ISSN: 2754-8880
Published 00 11 0000

An Eight Year Experiene Of Rigid Bronchoscopy

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ORIGINAL

Abstract

Purpose: Rigid bronchoscopy contributes a great deal in insuring survival for malignant airway obstruction and airway restoration for benign airway stenosis.

Methods: We retrospectively studied 101 RBs done for 73 patients during the 8-year period between 2016 to 2023 in the University Hospital of Ibn Rochd Of Casablanca.

Results: Benign airway stenosis was slightly more frequent than Malignant airway stenosis (n=56 vs n=46). The tracheal lesion was more frequent at 55.3 %. Pulmonary cancer was the more dominant malignant etiology and stenosis post-prolonged intubation was dominant in the benign airway category. A Dumon stent was placed in 30 cases. 16.43% of patients had a minimum second Rigid Bronchoscopy where Granulation tissue removal was the more frequent indication. Complications were few with 3 cases of tracheostomy and 2 cases of tracheal resection anastomosis.

Conclusion: Rigid Bronchoscopy is a safe procedure and very proceduralist-dependent. However, the demand for it is still very low even though its indications are current.

Keywords : bronchoscopy, stents, Benin Airway Stenosis, Malignant Central Airway Obstruction.

Introduction

Since the 19th century, Rigid bronchoscopy has been playing a major role in airway diseases. It allows more airway control and better suction, especially since it's done in the operating room with general anesthesia with less inconvenience to the patient who is awake in flexible bronchoscopy.

It plays a major role in insuring survival for people with Malignant Central Airway Obstruction (MCAO) (1) and could be an alternative to surgery in restoring airway patency for patients with Benin airway stenosis (BAS); helps with massive hemoptysis; blood clot removal and foreign body extractions.(2)

We are here to share an eight-year experience at Casablanca University Hospital with rigid bronchoscopy, in the thoracic surgery department.

OPEN ACCESS
Edited by
A.Hussain

Submitted *10 Mar. 2024*

Accepted *19 Mar. 2024*

Citation
H. Bourja, S. Boubia, M. Ridai .An Eight Year Experiene Of Rigid Bronchoscopy. Editorial article:BJOSS:2025:(5);136-141

Methods

We conducted a retrospective study for patients who underwent rigid bronchoscopy tests in the thoracic surgery department of University Hospital Ibn Rochd of Casablanca from January 2016 until December 2023. An 8-year data collection with descriptive statistics (age, sex, and medical history), as well as image findings and initial flexible bronchoscopy results; if existent; for the 102 RB done during this period. Every patient was hospitalized in the thoracic surgery department or the ICU if necessary. Different endoscopic maneuvers were applied from debridement to stent placement according to each case. Some cases required two procedures either at the same surgical time or in different scheduled procedures.

The bronchoscope used in this study is type Efer-Dumon. The design of the Rigid Bronchoscope is quite universal; it is a 40 to 45-cm metal tube that has 2 openings from each side; with other holes on the side that allow ventilation and other instruments insertion. The distal side of the bronchoscope is slightly fluted which allows the opening of the vocal cords during bronchoscope introduction as well as the mechanical resection of obstructive lesions (3). There are different scope diameters available adaptable for adults as well as a pediatric size. Through the hole; a rigid telescope with a light source is introduced to allow better visualization of the trachea. Other instruments are also available such as biopsy forceps; and suction catheters. A prior understanding was held between the anesthesiologist and the operator how the ventilation should be.

Results

73 patients underwent 102 RB throughout the 8-year period. The average age was 46.8 years with an IQR of 20.75 where 37% of the patients were female. The slightly more frequent indications were BAS (n=56) compared to MAO(n=46). In benign lesions; stenosis post-prolonged intubation was at 85.7% whereas 18,7% of post-prolonged intubation stenosis is due to COVID. As for Malignant obstructive diseases, pulmonary tumors were the most common etiologies with a percentage of 45.65%. The location of the anomaly varied in our study. The tracheal lesion was more dominant in 55.3%, the second most frequent was the left bronchus with a percentage of 14.8% followed by the carinal lesion (13.8%) and right bronchus (11.9%).

Many interventions were executed during rigid bronchoscopy including stent placement (n=30); The stents used during Rigid bronchoscopy were silicone-based; usually used in benign lesions (66% of the cases), unblocking (28 where 20 were tumoral and 8 were inflammatory) biopsies (n=40) laser treatment (n=4) foreign body extraction (n=2) stent removal (n=5).

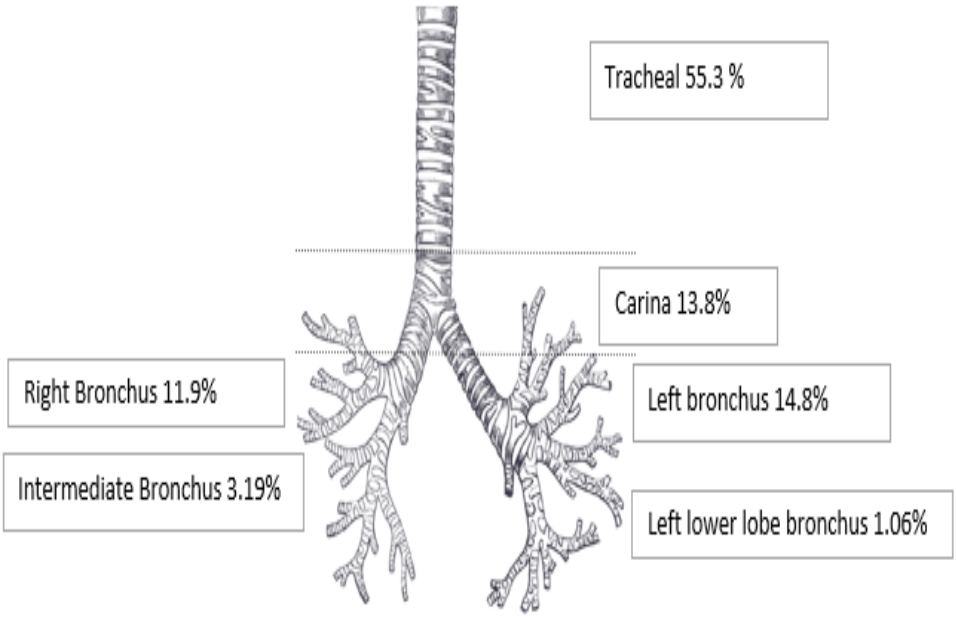

Figure 1. Locations Of Different Airway Lesions.

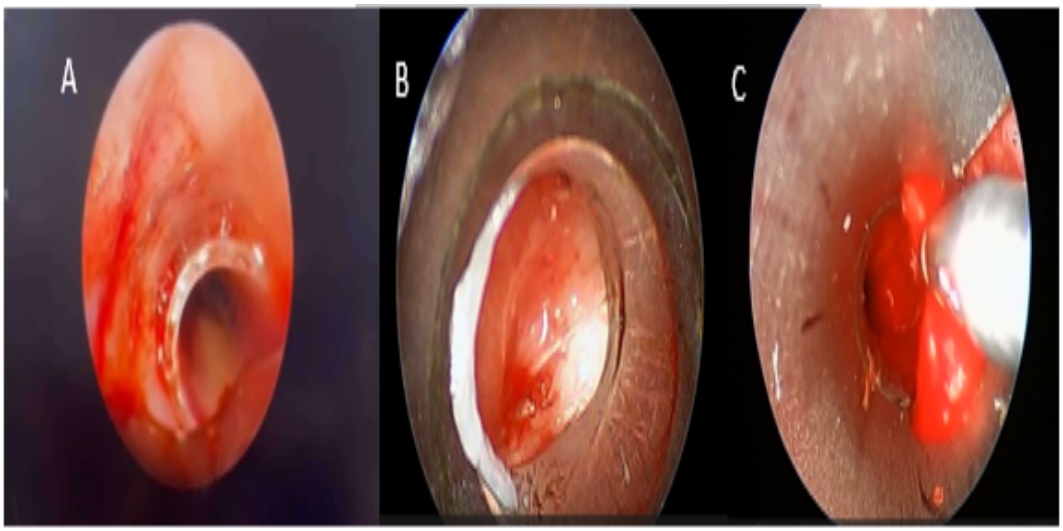

Figure 2. A: Image Still Of A Stent Placement During Rigid Bronchoscopy. **B:** Image Of A Stenosis Blocking A 100 Percent Of The Airway. **C:** Image Of A Biopsy Using Forceps During Rigid Bronchoscopy.

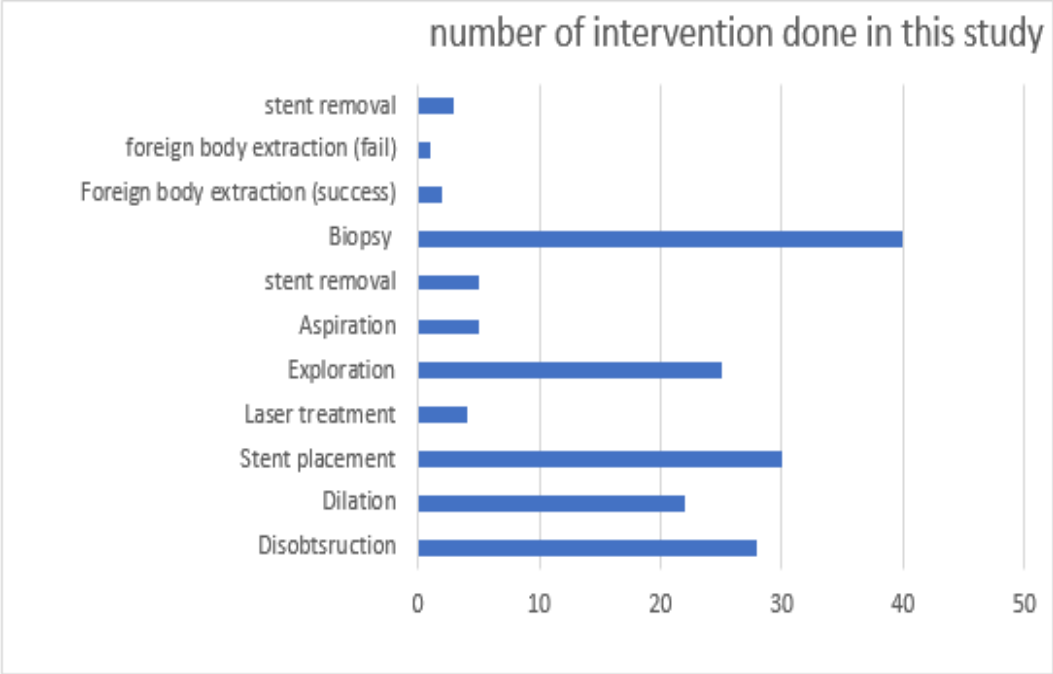

Figure 3. Therapeutic And Diagnostic Interventions Done Through RB During The Study.

Out of the 73 RB; 12 patients required 29 repeated RB (16,43%). The time lapse between the 29 RB redoes; 16 cases were before the 6-month period; 11 cases were done between the 6-month to 1-year period; 1 case before the 2-year period and only 1 case surpassed the 3-year time period. In the BAO category; the most frequent case of an RB repeat was granulation tissue removal in 12 cases (41.3%) 3 patients went for RB a second time for stent placement (10.3%), 3 cases of stent removal (10.3%) and 2 cases of Stent change for a more adequate size; and other 3 cases had an RB redo when the stent migrated and had to be remobilized; and 2 cases for tumor debulking.

Complications of RB have been few but remain noted. There were cases where RB failed to accomplish their therapeutic purposes with 3 cases of tracheostomy and 2 cases that were

Table 1. Malignant etiologies in our study.

Malignant etiology	n
Pulmonary	21
Tracheal	13
Thyroid	5
Oesophagus	2
Mediastinum	4
Larynx	1

Table 2. Cases of benign airway stenosis.

BAO	n
Prolonged intubation Tracheostomy	48
• Brain Trauma	29
• COVID	9
• Ischemic stroke	5
• Toxic encephalopathy	1
• Thyroidectomy	1
• Respiratory Insufficiancy post	3
Oesotracheal fistula	2
Foreign body	3
Tuberculosis stricture	2
Hemoptysis	1

Table 3. Indications for RB redo.

BAO	n
Granulation tissue removal	12
Stent placement	3
Stent removal	3
Stent change	2
Stent mobilisation (migration)	3
Exploration	3
MAO	**n**
Tm debulking	2
Stent placement	1

followed by tracheal resection anastomosis after failure to widen the tracheal stenosis. Moreover; 3 cases where silicone stents had migrated and an additional bronchoscopy was necessary to correct it.

Discussion

Although RB has many indications; this study indicated that the demand for it is still quite low for an average of 1.06 patients per month. Our study could be compared to another done in a tertiary hospital in Singapore where the average demand was 1.1 patients per month (1) in a 10-year period. On a slightly bigger scale, South Korea has an average of 2.6 patients per month (4; 5) over 10 10-year period. In addition; an even bigger study in the USA of 733 RB was done over a 5-year period with an average of 12.2 patients per month (6). The low demand for RB can be explained by the limited indication compared to flexible bronchoscopy; as well; as being very trainee-dependent. It demands practice and skills with a wide knowledge of its possible complications.

Benin airway stenosis was slightly more frequent than malignant airway obstruction with a

percentage of 54.9 %; tracheal stenosis post prolonged intubation or tracheostomy is the most common reason, especially with the submergence with COVID in 2020 (7). RB was a first-line treatment before moving on to other invasive procedures like tracheal resection and anastomosis or tracheostomy. A silicone stent was placed in 66% of benign airway stenosis; the stent used is type Dumon. And only 3 Y-shaped stents were placed during the 8-year period. Their placement is much more difficult than regular silicone stents. Different techniques have been described to properly place a Y shape but remain operator-dependent (8). As for the Malignant airway stenosis, pulmonary cancer obstruction (n=21) followed by primary tracheal tumors (n=13) were more prevalent of malignant etiologies; Rigid bronchoscopy improved the survival rate, especially with tumor debulking. Stent placement was avoided in most cases because most stents used in this study were silicone although proven effective in benign stenosis, but has yet to be discussed in their benefit in tumoral obstruction as palliative treatment (9).

Only 16,43% of patients required a minimum of a second RB and the most common reason was granulation tissue removal in 41.3% of the cases. 18.5% of patients developed granuloma tissue after silicone stent placement. In other studies, Chung and al (10) found granulation tissue was noted in 15.2% of patients with Self Expanding Metal Stents (SEMS). Ost and Al (11) compared different kinds of stents and granulation tissue formation rates according to every type of stent placed; it was found that silicone stents were more likely to develop granulation tissue in a shorter period. The average time, in our study, between granuloma tissue formation after silicone stent placement is 13,2 months with an IQR of 6 to 21 months. Similar results have been found in Verma and al with silicone and SEMS (1). A shorter time was noted in Chung and al of 2.6 months with the use of SEMS (10).

There is a wide range of complications concerning Rigid Bronchoscopy, from simple mucostasis to hypoxic arrest (8). However; during this study, complications have been few and merely related to the procedure's failure to fulfill its therapeutic purpose; where a secondary procedure was needed; such as a second Rigid Bronchoscopy for stent migration; tracheostomy and resection anastomosis when rigid bronchoscopy wasn't enough to treat tracheal stenosis.

Conclusion

Rigid bronchoscopy remains the gold standard for the management of many complex airway pathologies and also for prolonging survival for terminal-stage cancer. Whether used by interventional pneumologists or thoracic surgeons, its indications remain present despite flexible bronchoscopy. It is also safe in the hands of a well-trained specialist and has an economic benefit if repetitive FB can be avoided and direct indication for Rigid bronchoscopy is maintained, especially when there is granulation tissue formation.

Conflict Of Interest

Author declare no conflict of interest and no funding for this study.

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