

# Main bronchial stenosis – sequel of delayed diagnosis after posttraumatic bronchial injury

Ciprian Bolca,  
Olga Dănăilă,  
Cristian Paleru,  
Ioan Cordoș

1<sup>st</sup> Clinical Department of Thoracic  
Surgery, "Marius Nasta" National  
Institute of Pneumology  
90 Viilor street, Bucharest, Romania

Corresponding author:  
Bolca Ciprian, "Marius Nasta"  
Institute of Pulmonology,  
90, Șos. Viilor, Bucharest, Romania  
e-mail – bokaciprian@gmail.com

## Abstract

Bronchial ruptures due to blunt chest traumas are rarely encountered injuries and frequently late diagnosed. Once the diagnostic is established by bronchoscopy surgical treatment is mandatory and usually, the results are very good. In order to conserve as much as possible lung parenchyma minimal possible resection is required. We present four cases managed in our department by means of main bronchial sleeve resection – two on the right side and two on the left side – with good outcome. We were able to save the entire lung in all four cases despite long-term atelectasis.  
**Keywords:** posttraumatic bronchial stenosis; delayed diagnosis bronchial injury; main bronchial resection

## Rezumat

### Stenoza de bronhie primitivă sechelară după diagnostic tardiv de leziune bronșică post-traumatică

Rupturile bronșice secundare traumatismelor toracice închise sunt tipuri rare de injurie, frecvent diagnosticate tardiv. O dată stabilit diagnosticul prin bronhoscopie, tratamentul chirurgical este obligatoriu, de obicei cu rezultate foarte bune. Se practică rezecții minime cu scopul de conservare a cât mai mult parenchim pulmonar posibil. Lucrarea prezintă patru cazuri rezolvate în departamentul nostru prin tehnica rezecției „sleeve” de bronhie primitivă – două cazuri pe dreapta și două pe stânga – cu rezultate bune. A fost posibilă conservarea întregului parenchim pulmonar în toate cele patru cazuri, în ciuda atelectaziei prelungite.  
**Cuvinte-cheie:** stenoză bronșică post-traumatică, leziune bronșică diagnosticată tardiv, rezecție de bronhie primitivă

## Background

Bronchial ruptures due to blunt chest traumas are rarely encountered injuries. Only 0.5% of all patients managed in trauma centers suffer from tracheobronchial injury<sup>1</sup>. This kind of lesion can pose a significant diagnostic challenge. Often, the diagnosis and treatment are delayed, with surgical repair after months, even years after the initial trauma. The most common presentation in patients in this situation is related to development of airway obstruction.

## Cases

We present four patients operated in our department, with main bronchial stenosis due to delayed diagnosis after blunt chest trauma. All patients are young males, with car-crash related polytrauma; all of them had associated head, thorax and abdominal trauma. Three of them required abdominal surgery in order to repair a hepatic lesion, a spleen lesion and respectively a spleen and mesenteric lesion. The forth required neurosurgical intervention in order to evacuate a epidural hematoma and he had also a spleen lesion that was conservatively treated and a fractured humerus and clavicle that required stabilization.

Regarding the thorax, all were diagnosed with hemo-pneumothorax, two on the right side and two on the left side, multiple rib fractures, and two of them with discrete pneumomediastinum. They all received chest drains for the affected hemithorax.

The multiple body regions involved in trauma, the rib fractures presumed to produce the hemopneumothorax, masked the tracheobronchial injury and lead to delayed diagnosis and treatment. Even if the air leaks disappeared within 2 weeks for all patients, the lungs failed to reexpand. The fibrobronchoscopy established the diagnosis for all patients and they were referred to our thoracic surgery unit as soon as the other lesions allowed it. Table I presents the data of all our patients.

When admitted in our department, the patients presen-

ted with shortness of breath on exertion and intermittent cough. The radiologic aspect was typical, with complete lung atelectasis and persistent pneumothorax. The fiberbronchoscopy revealed in all cases complete main bronchial stenosis, two on the right side and two on the left side. CT scan completed the investigations confirming the diagnosis.

We performed surgery on admission day for all patients. After thoracotomy the lung parenchyma seemed to be normal and we were able to resect only the main bronchus in all patients, without involvement of pulmonary tissue. We also performed an intraoperative bronchoscopy in order to clean the lung which reexpanded with a normal aspect. Postoperative chest X-rays were with a near normal appearance. One month fiberbronchoscopy was performed in all cases in order to control the anastomosis. Follow-up between 2 and 4 years showed no recurrence in all cases.

## Discussion

There are three mechanisms that try to explain this kind of lesions. The most frequent is related to rapid deceleration; the lungs are fixed at carinal level, but mobile in the pleural cavity. Rapid deceleration produces a shearing force, causing rupture of the tracheobronchial tree<sup>2</sup>. This mechanism is probably the one that appears in patients involved in car-crash trauma.

Another theory, demonstrated on a canine model, involves compression of the chest with closed glottis; the increasing pressure produces an airway disruption, usually at the membranous portion<sup>3</sup>.

The last mechanism describes the forceful compression of the chest with a decrease of the antero-posterior diameter and a widening of the transverse diameter; as the lungs remain in contact with the chest wall, the lateral forces that appear pull the lungs apart at the carina<sup>2,3</sup>.

Injury to the trachea and bronchi is usually lethal, with more than 75% of patients with blunt tracheobronchial trauma dying

**Table I** Complete situation of our patients

| No | Age | Cause of trauma | Associated trauma  | Time to diagnostic (weeks) | Time to thoracic surgery (weeks) |
|----|-----|-----------------|--|----------------------------|----------------------------------|
| 1  | 25  | Car-crash       | Head trauma (ct)<br>Hepatic lesion (rs)<br>Rib fractures (ct)<br>Hemopneumothorax (cd)   | 6                          | 8                                |
| 2  | 25  | Car-crash       | Head trauma (ct)<br>Spleen lesion (rs)<br>Rib fractures (ct)<br>Hemopneumothorax (cd)<br>Pneumomediastinum                           | 7                          | 8                                |
| 3  | 35  | Car-crash       | Head trauma (rs)<br>Hepatic lesion (ct)<br>Fractured humerus and clavicle (rs)<br>Rib fractures (ct)<br>Hemopneumothorax (cd)        | 9                          | 15                               |
| 4  | 39  | Car-crash       | Head trauma (ct)<br>Spleen lesion (rs)<br>Mesenteric lesion (rs)<br>Rib fractures (ct)<br>Hemopneumothorax (cd)<br>Pneumomediastinum | 6                          | 10                               |

ct – conservative treatment; rs – requiring surgery; cd – chest drainage

before arrival to the hospital<sup>4</sup>. In a review study that identified 265 patients<sup>5</sup> in 2001, the overall mortality among patients that arrived at the hospital was 9% between 1970 and the publications date. Lately, there has been an apparent increase in the incidence of patients with airway injuries that arrive alive at the hospital, due to development of trauma care<sup>6</sup>. However, 50% of the tracheobronchial injuries are missed during the first 24–48 hours<sup>5,7</sup>.

The symptoms usually associated with this lesions (pneumothorax, pneumomediastinum, dyspnea, tachypnea) are attributed to other injuries like multiple rib fractures.

Delayed treatment may appear for several reasons: first, the initial injury may have been subtle and missed in the early or intermediate trauma management; second, severe involvement of abdominal or head trauma, multiple fractures with a more acute symptomatology will mask the airway injury; third, initial attempts to repair may fail, resulting in dehiscence or late stenosis<sup>8</sup>.

The management of this delayed presentations can be challenging. The literature often refers to delayed treatment as being associated with a higher possibility of requiring parenchymal resection as well as long term complication<sup>9</sup>, but a review article from 2008 regarding late presentation and treatment clearly demonstrates that the length of time between the initial trauma and the diagnosis did not impact the success of surgical treatment<sup>10</sup>.

There are reported cases with surgical intervention after more than 15 years after the initial trauma with successful preservation of lung parenchyma<sup>11</sup>.

Main bronchial sleeve resection with pulmonary conservation is a safe procedure, first done in 1947<sup>12</sup>, with multiple indications<sup>13</sup>, and is the approach of choice where is feasible. Surgical intervention even many years after initial trauma gives excellent results as in most cases lung parenchyma distal to the injury can be preserved.

## Conclusions

Tracheobronchial injuries are uncommon. The immediate diagnosis is difficult and we recommend a bronchoscopy for all patients presenting with chest trauma associated with pneumothorax and/or pneumomediastinum. Bronchial stenosis secondary to blunt thoracic trauma can present months, even years after the initial incident. However, late presentation doesn't impair the postsurgical evolution. As the subjacent lung parenchyma is frequently in a good shape despite long-time atelectasis we consider that a conservative sleeve resection is the best choice. ■

## Reference

1. Gussack GS, Jurkovich GJ, Luteran A. Laryngotracheal trauma: a protocol approach to a rare injury. *Laryngoscope* 1986; 96:660-5.
2. Kirsh MM, Orringer MB, Behrendt DM, Sloan H. management of tracheobronchial disruption secondary to nonpenetrating trauma. *Ann Thorac Surg* 1976; 22:93-101.
3. Estridge CE, Hughes FA, Pate JW, Cole F, Richardson R. Tracheobronchial injury caused by blunt trauma. *Am Rev Respir Dis* 1970; 101:230-7.
4. Bertelsen S, Howitz P. Injuries of the trachea and bronchi. *Thorax* 1972; 27:188-94.
5. Kieser AC, Obrien SM, Detterbeck C. Blunt tracheobronchial injuries: treatment and outcomes. *Ann Thorac Surg* 2001; 71:2059-2065.
6. Karmy-Jones R, Jurkovich GJ. Blunt chest trauma. *Curr Probl Surg* 2004; 41:211-15.
7. Richardson JD. Outcome of tracheobronchial injuries: a long-term perspective. *J Trauma* 2004; 56:30-36.
8. Karmy-Jones R, Wood DE. Traumatic injury to the trachea and bronchus. *Thorac Surg Clin* 2007; 12:35-46.
9. Chu CPW, Chen PP. Tracheobronchial injury secondary to blunt chest trauma: diagnosis and management. *Anesth Intensive Care* 2002; 30:145-152.
10. Glazer ES, Meyerson SL. Delayed presentation and treatment of tracheobronchial injuries due to blunt trauma. *Journ Surg Educ* 2008; 65:302-308.
11. Toker A, Tanju S, Dilige S. Reimplantation of the left lung 17 years after a bronchial rupture. *Ann Thorac Surg* 2008; 85:1436-8.
12. Thomas CP. Conservative resection of the bronchial tree. *J R Coll Surg Edinb* 1956; 3:168-86.
13. Cordos I, Bolca C, Paleru C. Main bronchial sleeve resection with pulmonary conservation. *J Med Life* 2008; 1:130-137.