Case report - Thoracic general

Artificial pneumomediastinum facilitates thoracoscopic surgery in anterior mediastinum

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Abstract

A 67-year-old woman underwent a thoracoscopic resection of a large anterior mediastinal cyst. Before surgery, artificial pneumomediastinum was performed with a retrosternal technique. Injection of 400 ml of air from the sternal notch caused emphysema throughout the mediastinum. In those areas, dissection of loose connective tissue was mostly accomplished by the injected air, which formed an air layer around the cyst. On the other hand, emphysema was not apparent in the areas around the left innominate and thymic veins. Artificial pneumomediastinum may be useful as a supplementary technique in a thoracoscopic surgery setting.

Keywords: Mediastinal tumor; Video-assisted thoracic surgery; Preoperative care; Thymus

1. Introduction

Video-assisted thoracoscopic surgery (VATS) for resecting benign mediastinal tumors has been broadly employed [1–3], and its reliability has been almost established. However, careful handling is mandatory to avoid injuries to important organs in this region. Thus, we considered diverting a pneumomediastinography for preparation of VATS, which causes an artificial pneumomediastinum through the use of injected air, and also outlines the thymus and mediastinal tumors [4]. The concept of the procedure indicates that loose connective tissue around these structures may be mostly dissected by injected air. Since the safety of the procedure is well established [4], we applied it in the present case of a large thymic cyst, hoping that it would greatly simplify dissection of the connective tissue surrounding the mass during VATS.

2. Clinical summary

A 67-year-old woman came to us for evaluation of a mass shadow in the right middle lung field shown on chest roentgenogram images (Fig. 1a). Chest computed tomography (CT) showed a mass 80 mm in diameter that projected into the right thorax from the anterior mediastinum (Fig. 1b). The margins were clear, and density inside the mass was slightly low and homogeneous. Chest magnetic resonance imaging demonstrated the mass with low level signaling in T1-weighed mode (Fig. 1c) and high level signaling in T2-weighed mode (Fig. 1d). Under the diagnosis of a cyst in the anterior mediastinum, thoracoscopic resection of the mass was planned.

Under general anesthesia, the patient was intubated with a double-lumen intratracheal catheter, then placed in a supine position with the neck extended. A pneumomediastinum was formed using a retrosternal technique for pneumomediastinography [5] after being anesthetized. Briefly, the anterior cervix was stuck at the sternal notch with a bent needle, then the tip of the needle was set toward the notch, and moved deeply to pass underneath the notch to reach the anterior mediastinum. After confirming that the tip of the needle had reached behind the manubrium and did not stick any vessels, 400 ml of air was injected with a syringe. The needle was removed immediately after injection. Vital signs remained stable throughout the procedure.

Thoracoscopic resection of the mass was subsequently performed in the supine position through the right thoracic cavity. Using thoracoscopy, emphysema was found formed around the superior vena cava and trachea (Fig. 2a), the hilum (Fig. 2b), and the anterior and lateral surfaces of the pericardium (Fig. 2c) by the injected air.

The right mediastinal pleura was incised with an electric cautery between the lesion and anterior chest wall, the region where apparent mediastinal emphysema had been formed. The injected air had already made a space in the mediastinal connective tissue (Fig. 2d), thus dissection around the mass was safe and relatively easy. Because the
mass was large, the right mediastinal pleura covering the mass was resected altogether, whereas the left mediastinal pleura was already dissected by the injected air, thus manipulation from the left thoracic cavity was not necessary. Connective tissues surrounding the left innominate and thymic veins were not dissected by the injected air. The cyst was excised en bloc with the right lobe of the thymus, with minimal injury to the wall. Histologically, the lesion was diagnosed as a thymic cyst. It took 180 min for the whole procedure because we had difficulty in keeping a good working area besides handling the filled large cyst, especially in identifying the left innominate and thymic veins. The postoperative course was uneventful and the patient was discharged from the hospital on day 4.

3. Discussion

Pneumomediastinography was abandoned in clinical practice by developments in CT, however, its feasibility had already been established [4]. Potential complications caused by the procedure may include vascular injuries and air embolism, both of which can be avoided by certifying that the tip of a needle has not stuck any vessels. Significant compression of the heart and great vessels will likely not arise from the injected air, because extra air under high pressure would then be transferred to an adjacent structure such as cervical subcutaneous tissue. In fact, we did not detect any change in circulation in the present patient.

In a previous report [6], a similar amount of air was injected to produce a pneumomediastinum 24 h before surgery with a syringe pump, which required about 20 min to perform. They reported that this was to allow for uniform distribution of the air in the anterior mediastinum. However, we found that air injection into the anterior mediastinum after general anesthesia for surgery with manual pumping of the syringe in the present case led to the same satisfactory pneumomediastinum formation. Air injection 24 h before surgery might be more beneficial than the present procedure conducted immediately prior to surgery, if it would help dissection around the left innominate and the thymic veins. Nevertheless, the previous report did not describe such findings. As a result, we recommend that the procedure be performed immediately before surgery under general anesthesia, as we were able to obtain a sufficient pneumomediastinum, the patient did not have to endure overnight chest compression, and an unexpected cardiopulmonary insufficiency, if it had occurred, could have been handled effectively.

In summary, we performed an artificial pneumomediastinum procedure in preparation for thoracoscopic surgery for extraction of a large thymic cyst. The procedure worked well in dissecting loose tissue around the mass in the mediastinum, thus reducing the amount of effort required to perform the operation.

References