CLINICAL IMAGE

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Severe pneumomediastinum after voice training

Hiroshi Ono, Naoki Nishimura, Katsunori Oikado, Kouyu Suzuki

CASE REPORT

A 76-year-old male was brought to our emergency department with a 10-day history of shortness of breath on exertion despite long-term oxygen therapy (1.0 L/min continuously). He complained of mild precordial discomfort, which was aggravated by movement. He had emphysema and a past medical history of pneumothorax, tuberculosis, gallstone surgery, and surgery for stomach cancer in 1987. He was in chronic distress and appeared emaciated. This laboratory examinations were as follows blood pressure 102/56 mmHg, heart rate 92 bpm, respiratory rate 28 bpm, body temperature 37.2°C. Oxygen saturation was 100% at a flow rate of 1.0 L/min. There were no audible rales in the chest. Blood tests showed a low concentration of serum albumin (3.1 g/dL). There were no electrocardiogram changes. Chest radiography demonstrated residual scarring from tuberculosis and mild pneumomediastinum. Computed tomography (CT) scan of chest demonstrated that the pneumomediastinum was limited mainly to the mediastinal tissues to the left of the trachea.

The day after admission we confirmed that the pneumomediastinum was improving by chest X-ray and

the patient started to receive training in swallowing and voice production by a speech therapist. He complained that after the voice training his shortness of breath had been exacerbated and he had developed acute, severe chest pain, by which time he was having difficulty in breathing and speaking. Marked subcutaneous emphysema was found in the neck and supraclavicular area. Furthermore, the breathing sounds were weakened on both sides of the chest. X-ray and CT scan of chest demonstrated severe exacerbation of the pneumomediastinum associated with subcutaneous emphysema, subpleural bullae and the formation of adhesions between the lungs and the chest wall (Figure 1). We immediately inserted a chest tube for drainage. However, the chest drainage did not work and bubbles

Figure 1: Computed tomography scan of chest (coronal section image). Marked pneumomediastinum and interstitial emphysema were observed (blue arrows). We inserted chest tube into the space marked by red arrow. But the chest drainage did not work. Dissection revealed that the tip of chest tube was located between chest wall and parietal pleura.

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Received: 26 March 2013
Accepted: 26 April 2013
Published: 01 August 2013

Figure 2: Histological findings of the left lower lobe of the lung and the pleura. Elastica van Gieson stain. Ribs, chest wall, and endothoracic fascia were confirmed macroscopically during dissection, and drawn by computer drawing program. Open and both ends-arrows indicate pneumomediastinum.

formation through the water valve was not noted. We were unable to relieve the patient's symptoms. The patient became weaker because the patient was put on complete bed rest and oral intake was restricted for the treatment of severe pneumomediastinum.

On day-23 after admission, the patient died of acute bacteremia due to *Serratia* infection. After obtaining consent from his family, we conducted an autopsy. On dissection, it was noted that air leakage had spread hierarchically into the clefts between the chest wall and the endothoracic fascia (at gross dissection), the endothoracic fascia and the parietal pleura (at gross dissection), the visceral pleura, and the lung itself. There were multiple bullous or cystic formations on the surface of the lungs. These findings were consistent with those of chest computed tomography. Although we filled the chest cavity with water and infiltrated the lungs with air via the mouth and nose, we were unable to identify the primary lesion causing air leakage. The diagnosis of severe pneumomediastinum was confirmed pathologically (Figure 2). The tip of chest drainage tube was located between chest wall and parietal pleura.

DISCUSSION

Pneumomediastinum is a rare disorder involving the presence of air within the mediastinum. It is classified by the site of origin of the air [1], namely the upper respiratory tract, intrathoracic airways, lung parenchyma, gastrointestinal tract, or an external source. The causes of pneumomediastinum include diabetic ketoacidosis, asthma, delivery, sports trauma, and anorexia nervosa. In our patient, the initial pneumomediastinum was considered spontaneous, but the vocal exercise and state of malnutrition unfortunately triggered a series of events resulting in severe

pneumomediastinum. This is the first case report about a pneumomediastinum exacerbated by vocal exercise in English literature. We confirmed histologically that the presence of air was limited to the lung parenchyma and did not extend to the pleural cavity.

Pneumomediastinum usually follows a benign and self-limiting course and usually occurs in younger patients [2]. The treatment required is bed rest, oxygen therapy, reassurance, and analgesia [3]. This case shows that the patient's nutritional status and past history of similar disease should be considered before vocal exercise is initiated; such exercises can impose a strain that is potentially life-threatening.

CONCLUSION

In pneumomediastinum, the presence of air is limited to the lung parenchyma and does not extend to the pleural cavity. Emaciation is one of the risk factors for this condition. Care should be taken in initiating vocal exercises in such patients.

ACKNOWLEDGEMENTS

We thank Dr. Hiromichi Tamaki for caring for the patient, Dr. Mizuto Otsuji for help with surgical treatment, and Dr. Naohiko Chohnabayashi for directing the patient's treatment.

Ono H, Nishimura N, Oikado K, Suzuki K. Severe pneumomediastinum after voice training. *International Journal of Case Reports and Images* 2013;4(8):460–462.

doi:10.5348/ijcri-2013-08-356-CS-15

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article, Critical revision of the article, Final approval of the version to be published

Guarantor

The corresponding author is the guarantor of submission.

Conflict of Interest

Authors declare no conflict of interest.

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