SAGE Open Medical Case Reports
Volume 7: 1–3

DOI: 10.1177/2050313X19833258
journals.sagepub.com/home/sco
SAGE

Bilateral pneumothorax after general anesthesia in patient with pleomorphic sarcoma of soft tissue

Lara Gianesello[1], Alberto Boccaccini[1] and Carlo Rostagno[2]

Abstract

The occurrence of a pneumothorax using supraglottic device is a rare complication during general anesthesia. Moreover, less than 2% of pneumothoraxes can be related to lung metastases, most due to soft tissue sarcoma. We present the case of a 45-year-old female diagnosed with metastatic sarcoma who developed a bilateral pneumothorax after general anesthesia with supraglottic device. Different causes of pneumothorax were discussed.

Keywords

Pneumothorax, metastatic sarcoma, mechanical ventilation

Date received: 13 September 2018; accepted: 29 January 2019

Introduction

Secondary pneumothorax due to metastatic sarcoma is often associated with advanced disease or systemic chemotherapy.[1,2] From the case series reported in the literature, the prevalence of spontaneous pneumothorax in sarcoma is 1.9%.[3] The first case was described by De Barrin[4] in 1937 associated with advanced disease-metastatic osteosarcoma. We present a case of a 45-year-old female suffering from metastatic sarcoma who developed a bilateral pneumothorax after general anesthesia with supraglottic device.

Case report

A 45-year-old female, with a history of thyroid nodules, noticed 2 months before hospitalization a tumefaction of her right thigh. Magnetic resonance (MR) imaging showed a vascularized mass measuring $20 \times 8.5 \times 7\,cm^3$ with intra-fascial edema of vastus lateralis and vastus medialis.

Three weeks later, a new MR showed an increase in the size of the mass surrounding the femur with irregular profile of the femoral cortical. Computed tomographic (CT) scan of the chest did not show lung metastasis. An incisional biopsy of the mass demonstrated a high-grade pleomorphic sarcoma.

Resection of the femur with quadriceps muscle was performed and a total femoral prosthesis was implanted. Pathologic diagnosis was high-grade pleomorphic sarcoma with widespread necrotic-bleeding aspects and infiltration of striated muscle and bone tissue.

Forty days later, she was readmitted for the treatment two eschars within the surgical scar associated with peri-prosthetic abscess. No other pulmonary CT scan was performed before re-admission. Arthrocentesis and superficial debridement were conducted under general anesthesia. A lubricated laryngeal mask airway (LMA) Supreme™ n.4 was inserted successfully at the first attempt without difficulty using the standard insertion technique (The LMA Supreme Instruction Manual, Intravent Orthofix Ltd, Maidenhead, 2007). The cuff of the LMA Supreme was inflated with air (30 mL) to obtain a pressure of 60 cm H_2O. After insertion, the device was connected to a closed-circuit breathing system under pressure-controlled ventilation (PCV) with an inspiratory pressure 16 cm H_2O, a positive end-expiratory pressure (PEEP) of 5 cm H_2O, a respiration rate (RR) of 12 breaths/min, an inspiratory ratio of 1:2 and fresh gas flow (oxygen/air) of 3 L/min. Successful placement was defined as a square

[1]Department of Anesthesia and Intensive Care, Careggi University Hospital, Florence, Italy
[2]Department of Experimental and Clinical Medicine, University of Florence, Florence, Italy

Corresponding Author:
Carlo Rostagno, AOU Careggi, Largo Brambilla 3, 50134 Firenze, Italy.
Email: carlo.rostagno@unifi.it

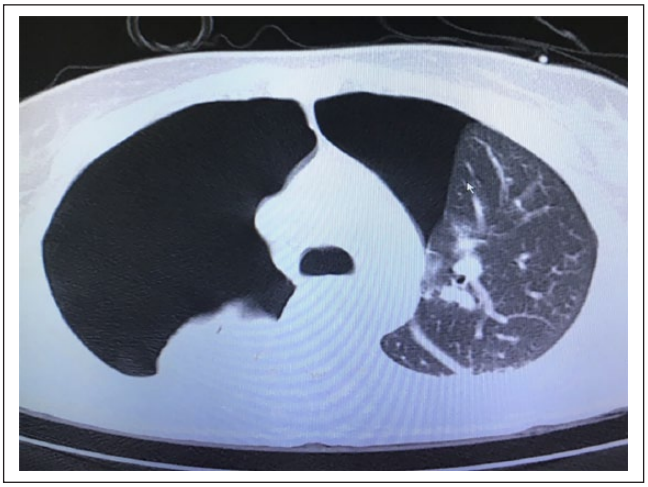

Figure 1. CT scan with right massive pneumothorax and left pneumothorax.

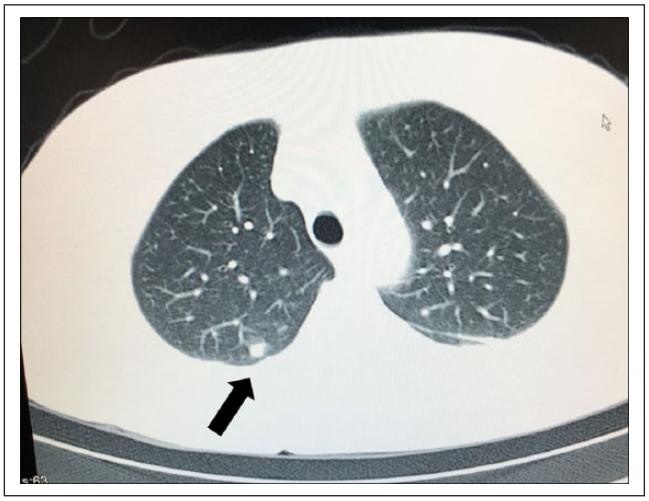

Figure 2. CT scan. Black arrow shows a sub-pleural metastasis.

wave tracing on the capnography with an end-tidal CO_2 ($EtCO_2$) value of 32–35 mmHg. There was not gas leakage at a positive pressure. Anesthesia was maintained with sevoflurane (end-tidal concentration of 2.5%) and remifentanil (0.15–0.20 µg/kg/min). The patient was in the supine position and hemodynamic and respiratory parameters were stable during the surgery. The surgery was uneventful and the duration of anesthesia was 60 min. After surgery, the patient was admitted to post-anesthesia care unit for postoperative monitoring and thereafter transferred to the ward in stable conditions.

Next morning, she developed respiratory distress with sudden desaturation (SpO_2 85%) associated with intense thoracic pain located in right scapular area. CT scan showed right massive pneumothorax and left pneumothorax of 6 cm depth (Figure 1). Bilateral thoracic drainage was needed. Following lung re-expansion, a CT scan of the chest showed bilateral lung pulmonary metastasis, some of these located in sub-pleural region (Figure 2). No further complications occurred and the patient was discharged after 10 days of hospitalization with indication to chemotherapy and radiotherapy.

Discussion

Pneumothorax is a rare complication during general anesthesia. It can be due to surgical or anesthetic procedures that damage the pleural surface. The incidence of barotrauma in postoperative patients has been reported to be as low as 0.5%.[5] Several studies reported that a peak airway pressure above 50 cm H_2O is associated with increased risk of alveolar rupture during ventilation.[6] Although high PEEP values had been reported to be associated with pneumothorax,[7] contrasting data have been reported.[8,9]

The development of the pneumothorax during general anesthesia with supraglottic devices is rarer than general anesthesia with endotracheal intubation; it has previously been reported only twice in the medical literature. Choy and Pescod[10] described a case of spontaneous pneumothorax during general anesthesia while a patient was breathing spontaneously through a supraglottic airway device. Similar experience was reported by Sandor and Tolas.[11] In both cases, the patient responded to surgical stimulation with an episode of cough which preceded the onset of the pneumothorax. Cough may generate intrapleural and intra-alveolar pressures up to 400 cm H_2O[12] and cause sub-pleural bleb rupture, resulting in a pneumothorax.

Our patient was suffering from sarcoma that is a neoplasm originating from tissue of mesenchymal origin.[13] Metastatic soft tissue sarcoma is often exclusively located in the lung. The time from presentation to development of pulmonary metastases is difficult to ascertain. Most patients developed lung metastases within 1 year after presentation. Metastases-free intervals were significantly lower with the increase in the grade of disease.[14] Secondary pneumothorax due to metastatic sarcoma is often associated with advanced disease or systemic chemotherapy and these patients have poor prognoses unless promptly treated.[1] The incidence of spontaneous pneumothorax is difficult to ascertain from the literature, but several case series report a prevalence in sarcoma of 1.9%.[3] The first patient was described by De Barrin in 1937.[4] Tariq et al.[15] reported a case of simultaneous bilateral spontaneous pneumothorax in a young patient with fibular osteosarcoma. Gan et al.[16] described a similar case of a patient with osteosarcoma of the right mandible who developed bilateral pneumothorax. In both cases, the formation of bullae in pulmonary metastases and bilateral pneumothorax was produced after chemotherapy.

In the literature, several hypotheses were made to understand the pathophysiological mechanism of metastasis-related pneumothorax. Necrosis of metastatic nodules, spontaneous or induced by chemotherapy, may be followed

by rupture in the pleural space. Moreover, patients who receive chemotherapy have a higher risk of spontaneous pneumothorax than those who do not.[17] It has been hypothesized that pneumothorax was the result of ruptures of the necrotic sub-pleural micrometastasis in patients treated with chemiotherapy.[18] Other mechanism may be the compression by neoplastic nodules that determine a valve stenosis mechanism of peripheral bronchi with hyperinflation and subsequent rupture in pleura. Finally, infiltration of a pre-existing benign cysts may be responsible for the development of a solution of continuity of the visceral pleura.[1,19]

In our case, at the time of spontaneous pneumothorax, the patient had not yet been undergoing chemotherapy. During the surgery, we used protective mechanical ventilation; it is unlikely that a sub-pleural bleb may rupture at low inflation pressures. Furthermore, whether the development of pneumothorax occurred during ventilation with laryngeal mask, it should have been associated with intraoperative hypoxemia.

The pneumothorax developed the following day; probably, the irritation of the oropharynx, determined by the supraglottic device, induced the cough that caused the bubbles' breaking.

In conclusion, in our patient, pneumothorax is likely due to the progression of the disease with the presence of lung metastases rather than a barotrauma due to general anesthesia. Malignancies, in patient with sarcoma of soft tissue, should be considered in the differential diagnosis of pneumothorax after general anesthesia. We should take into account that supraglottic device could trigger an irritative cough which can cause the sub-pleural bleb rupture.

Acknowledgements

L.G. and C.R. contributed to the concept; L.G. and A.B. designed the study; L.G. and C.R. performed data collection and/or processing; L.G. performed the literature search; L.G and C.R. wrote the manuscript; and A.B and C.R. performed critical reviews.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Informed consent

Written informed consent was obtained from the patient for his anonymized information to be published in this article.

ORCID iD

Carlo Rostagno https://orcid.org/0000-0002-7764-8919

References

1. Furrer M, Althaus U and Ris HB. Spontaneous pneumothorax from radiographically occult metastatic sarcoma. *Eur J Cardiothorac Surg* 1997; 11(6): 1171–1173.
2. Upadya A, Amoateng-Adjepong Y and Haddad RG. Recurrent bilateral spontaneous pneumothorax complicating chemotherapy for metastatic sarcoma. *South Med J* 2003; 96(8): 821–823.
3. Hoag JB, Sherman M, Fasihuddin Q, et al. A comprehensive review of spontaneous pneumothorax complicating sarcoma. *Chest* 2010; 138(3): 510–518.
4. De Barrin MJ. Hemopneumothorax spontane dans une metastase pulmonaire de sarcoma osseux. *Bul Mem Soc Rad Med Fr* 1937; 25: 73–76.
5. Noppen M and Schramel F. Pneumothorax. *Eur Respir Rev* 2002; 7: 279–296.
6. Petersen GW and Baier H. Incidence of pulmonary barotraumas in a medical ICU. *Crit Care Med* 1983; 11: 67–69.
7. Gammon RB, Shin MS and Buchalter SE. Pulmonary barotraumas in mechanical ventilation. Patterns and risk factors. *Chest* 1992; 102: 568–572.
8. Cullen DJ and Caldera DL. The incidence of ventilator-induced pulmonary barotrauma in critically ill patients. *Anesthesiology* 1979; 50(3): 185–190.
9. Kumar A, Pontoppidan H, Falke KJ, et al. Pulmonary barotraumas during mechanical ventilation. *Crit Care Med* 1973; 1: 181–186.
10. Choy MCK and Pescod D. Pneumothorax in association with spontaneous ventilation general anesthesia. *Anesth Intensive Care* 2007; 35(2): 270–273.
11. Sandor GK and Tolas A. Spontaneous tension pneumothorax following outpatient general anesthesia. *J Oral Maxillofac Surg* 1982; 40(9): 596–600.
12. Fontana GA. Motor mechanisms and the mechanics of cough. In: Chung KF, Widdicombe JG and Boushey HA (eds) *Causes, mechanisms and therapy*. Oxford: Blackwell, 2003, pp. 193–206.
13. Mason RJ, Broaddus VC, Murray JF, et al. *Murray and Nadel's textbook of respiratory medicine*. 4th ed. Philadelphia, PA: Elsevier Saunders, 2005.
14. Songur N, Dinc M, Ozdilekcan C, et al. Analysis of lung metastasis in patients with primary extremity sarcoma. *Sarcoma* 2003; 7: 63–67.
15. Tariq U, Sohail MS, Fatima Z, et al. Simultaneous bilateral spontaneous pneumothorax: a rare complication of osteosarcoma. *Cureus* 2018; 10(6): e2745.
16. Gan Z, Lin S, Han K, et al. Bilateral spontaneous pneumothorax in an osteosarcoma patient with pulmonary metastases: a case report. *Oncol Lett* 2016; 11(2): 1179–1180.
17. Smevik B and Klepp O. The risk of spontaneous pneumothorax in patients with osteogenic sarcoma and testicular cancer. *Cancer* 1982; 49(8): 1734–1737.
18. D'Angiò GJ and Iannoccone G. Spontaneous pneumothorax as a complication to pulmonary metastases in malignant tumors of childhood. *Am J Roentgenol Radium Ther Nucl Med* 1961; 86: 1092–1102.
19. Yamamoto T and Mizuno K. Spontaneous pneumothorax without any detectable pulmonary metastasis in a patient with osteosarcoma. *Int Orthop* 1999; 23(6): 361–362.