Bilateral tension pneumothoraces during minimally invasive parathyroidectomy
− A case report −

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Minimally invasive parathyroidectomy, a new technique for the surgical management of parathyroid disease, is gaining popularity. The smaller incision in the neck results in better cosmetic results and patient satisfaction. Despite a low incidence of complications, the anesthesiologist should be aware and prepared to manage life saving situations. We describe a case of bilateral tension pneumothoraces during minimally invasive parathyroidectomy. (Korean J Anesthesiol 2009; 57: 246~8)

Key Words: Minimally invasive surgery, Parathyroidectomy, Pneumothorax.

The traditional treatment for primary hyperparathyroidism is bilateral neck exploration in order to evaluate all four parathyroid glands. Since the 1990’s, minimally invasive parathyroidectomy (MIP) utilizing a smaller incision has become a common technique. Following a radioactive injection to localize the diseased parathyroid gland(s), the patient is brought to the operating room. Through a small transverse 2.5 cm incision in the neck, the parathyroid gland is explored and the diseased gland is resected. The complication rate for this technique is low. The most frequent complication is hypocalcemia followed by bleeding and recurrent laryngeal nerve injury <4% [1].

Pneumothorax is a rare complication and has been reported in four cases. Furthermore, there is only one report in the literature of bilateral pneumothorax [2]. We present a case report of bilateral tension pneumothoraces with acute respiratory distress and hemodynamic compromise.

CASE REPORT

A 57-year-old 94 kg male was scheduled for MIP secondary to hypercalcemia. His past medical history was significant for anxiety, his past surgical history was negative, and he was not taking any medications. Preoperative Tc-99m sestamibi scan prior to surgery revealed an abnormal right inferior parathyroid gland. The patient was brought to the operating room after premedication with intravenous (IV) midazolam. A size 5 laryngeal mask airway (LMA-Unique) was placed easily and 20 ml of air was injected into the cuff. The patient was spontaneously breathing with an FiO2 of 50% and he was maintained with sevoflurane and IV fentanyl. After subcutaneous injection of 10 ml of 1% lidocaine with 1:200,000 epinephrine, the surgeons made a right paramedian neck incision and resected the low-lying right parathyroid adenoma in 50 minutes. The patient maintained stable vitals signs and adequate oxygenation and ventilation (spontaneous breathing without any additional ventilatory support, coughing or straining) throughout the operation. Following resection, the neck incision was closed in layers using the surgical planes. At the conclusion of the operation, the LMA was removed uneventfully and the patient was taken to the post anesthesia care unit (PACU).

In PACU, the patient developed tachypnea acutely and a de-
crease in oxygen saturation to 82% was observed. The patient was placed on 100% oxygen using a nonrebreather mask. Oxygen saturation improved to only 90%. Decreased bilateral breath sounds were noted. Fiberoptic laryngoscopy confirmed mobile vocal cords bilaterally and a patent airway. A chest x-ray demonstrated bilateral lower lobe atelectasis with no lung markings demonstrated in bilateral upper lobes. This finding was consistent with bilateral pneumothoraces (Fig. 1). The patient’s heart rate increased to the 120 beats per minute and the patient became hypotensive. At this point the surgical team placed bilateral thoracostomy tubes. A rush of air was noticed from both sides of the chest, and the patient’s cardiorespiratory status markedly improved. The patient did not need to be intubated and he ruled out for a myocardial infarction by EKG’s and by serial blood draws of troponin I, creatine kinase, and CK-MB isoenzyme. The chest x-ray on postoperative day 1 showed resolution of bilateral pneumothoraces. Thus, the chest tubes were placed on water seal and subsequently removed, and the patient was discharged home on postoperative day two.

**DISCUSSION**

Minimally invasive parathyroidectomy (MIP) is associated with fewer complications than standard bilateral neck exploration of the four glands. Hypocalcemia was reported in 4% of the patients who had MIP versus 9.5% of the patients that underwent bilateral neck exploration. In the same study, recurrent laryngeal nerve injury was 1% in the MIP group compared to 2% in the bilateral neck exploration group [3]. Guerrero et al reported four cases of pneumothorax in a series of 205 parathyroidectomies resulting in an incidence of 2%. In their report, three patients had a pneumothorax involving the contralateral pleura and one case involved both sides [2]. This case shows that a unilateral operation on the neck can result in bilateral pneumothoraces. Several factors may have contributed to this result: extreme neck hyperextension, dissection low in the neck near the superior mediastinum, and electrocautery. Specifically, to provide adequate surgical exposure through a small incision, aggressive surgical traction may be required. This maneuver can cause significant traction on the thyrothymic ligament resulting in tension and damage to the adjacent pleura or even the contralateral pleura [2]. Furthermore, the pleura of either lung may have been violated by the use of electrocautery device or by surgical dissection into the thorax.

The mode of ventilation is an important aspect of the anesthetic management in these patients. Positive pressure ventilation may predispose the patient to pleural injury and to pneumothorax because the apical regions expand closer to the surgical field. More specifically, the dome of the apical portion of the left lung may rise higher than the first rib; thus, the chance of causing a pneumothorax from a neck procedure is greater on the left side. On the other hand, spontaneous ventilation with its inherent negative intrathoracic force minimizes the expansion of the pleural apices and thus is associated with a lower incidence of pneumothorax.

In terms of progression from pneumothorax to tension pneumothorax, it is important to point out the interplay of site of damage with mode of ventilation. Without visceral pleural damage, the size of a pneumothorax may be minimized in patients receiving positive pressure ventilation. On the other hand, tension pneumothorax may result from spontaneous ventilation because of damage to the parietal pleura. In other words, with each breath of negative inspiratory pressure in a patient with a compromised parietal pleura, air can accumulate into the chest wall through a one-way valve effect [2]. Another possibility is the formation of a tension pneumothorax from damage to the visceral pleura in a patient who is breathing spontaneously. Since damage to the visceral, parietal, and mediastinal pleura can all lead to pneumothorax [4], it is imperative that the surgeon and anesthesiologist be familiar with the
potential intraoperative and postoperative complications of mini-
mally invasive parathyroidectomy.

In summary, the anesthesiologist can implement measures to help prevent or at least minimize the chances the patient will develop a pneumothorax. Despite the potential complications of negative inspiratory pressure, spontaneous ventilation is associated with a lower incidence of pneumothorax. In addition, the anesthesiologist should vigilantly monitor the patient peri-operatively in order to diagnose an uncommon complication such as pneumothorax. Dissecting sharply in the lower neck (rather using electrocautery), avoiding excessive neck hyper-extension, and refraining from overly aggressive tissue retraction may also minimize the chances of pneumothorax. Listening carefully to the patient’s complaints of shortness of breath and to the chest for bilateral breath sounds using the standard stethoscope would provide invaluable information. Chest x-ray and computerized tomography of the chest can certainly yield important data to make the diagnosis of pneumothorax, but obtaining these studies should not unnecessarily delay treatment in an acutely decompensating patient. The immediate recognition of tension pneumothorax and expeditious treatment (needle decompression or tube thoracostomy) can be lifesaving.

REFERENCES