

# A rare cause of respiratory insufficiency: case presentation

## Case Report

Camelia C. Diaconu\*<sup>1</sup>, Bianca Paraschiv<sup>2</sup>, Răzvan Lungu<sup>3</sup>, Daniela Bartoș<sup>1</sup>

*1 Internal Medicine Clinic, University of Medicine and Pharmacy Carol Davila, Clinical Emergency Hospital of Bucharest, Romania*

*2 National Institute of Pneumology Marius Nasta, Bucharest, Romania*

*3 Internal Medicine Clinic, Clinical Emergency Hospital of Bucharest, Romania*

Received 10 June 2013; Accepted 30 August 2013

**Abstract:** We report the case of a 73 year old woman who presented for progressive dyspnea. Her medical history included thyroidectomy 15 years ago, myocardial infarction, recurrent paroxysmal atrial fibrillation and femoral fracture two weeks previously, conservatively treated. Physical examination revealed absent breath sounds in the left hemithorax, up to the apex, and crackles in the right hemithorax. The acid-base balance showed acute hypoxemic respiratory failure. The chest X-Ray revealed left diaphragmatic paralysis. Thoracic CT-scan was performed, which excluded the pulmonary embolism and revealed left diaphragmatic relaxation, ascension of the splenic angle of the colon, stomach and spleen up to the projection of left lung hilum, and right postero-basal alveolar condensation process. Diaphragm dysfunction can be caused by various disorders, including phrenic paralysis. This pathology should be considered in the differential diagnosis of acute respiratory failure.

**Keywords:** *Diaphragm • Paralysis • Surgery*

© Versita Sp. z o.o

## 1. Introduction

Diaphragm dysfunction can be a cause of dyspnea and should always be considered in the differential diagnosis of acute respiratory failure [1]. The diaphragmatic dysfunction may present as a partial impairment of the ability to create pressure (weakness) or a complete loss of diaphragmatic function (paralysis). The evolution of diaphragmatic dysfunction depends on the cause and underlying disease. Unilateral diaphragmatic paralysis is often discovered incidentally in patients undergoing imaging chest studies for other reasons. Most cases of unilateral diaphragmatic paralysis are idiopathic or have a malignant intrathoracic lesion leading to phrenic nerve compression. Other causes include surgical trauma, herpes zoster, and supraclavicular brachial plexus

block. In patients with unilateral or bilateral diaphragmatic paralysis, a history of thoracic surgery should always be searched. If this condition occurred after traumatic injury, recovery is possible and implies the regeneration of the phrenic nerve, which takes usually up to 3 years [2]. Patients with unilateral diaphragmatic paralysis may be asymptomatic or may have exertional dyspnea. The combination of diaphragmatic dysfunction with a disease that increases the respiratory work may overwhelm the capacity of a mildly dysfunctional diaphragm. Comorbidities such as underlying heart or pulmonary diseases may worsen dyspnea in patients with unilateral diaphragmatic paralysis. With aging, the changes in respiratory muscle strength may also lead to worsening dyspnea in patients with diaphragmatic dysfunction.

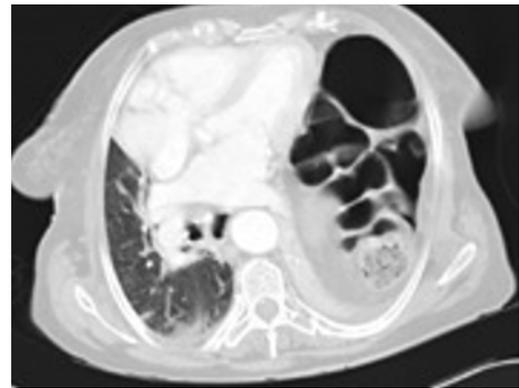
\* E-mail: [camiluciemi@yahoo.com](mailto:camiluciemi@yahoo.com)

## 2. Case report

A 73 years old Caucasian woman presented at the Emergency Department with progressive dyspnea up to severe rest dyspnea, in the previous 12 hours. She had a medical history of subtotal thyroidectomy for plunged goiter 15 years ago, myocardial infarction 2 years ago, treated by primary angioplasty, recurrent paroxysmal atrial fibrillation and a recent left femoral neck fracture, treated conservatively with low molecular weight heparin, stockings and a frame for walking. In the last years, the patient had a slow intestinal transit. Two days after discharge from the Orhtopedics Clinic, she presented to our Emergency Department with complaints of severe dyspnea at rest and fatigue. Physical examination revealed an afebrile patient, with pale skin, diaphoresis, dyspnea with orthopnea, absent breath sounds in the left hemithorax, up to the apex, crackles in the right hemithorax, SaO<sub>2</sub> 84% while breathing ambient air, atrial fibrillation 100 bpm, blood pressure of 130/60 mm Hg, no peripheral lymphadenopathy, and no peripheral edema. The blood count, electrolytes, B-natriuretic peptide and cardiac enzymes were all normal, and laboratory tests showed only mild hepatic cytolysis. The acid-base balance showed acute hypoxemic respiratory failure (pH=7.492, pCO<sub>2</sub>=46 mmHg, pO<sub>2</sub>=59 mmHg). An electrocardiogram investigation showed atrial fibrillation, right axis deviation, without terminal phase changes. The chest X-Ray revealed a left diaphragmatic paralysis (Fig. 1). Cardiac ultrasound revealed the heart displaced to the right hemithorax, with arrhythmic contractions, left ventricle ejection fraction of 55%, and mild aortic, mitral and tricuspid degenerative insufficiency. Due to the recent femoral fracture, pulmonary thromboembolism was suspected and thoracic contrast enhanced computed tomography was performed (Fig. 2), which excluded the thromboembolism and confirmed left diaphragmatic relaxation, ascension of the splenic angle of the colon, stomach and spleen up to the projection of left lung hilum, atelectasis of the right lower lobe by extrinsic compression, right postero-basal alveolar condensation process, and heart displaced in the right hemithorax. The established diagnosis was: Acute hypoxemic respiratory insufficiency; Left diaphragmatic paralysis; Right basal pneumonia; Persistent atrial fibrillation; Mild aortic, mitral and tricuspid degenerative insufficiency; Recent left femoral neck fracture. The patient was admitted in the Intensive Care Unit, where treatment with oxygen, low molecular weight heparin, betablocker and broad-spectrum antibiotics was initiated. The evolution was unfavorable and she died 3 weeks later.



**Figure 1.** Chest X-ray at admission revealing severe diaphragm paralysis



**Figure 2.** Thoracic CT scan. Left diaphragmatic relaxation, ascension of the splenic angle of the colon, stomach and spleen up to the projection of left hilum, atelectasis of the right lower lobe by extrinsic compression, right postero-basal alveolar condensation process, heart displaced in the right hemithorax.

## 3. Discussion

The diaphragm is the main respiratory muscle. Any interference in the diaphragm innervation or contractility can lead to respiratory failure [1,2]. Diaphragmatic pathology can involve either one or both hemidiaphragms [3-5]. Unilateral diaphragmatic paralysis is uncommon, and its incidence is not well known. Patients with unilateral diaphragmatic paralysis are usually asymptomatic or mildly symptomatic; rarely they report dyspnea on exertion or limited ability to exercise. The condition is discovered as an incidental radiographic finding [6,7], as the case of our patient. Several coexisting conditions, such as obesity, underlying heart or lung disease, may worsen dyspnea in this category of patients. Furthermore, the natural history of diaphragmatic dysfunction

depends largely on its cause and rate of progression of the underlying disease [8]. After diaphragmatic paralysis is confirmed, the etiology needs to be clarified. There are no studies addressing the work-up strategy to clarify the cause of diaphragm paralysis. In a significant number of cases, no cause is found. Diaphragmatic paralysis may be an early sign of systemic diseases, like systemic lupus erythematosus, metabolic diseases, motor neuron disease or thoracic malignancy [9]. Bilateral diaphragmatic paralysis is more common in systemic diseases such as myopathies or metabolic diseases. One of the many causes of diaphragm paralysis is a disorder of the phrenic nerve. Damage to the phrenic nerve is most commonly due to iatrogenic injury during surgery (cardiothoracic or neck surgery) or to compression caused by bronchogenic or mediastinal tumors [10,11]. Other processes that can directly involve the phrenic nerve include trauma, infections (herpes zoster, Lyme disease), inflammatory disorders, Guillain-Barré syndrome (up to 25%) and neurologic amyotrophy (up to 5%) [10]. In our patient, the only possible cause that we could find for diaphragmatic paralysis, in the short time until exitus, was the phrenic nerve injury during thyroidectomy; an idiopathic paralysis could not be excluded. The clinical presentation of our elderly patient, with dyspnea appeared in the context of a recent femoral neck fracture,

initially oriented the diagnosis towards a pulmonary thromboembolism. When thinking about the differential diagnosis of acute respiratory failure we must not forget the diaphragm dysfunction, especially in patients with a history of thoracic surgery. Thoracic X-Ray may reveal elevated hemidiaphragms; however, the radiography has a low specificity for diagnosis [10]. Pulmonary functional tests can be useful noninvasive tests for the diagnosis of diaphragmatic dysfunction [10]. In patients with unilateral paralysis, total lung capacity may be mildly restricted; in patients with bilateral paralysis, the restriction is more severe [10]. The restrictive dysfunction is more severe with the patient in the supine position due to displacement of abdominal content [10].

## Acknowledgements

No financial support for this work.

## Conflicts of interest

None.

## References

- [1] Al-Bilbeisi F, McCool FD. Diaphragm recruitment during nonrespiratory activities. *Am J Respir Crit Care Med* 2000;162:456-459
- [2] Ben-Dov I, Kaminski N, Reichert N, Rosenman J, Shulimzon T. Diaphragmatic paralysis: a clinical imitator of cardiorespiratory diseases. *Israel Medical Association Journal* 2008, Vol. 10 (8-9):579-583
- [3] Laghi F, Tobin MJ. Disorders of the respiratory muscles. *Am J Respir Crit Care Med* 2003;168:10-48
- [4] Loring SH, Mead J. Action of the diaphragm on the rib cage inferred from a force-balance analysis. *J Appl Physiol* 1982;53:756-760
- [5] Wilcox PG, Pardy RL. Diaphragmatic weakness and paralysis. *Lung* 1989;167:323-341
- [6] Mier-Jedrzejowicz A, Brophy C, Moxham J, Green M. Assessment of diaphragm weakness. *Am Rev Respir Dis* 1988;137:877-883
- [7] Gayan-Ramirez G, Gosselin N, Troosters T, Bruyninckx F, Gosselink R, Decramer M. Functional recovery of diaphragm paralysis: a long-term follow-up study. *Respiratory Medicine* 2008, Vol. 102 (5):690-698
- [8] Maish MS. The diaphragm. *Surgical Clinics of North America* 2010, Vol. 90 (5):955-968
- [9] Crausman RS, Summerhill EM, McCool FD. Idiopathic diaphragmatic paralysis: Bell's palsy of the diaphragm? *Lung* 2009, vol. 187(3):153-157
- [10] Dennis McCool F, Tzelepis GE. Dysfunction of the diaphragm. *N Engl J Med* 2012;366:932-942
- [11] Salati M, Cardillo G, Carbone L, et al. Iatrogenic phrenic nerve injury during thymectomy: the extent of the problem. *J Thorac Cardiovasc Surg* 2010;139(4):e77-e78