

Tracheobronchial Surgery:

Experience of Thoracic Surgery Department in Fez- Morocco.

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ABSTRACT

Introduction: Tracheobronchial resections with anastomosis are not very common. They are mostly indicated in post-intubation tracheal stenosis and tracheal tumors (80% of which are malignant). As for bronchoplastic pulmonary resections, they are mainly applied to bronchopulmonary cancer. The goal of this surgery is to allow a carcinological resection with an optimal conservation of a good respiratory function. The purpose of this study is to discuss the indications, surgical techniques and prognosis of tracheal resections and bronchoplasty. **Materials and Methods:** It is a retrospective study including 30 patients who underwent tracheobronchial resection with anastomosis over 10 years (2010-2019) in the thoracic surgery department at Hassan II^d University hospital in Fez-Morocco. **Results:** A total of 30 patients were operated on, divided in 2 groups: the first group with 20 cases of tracheal disease and the second group with 10 cases of bronchial disorder. The 1st group includes 11 cases of post-intubation tracheal stenosis and 9 cases of tracheal tumors. The surgical approach was mainly through a cervical approach with cervicotomy in 8 cases. End-to-end tracheal anastomosis was performed in 13 patients. Two deaths were reported: the first patient died on day 4 from cataclysmic hemothorax and the second 8 months after surgery by complications related to post-radiation tracheal stenosis. In the second group, the bronchial condition consisted of carcinoid tumors in 80% of cases (8 patients). Postero- lateral thoracotomy was performed in all patients. They initially underwent lung resection followed by bronchoplasty. The post-operative course was uneventful. **Conclusion:** The prognosis of tracheobronchial surgery is influenced by patient selection and the mastering of the tracheal surgical techniques. For bronchoplastic surgery, the fresh mount study of the sections plays a major role.

Keywords: Trachea; bronchi; thoracic surgery; anastomosis.

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INTRODUCTION

Resections followed by anastomosis of the tracheobronchial tree (TBT) can be performed either at the tracheal or the bronchial level. Indications are mainly reported at the tracheal level including tracheal stenosis (mainly following intubation) and tracheal tumors (80% of which are malignant in the adult population).

At the bronchial level, bronchopulmonary cancer is predominant. Tracheal surgery was improved essentially as a result of the pioneering work of the Dr Hermes Grillo [1, 2]. The first lobectomy with bronchoplasty was performed by Mr. Price-Thomas in 1947 for a patient who had a carcinoid tumor of the right main stem bronchus [3]. The essential goal of this bronchoplastic lobectomy is to maintain a decent respiratory function without affecting the carcinologic prognosis.

MATERIAL AND METHODS

It's a retrospective and monocentric study including 30 cases of patients over 18 years old who underwent surgery for a tracheal or bronchial resection with anastomosis over 10 years (2010-2019) in the thoracic surgery department of Hassan II^d University hospital in Fez-Morocco. Patients who underwent surgery for traumatic tracheobronchial lesions: wounds, ruptures, were excluded from the study. Data collection was made from the medical records of patients.

RESULTS

Thirty patients were included: 20 underwent tracheal resection anastomosis (TRA) and 10 bronchial resection anastomosis (BRA). The median age of all patients was 37 years old.

Regarding tracheal indications, 15 patients out of 20 were male. History of chronic tobacco smoking was reported in 4 patients, 10 patients had a history of intubation or tracheostomy and only one patient underwent a thyroidectomy; a lower left lobectomy was performed in a single patient.

Main complaint in the group with tracheal disorder was chronic dyspnea in 17 patients, wheezing in 10 patients. The radiological and endoscopic assessment showed a tracheal stenosis in 11 cases (average length of the stenosis was 2.7cm) and tracheal tumors in 9 patients with adenomatoid cystic carcinoma in 3 patients (**Table I**).

Table I: Etiologies of tracheal tumors

Etiologies	n
Adenomatoid cystic carcinoma	3
Squamous cell carcinoma	1
Adenocarcinoma	1
Atypical carcinoid tumor	1
Pleomorphic adenoma	1
Ectopic thyroid adenoma	1
Mucoepidermoid carcinoma of the salivary type	1

Regarding surgical approach, cervicotomy was performed in 8 patients. Resection end-to-end tracheal anastomosis (**figure 1**) was the most common intervention (13 cases).

In the bronchial disease group, 9 patients out of 10 were female. Hemoptysis was reported in 6 patients and dyspnea with cough in one case; 2 patients were asymptomatic. The bronchial condition was predominated by carcinoid tumors (8 patients) (**Tables II; III**).

Table II: Etiologies of bronchial tumors

Etiologies	n
Typical carcinoid tumor	6
Atypical carcinoid	2
Primary pulmonary adenocarcinoma	1
Metastasis of an ovarian adenocarcinoma	1

Table III: Site of bronchial tumors

	n
Right upper lobe	3
Middle lobe	2
Right lower lobe	1
Left upper lobe	1
Left lower lobe	1
Right main stem bronchus	1
Intermediate trunk	1

In patients with bronchial condition, the most common procedure performed was a right superior thoracotomy with anastomosis between the intermediate trunk and the right main stem bronchus (3 cases) with mediastinal radical lymphadenectomy.

Tables IV and V are summarizing surgical approaches and procedures performed in our series. A flap protection of the bronchial and tracheal anastomosis was done in all cases.

Table IV: Summary of surgical approaches in our patients' series

Surgical approaches	n
Tracheal disorder patients group	
Cervicotomy	8
Cervico- manubriotomy	6
Right posterolateral thoracotomy	4
sternotomy	2
Bronchial disorder patients' group	
Right postero- lateral thoracotomy	8
Left posterolateral thoracotomy	2

Table V: Summary of surgical procedures performed in our patients series

Surgical procedures	Number of patients (n)
Tracheal disorder patients group	
Tracheal resection with end to end anastomosis	13
Tracheal resection with « V » reconstruction (Figure 2)	1
Right pneumonectomy with « Kergin » reconstruction	1
Tracheal resection avec tracheobronchial anastomosis	1
Résection with crico-tracheal anastomosis	3
Résection with thyro-tracheal anastomosis	1
Bronchial disorder patients' group	
Sleeve right upper lobectomy (Figure 3)	1
Right carinal pneumonectomy with « V » reconstruction	1
Sleeve left upper lobectomy	1
Sleeve left lower lobectomy	1
Middle lobectomy with wedge bronchoplasty	1
Right lower lobectomy with wedge bronchoplasty	1



Figure 1: Tracheal resection with end to end anastomosis.

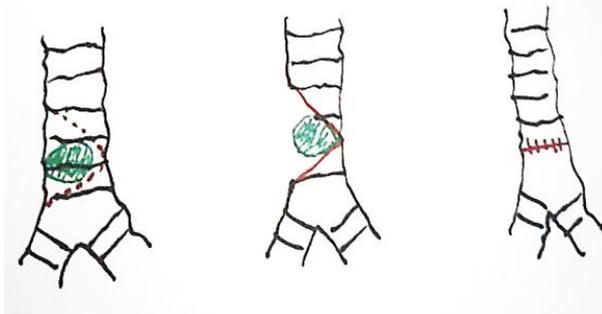


Figure 2: Tracheal resection with « V » reconstruction.

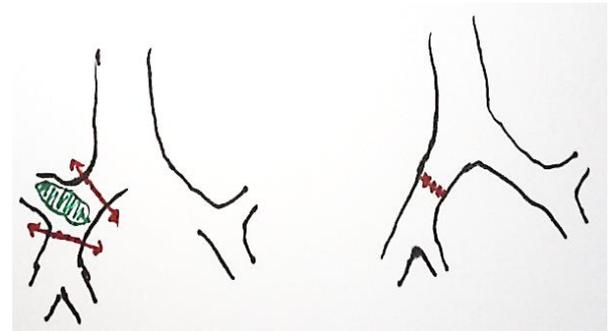


Figure 3: Sleeve right upper lobectomy

Peri-hospital morbidity complications in our series consisted for 2 patients in a recurrent nerve palsy, a tracheocutaneous fistula for one patient, and atelectasis for another patient. Two deaths were reported, the first one caused by a cataclysmic hemothorax following a tracheal resection with end-to-end anastomosis but related to pulmonary arterial fistula following lobectomy for pulmonary aspergilloma, and the other had adenomatoid cystic carcinoma of the trachea which died from post-radiation stenosis.

DISCUSSION

Tracheo-bronchial resections with anastomosis have benefited from advances in anesthesia and also innovative surgical techniques. Tracheal resections with anastomosis can be performed in tracheal tumors dominated by squamous cell carcinoma and cystic adenoid carcinoma which represents respectively 35% and 40% of tracheal cancers in the adult population [4, 5], or in the case of post-traumatic tracheal stenosis occurring mainly after chronic tracheal intubation.

Computed tomography (CT) of the neck and chest is a diagnostic step and a valuable preoperative imaging modality that can be performed prior to bronchial fibroscopy. It assesses the location, size, extent of the stenosis and its anatomical relation to the vocal cords and the carina. It also determines its circumference, the infiltration of the mediastinum and is used to search for local or regional metastases. It assesses the quality of the pulmonary parenchyma and it also enables to assess the degree of obstruction which will be better characterized on a following bronchial fibroscopy. The latest advances in techniques of multi-baret computed tomography enabled the realization of three-dimensional reconstructions and virtual bronchoscopies that can identify intra- and extra luminal components [6].

Bronchial fibroscopy is a crucial step in the management of tracheal tumors. In fact,

There are 2 types of bronchoscopy: flexible and rigid, and each of these 2 types has specific indications.

Rigid bronchoscopy is essential in the diagnosis by the characterization of the appearance of the tracheal mucosa, as well as in the therapeutic management of complications such as bleeding, fistulas or obstructions the tracheal lumen by placing an endotracheal prosthesis [7].

The basic procedure remains the tracheo-tracheal anastomosis. This surgical approach is generally performed by a cervicotomy, total or partial cervico-sternotomy, and rarely by right posterolateral thoracotomy [7]. The dissection technique consists of a delicate liberation of the area to be resected while preserving the vascularisation of both segments involved in the anastomosis procedure [8].

Anesthesia techniques have also evolved with the introduction of intubation in the operating field, the "jet ventilation" or extracorporeal circulation including ECMO (Extracorporeal membrane oxygenation) [9]

Per-operative flexion of the head and release of the pulmonary hilum and the triangular ligament is used to reduce tension in the anastomosis area.

The surgery is contraindicated when the resection area exceeds 50% of the tracheal length in order to avoid anastomotic tension.

Bronchial sleeve lobectomy was initially reserved for patients who could not endure a pneumonectomy from a respiratory functional point of view, as it allows to keep a decent lung respiratory reserve [10]. Currently these interventions are performed once they are technically feasible because the morbi-mortality is lower than that of the pneumonectomies, with identical carcinological results. The main indication remains carcinoid tumors that are endobronchial with intermediate malignancy.

Bronchoplastic lobectomy is also indicated in cases of lung cancer with limited invasion of the proximal adjacent bronchial structure, or in the presence of N1 lymph nodes [11].

CONCLUSION

Tracheal and bronchial anastomosis resections have benefited from the progress made in terms of anesthetics and surgery. These advances have allowed reducing morbidity and mortality concerning these surgical interventions.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest and no funding to declare.

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