is operable, if the patient does not have high risk comorbidity and accept the operation. We accepted the patient inoperable if the stenosis is closer more than 1 cm to vocal cords (in adults), if stenosis includes a segment more than 5 cm and if the patient has a high risk comorbidity which is not seldom among previously intubated patients. Those inoperable [for major airway reconstruction] patients were undergone tracheal dilatation and/or stent placement.

The two most common primary malignancies are squamous cell carcinoma and adenoid cystic carcinoma [10] as in 9 of our patients. Primary tracheal tumors have an annual incidence of only 2.7 cases per million people [2]. Secondary neoplasms involve the trachea through direct extension, most commonly thyroid carcinomas, as in 7 of our patients, by invading the trachea [2, 11]. For these malignancy groups we applied the same strategy with tracheal stenoses group in choosing the resection or stent placement.

When the pathology extends from the upper trachea into the larynx, the problem becomes more complex. If the lesion extends well above the lower border of the cricoid cartilage, circumferential resection is not possible since recurrent laryngeal nerves enter into the larynx medial and posterior to the inferior cornua of the thyroid cartilage along the back of the posterior cricoid lamina [12].

The major palliative indications for airway stenting are, reestablishing patency of an obstructed airway, supporting weakened airway walls [malacia], and sealing dehiscence and fistulas [13]. The location, shape, and length of the airway pathology are important considerations to determine the choice of stent [14, 15]. We used both CT scan and bronchoscopy for determining the location, shape, diameter and length of the airway pathology. The dilatation, cauterization and stenting were done via rigid bronchoscopy. We used 2 types of stent; silicon stents and covered self expandable metallic stents. We do not have any preference one to other. We just decided for metallic or silicon stents according to availability.

Computed tomography (CT) scanning has proved to be the most useful modality for evaluation of tracheal pathology by revealing the extent and luminal diameter of the pathology. Three-dimensional CT scan has also been utilized more lately to help facilitating and planning for resection of complex tracheal problems such as removal and reconstruction after inappropriate stent placement. Bronchoscopic evaluation is essential in the preoperative workup of tracheal pathology. Bronchoscopic measurement of the amount of normal trachea proximal and distal to the lesion and the relation to the vocal cords and carina allows for operative planning as to approach [2].

As a conclusion, major airway reconstruction is the best way of managing airway pathologies with high success rate and low morbidity. Palliative bronchoscopic interventions are chosen if the pathology is not resectable, if the patient has high risk comorbidity and if the patient does not accept the major operation.

Disclosure of conflict of interest

None.

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