

# Airway stenting for advanced lung cancer with central airway obstruction – a case report

*Stentarea căilor aeriene în neoplasmul pulmonar avansat – prezentare de caz*

## Abstract

About 30% of patients diagnosed with lung cancer present endoluminal involvement that cause central airway obstruction (CAO). The debulking endoscopic techniques are: electrocautery, laser therapy, cryotherapy, argon plasma coagulation, mechanical debulking using rigid bronchoscopy and stenting with immediate and delayed effect. Endobronchial stenting has an immediate palliative effect for patients with CAO, significantly improving their quality of life. In this paper, we present the case of a 62-year-old, former smoker patient, admitted at the emergency department for an acute respiratory failure accompanied by stridor and hemoptysis. The medical imaging procedures described a mediastinal tumor, while the endoscopic findings showed mixed obstruction due to extrinsic compression and exophytic endoluminal tumor in the inferior part of trachea and bilateral main bronchus. The histopathological report confirmed the diagnosis of a squamous cell carcinoma. A Y-shaped tracheobronchial stent was inserted. This procedure proved to be life-saving for the patient, and significantly improved his quality of life allowing a subsequent debulking radiotherapy which would not have been possible without the insertion of the stent.

**Keywords:** CAO, stent, bronchoscopy, lung cancer

## Rezumat

Aproximativ 30% dintre pacienții cu diagnostic de cancer pulmonar au afectare endobronșică ce determină obstrucția căilor respiratorii mari (OCAM). Metodele endoscopice de dezobstrucție sunt: electrocauterizarea, laserterapia, crioterapia, coagularea cu plasmă de argon, dezobstrucția mecanică cu bronhoscopul rigid și stentarea cu efect imediat, respectiv întârziat. Protezarea endobronșică are un efect paliativ imediat la pacienții cu OCAM, cu ameliorarea semnificativă a calității vieții. Prezentăm cazul unui pacient în vârstă de 62 de ani, fumător, internat prin departamentul de urgență, pentru insuficiență respiratorie acută, stridor și hemoptizii. Imagistic s-a descris o formațiune tumorală mediastinală, iar bronhoscopic, obstrucție mixtă prin compresie extrinsecă, respectiv intrinsecă, determinată de o tumoră exofitică intraluminală situată în partea inferioară a traheii și în bronhiile principale. Examenul histopatologic a confirmat diagnosticul de carcinom cu celule scuamoase. Ca urmare, s-a montat un stent traheobronșic în formă de „Y”. Procedura s-a dovedit salvatoare de viață și a ameliorat semnificativ calitatea vieții pacientului, permițând continuarea dezobstrucției prin radioterapie, lucru imposibil de realizat în absența stentului.

**Cuvinte-cheie:** stent, neoplasm pulmonar, bronhoscopie

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## Introduction

Advanced lung cancer can cause a severe worsening of the quality of life due to CAO. This can lead to respiratory failure, through an extrinsic compression, exophytic endoluminal obstruction or through a combined mechanism. The imminent risk of suffocation requires rapid medical intervention. Most patients are not candidates for open surgery due to impaired functional status, tumor stage (at least III B) and simultaneous comorbidities. In these cases the bronchoscopic debulking procedures become life-saving<sup>(1,2,3)</sup>.

Acute respiratory failure due to tracheobronchial obstruction is associated with symptoms like stridor and severe dyspnea that require an immediate therapeutic action. These symptoms appear when the lumen of the central airway is reduced by at least 50%<sup>(4)</sup>.

The minimally invasive bronchoscopic techniques used for the management of CAO such as electrocauterisation, laser therapy and argon plasma coagulation may have immediate effect, or they can have delayed effect, such as brachytherapy and cryotherapy. After the endoscopic debulking, the patency of the airways is managed by stenting<sup>(1-4)</sup>. In 1990, Dumon developed the first silicone stent

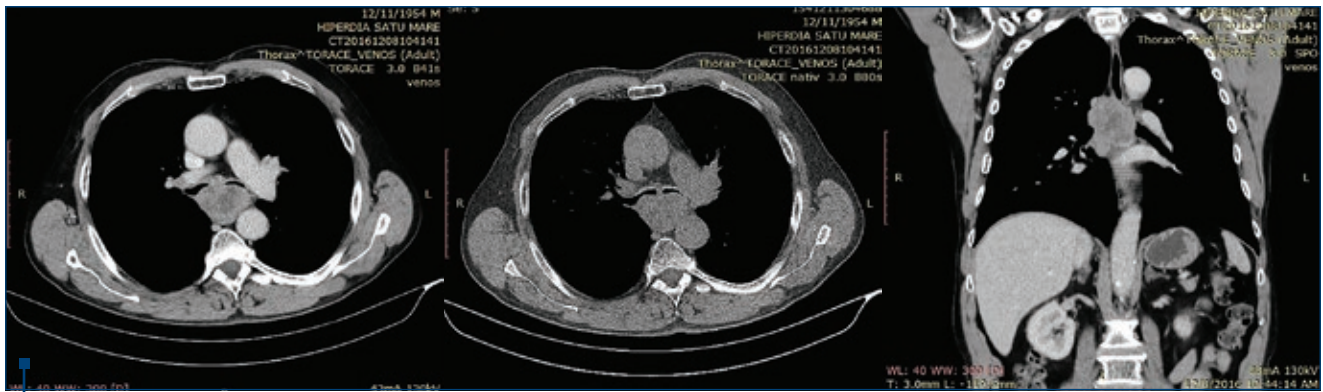
that could be placed using the bronchoscope without tracheostomy. This great step in the interventional bronchoscopy made it possible for the inoperable tumors or the ones that requested extensive and risky surgery to be palliative managed through stent placement. Nowadays, the Dumon stents are still the most widely used.

## Case report

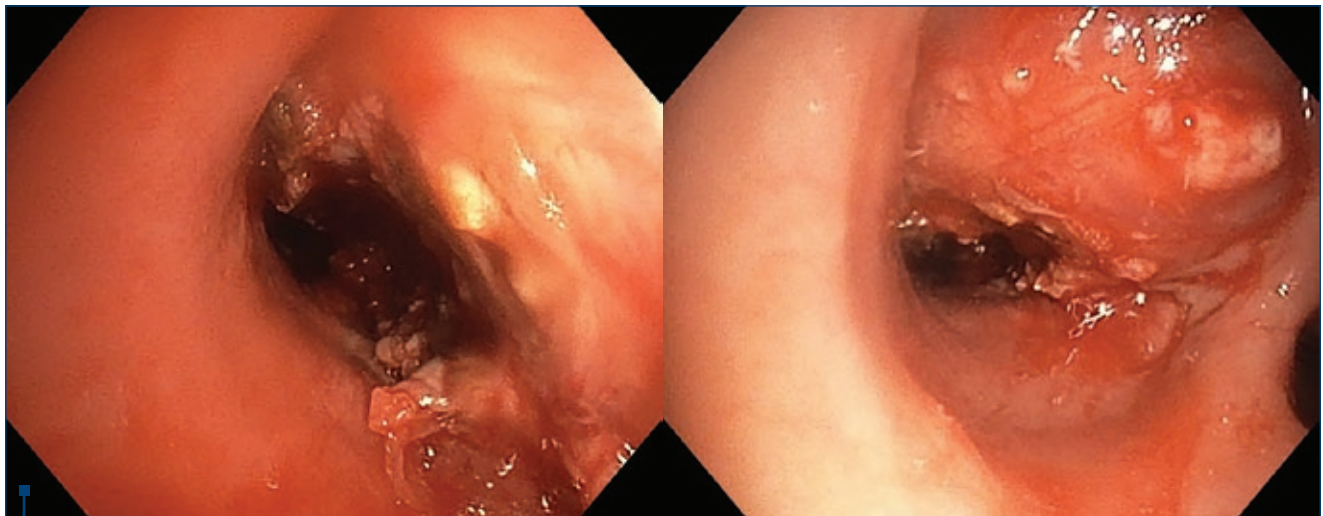
We present the case of a 62-year-old male patient, former smoker, with a medical history of arterial hypertension, chronic ischemic cardiomyopathy and congestive heart failure who was admitted for dyspnea, stridor and productive cough with hemoptysis.

The Karnofsky Performance Scale Index according to his functional impairment was 40-50. The respiratory examination revealed bilateral sibilant wheeze. The saturation of oxygen was 88% at rest. The pulmonary function tests showed a mixed dysfunction with medium restriction and severe obstruction (FEV<sub>1</sub><1 L).

The CT scan identified an infracarinal, lung mass in the posterior mediastinum, which measured 52/42/46 mm and had central areas of necrosis. The mass compressed the bifurcation of the trachea, the posterior wall



**Figure 1.** Computed tomography before stenting



**Figure 2.** Endobronchial images following the debulking methods and prior to the stent placement

of the main bronchi and the esophagus with loss of the demarcation lines between these organs. Right mediastinal and hilar adenopathies of 22/7 mm and 15/15 mm could be noted as well (Figure 1).

The fibrobronchoscopy revealed a stenosis caused by extrinsic compression in the inferior third of the trachea, the extrinsic obstruction of left main bronchi on approximately 2.5 cm with medial neoplastic burgeoning process and necrosis. The right main bronchus was obstructed by a proliferative tumor, with a remaining lumen of 2-4 mm and a suppurative process behind the stenosis.

The final diagnosis was squamous cell carcinoma, T4N2M0, stage IIIB, COPD stage III GOLD, risk group C, acute respiratory failure.

We performed rigid bronchoscopy in general anesthesia, after pre-anesthetic evaluation and signing of the informed consent. The patient was intubated using a 14-mm rigid tracheoscope and was balloon ventilated. Mechanical debulking using electrocauterization and resection with forceps, dilatation with rigid bronchoscope was made with a result of an 8-10 mm tracheal lumen on a 5 cm length (Figure 2). After this, a Y stent was placed, followed by bronchoaspiration and cryoresection of the tumoral tissue through the stent (Figure 3). No complications appeared

during the procedure. The patient was hemodynamically and respiratory stable, with a SaO<sub>2</sub> of 97%.

The bronchoscopic follow-up showed the Y stent in a correct position, the congestion of the mucosa and adherent mucopurulent secretions.

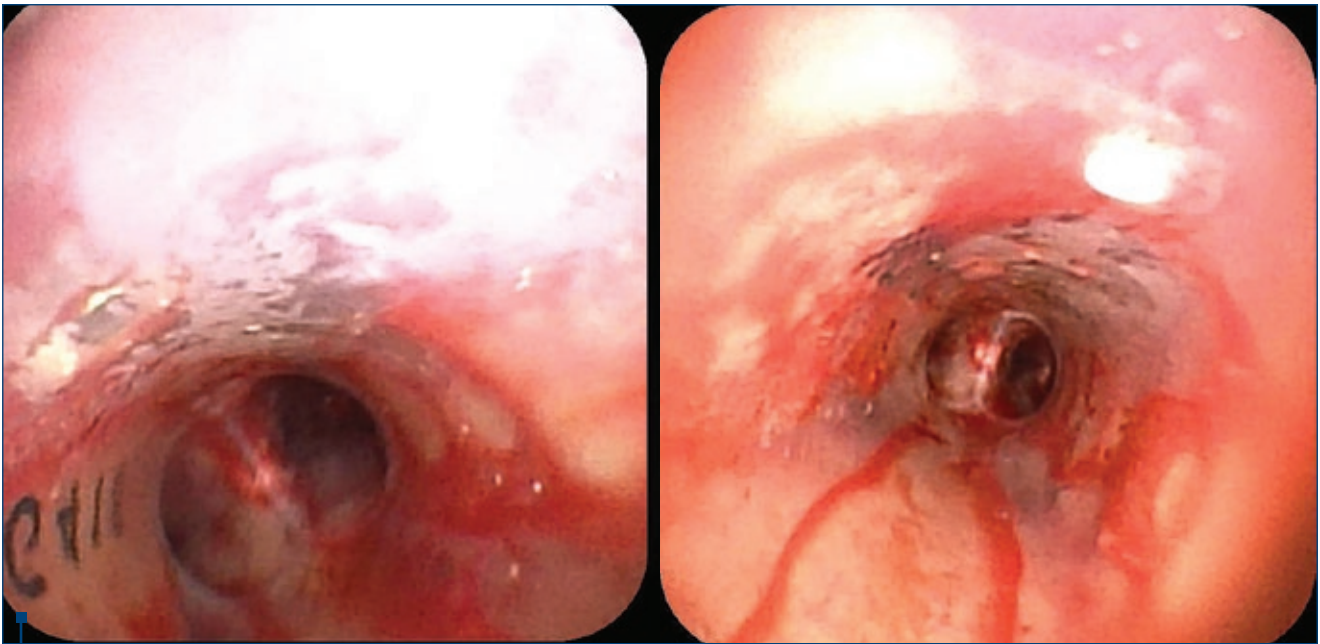
Postero-anterior control radiography and CT scan showed the Y tracheal stent in correct position (Figure 4).

The patient was discharged with recommendation for oncological treatment, radiation and chemotherapy.

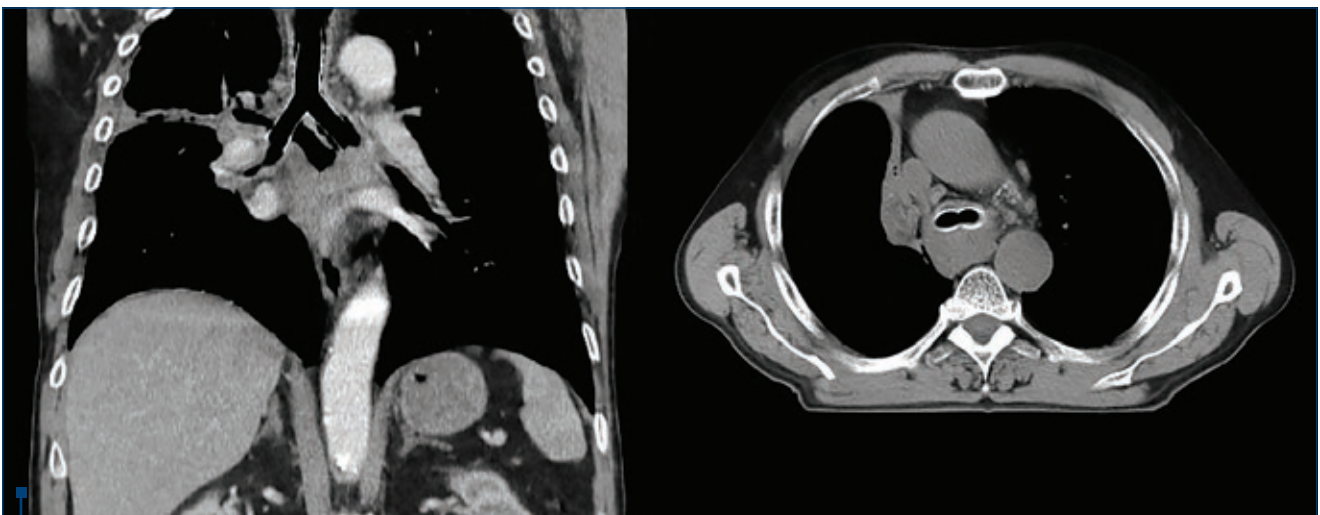
## Discussion

It is estimated that about 20-30% of patients with primary lung cancer will develop CAO, many of them having the advantage of palliative procedures to relieve dyspnea caused by the obstruction<sup>(8,9)</sup>. There are three forms of CAO: extrinsic, intrinsic and mixed. The therapeutic option depends on the type of the obstruction.

Stents are devices for the internal splinting of luminal structures, for example the airways. The indications for stenting are: 1) extrinsic compression caused by tumors or lymphnodes; 2) maintaining airway patency after endoscopic removal of intraluminally grown cancer; 3) sealing malignant fistulas and 4) treating benign strictures<sup>(1,3,5,6)</sup>.



**Figure 3.** Y stent at the tracheal carina



**Figure 4.** CT scan after stent placement

The stents are available in different lengths, diameters and forms: straight or Y-shaped for tracheal and bronchial stenosis. Among other advantages, they can be easily repositioned, replaced or extracted. They are placed using the stent applicator system through the rigid bronchoscope in general anesthesia, which makes them accessible only for the most experienced bronchoscopy centers. They can be placed only by experts qualified in interventional bronchoscopy.

We decided that our patient was a good candidate for placing the Y silicone stent, since he had a nearly full obstruction of the inferior part of the trachea and the main bronchi, and a life-threatening condition.

In the case of our patient, debulking methods were applied, with the result of a 8-10 mm tracheal lumen, and the patency of the airway was maintained by placing a Y stent with a length of 5, 3, 2 cm and a width of 14, 12, 12 mm.

Postobstructive pneumonia caused by malignant airway obstruction is another appropriate indication for stenting<sup>(11)</sup>. In our case, the stent provided the possibility of a better aspiration of the post-stenotic secretions and a better ventilation.

Choosing the optimal size of the stent is very important and can be estimated before its placement, using the CT-scan, or during its placement by bronchoscopy<sup>(10,11)</sup>. The size of the stent has to be equal to that of the bronchoscope used for debulking, in this case 12-14 mm. One of the greatest problems encountered was the lack of a stent bank in Romania that could provide all the sizes needed.

The complications that could arise are the migration of the stent, if its size is smaller than necessary, and granulation or fistula formation if a larger size is used<sup>(10,11)</sup>. Four percent of the stents placed for treatment of malignancy develop granulation tissue<sup>(15)</sup>.

Once chosen, the stent is inserted with a loading device. The problem encountered during placement is a short period of blind intervention (the moment of stent delivery), which increases the difficulty of the method in the lack of fluoroscopy. In general, the bronchoscope is advanced behind the stenosis and the stent is delivered gradually from distal to proximal, after precise measurements.

The placement of the Y stent is more difficult than that of the others. Two methods of placement are in use. In the first technique, or the “pushing method”, the stent is inserted above the carina and it is then pushed using right-left rotation moves, after being grasped with the stent forceps, until it saddles the bifurcation and it reaches the main bronchi.

The second technique involves delivery of the stent in one of the main bronchus, then pulling and rotating the stent using the forceps, until the other limb of the stent enters the contralateral main bronchus<sup>(11,12)</sup>.

We used the second method, by introducing the stent in the right main bronchus and then relocating it with the help of the forceps.

Among the special aspects of this case, we mention the fact that this was the first case where a Y silicone stent was placed for CAO at the Bronchology Department of the Cluj-Napoca Pulmonology Clinic, a case where this intervention was life-saving, as the patient faced a life-threatening situation. This interventional bronchoscopic

method has been introduced in our country only in three bronchoscopic centers.

The high cost of the stents and the placement cost are not covered by medical insurance in Romania, which results in a low number of patients who can benefit from this intervention. It is an urgent matter to change this situation. The best solution of the problem would be a regional center of excellence financed by the National Health System using a cost-centered approach<sup>(13,14)</sup>.

These procedures are complex and of high risk, and are performed in case of patients with poor health status, severe illnesses, and several other comorbidities<sup>(13)</sup>.

The complexity of stenting requires a facility with both rigid and flexible bronchoscopy. Unfortunately, the current codes scale does not recognize the additive skill, risks, and limited pool of technical competency in performing rigid bronchoscopy<sup>(14)</sup>.

## Conclusion

The CAO is frequently encountered in case of patients diagnosed with lung cancer and sometimes it requires urgent therapy by interventional bronchoscopy. The placement of the stent is a life-saving procedure in life-threatening situations.

These procedures are of high risk and complexity, and additional skills and technical competence are necessary. Regional centers of excellence for interventional bronchoscopy would be required in Romania. ■

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