Asian Journal of Pharmacy, Nursing and Medical Sciences (ISSN: 2321 – 3639)
Volume 11 – Issue 1, 2023

Subcutaneous Emphysema as a Complication of Laparoscopic thyroidectomy

Ki Young Shin, Jangho Bae, Daehun Goh, Seungsik Kang*

Department of Anesthesiology and Pain Medicine, Institute of Medical Sciences
Kangwon National University Hospital, School of Medicine
Chuncheon, South Korea

Corresponding author's email: sskang0504 [AT] gmail.com

ABSTRACT—Laparoscopic surgery requires some anesthetic considerations and has complications that we must to know. One of them is subcutaneous emphysema. In this report we present a case of occurring subcutaneous emphysema during elective laparoscopic total thyroidectomy(BABA, Bilateral Axillo-Breast approach). The patient was treated conservatively and recovered completely. She was discharged from the Hospital without any complication.

Keywords— Subcutaneous emphysema, Laparoscopic surgery, Thyroidectomy, Anesthesia

1. INTRODUCTION

Minimally invasive, laparoscopic, surgery is popular in these days. But not only cosmetic cause but also there are some benefits; less wound infection, faster recovery, reduced morbidity and reduced pain. Along with that, also there are complications[1]. During the laparoscopic surgery, carbon dioxide has used to produce and maintain a working space. Therefore hypercapnia, acidosis and subcutaneous emphysema may be observed during carbon dioxide insufflations[2]. That conditions often cause minimal symptoms, but sometimes it can be severe and even life-threatening.

The authors have experienced subcutaneous emphysema, hypercapnia, respiratory acidosis, and increased airway pressure during endoscopic thyroidectomy, and we report it with a review of the literature.

2. CASE

A 43-year-old female patient underwent laparoscopic total thyroidectomy. She weighed 71.6kg and was 171.5cm tall. There was no underlying disease and no abnormality in the preoperative examination. After induction, mechanical ventilation was provided with tidal volume(TV) of 440 ml, a respiratory rate(RR) of 14/min, and peak inspiratory pressure(PIP) of 10 mmHg. End-tidal carbon dioxide($EtCO_2$) was 34-36 mmHg. Two ports inserted via each circumareolar incision and two ports via the bilateral axillary incisions; all trocars were inserted beneath the pectoral muscles. CO_2 was continuously administered at 12 mmHg to create an air pocket and to allow the surgery to proceed.

30 minutes after induction, 15 minutes after operation started, $EtCO_2$ was shown to rise to 50 mmHg by capnography and crackling-feel was observed on both necks and shoulder. And hyperventilation had been supplied, TV of 580 ml and a RR of 20. After that the $EtCO_2$ was maintained at around 40-44 mmHg. At that time, the PIP showed 19 mmHg.

An hour and 15 minutes after the start of the operation, the pressure limitation alarm rang. At that time, PIP was 30 mmHg and patient's TV was about 100-200 ml because pressure limitation. And $EtCO_2$ arose up to 50 mmHg. It was judged that there was no proper ventilation, then the operation and CO_2 insufflation was stopped. And manual hyperventilation was performed. During manual ventilation, $EtCO_2$ shown instantly 100mmHg. We could exclude the possibilities of respiratory obstruction resulting from secretion, or the possibilities of a bent tube by suctioning endotracheal tube. Also both of lungs were examined with a stethoscope because we suspected pneumothorax or one lung ventilation. Then both lung sound was clear. ABGA was done and hypercapnia and respiratory acidosis observed (pH 7.12 PCO_2 82mmHg PO_2 250mmHg $EtCO_2$ 62mmHg BE -3.8mmol/L).

After performing manual ventilation, $EtCO_2$ was decreased to 50 mmHg. Making sure the patient's respiratory

condition was stabilized, operation was restarted and CO_2 was insufflated again. CO_2 administered pressure lowered at 9 mmHg. At the time of restart, TV was 580 ml and RR was 25, $EtCO_2$ remained below 50 mmHg. After that, $EtCO_2$ did not accumulated, but rather decreased, and ventilation setting could also be changed. TV was 500 ml and RR was 14, and $EtCO_2$ was 31 mmHg at the end of surgery.

After the surgery was finished, the patient' respiration and consciousness fully recovered without any complication. After recovering from PACU, subcutaneous emphysema was seen in the postoperative chest radiograph(figure 1). But the patient was breathing well and there was no other problems, then she was able to transfer to general ward without any other treatment. And she was able to discharge without any complications on POD #4.

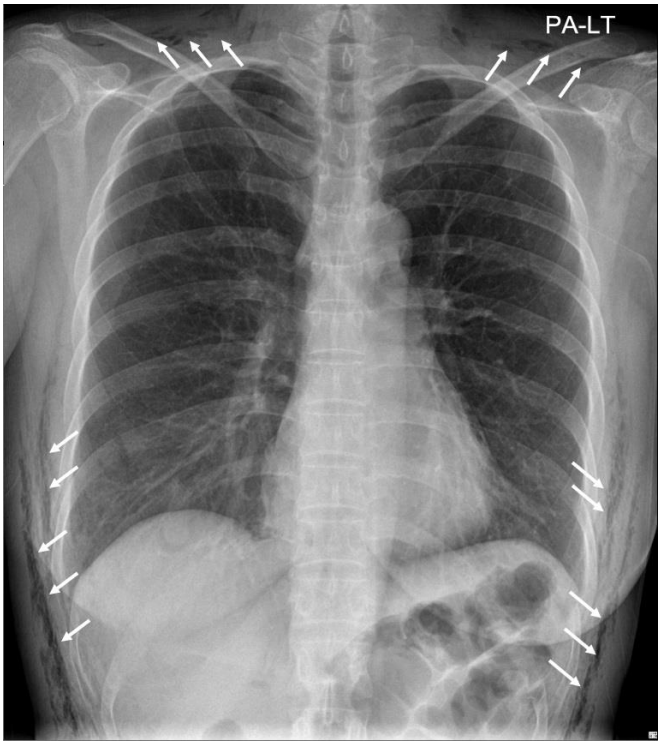

Figure 1: Postoperative chest radiograph (AP view) [white arrows show subcutaneous emphysema]

3. DISCUSSION

Continuous injection of carbon dioxide into the subcutaneous tissue to ensure proper visibility during laparoscopic surgery can lead to complications such as subcutaneous emphysema, hypercapnia, acidosis, etc[3]. And subcutaneous emphysema on head and neck can be risk for pharyngeal swelling secondary to submucous emphysema in the most severe case.[4]

There are risk factor for subcutaneous emphysema to occur during the laparoscopic surgery. (1)maximum end-tidal CO2 of 50mmHg or greater, (2)the use of six or more operative ports, (3)operative time over 200 minutes, and (4)older patients[5]. In our case, four operation ports were used and operation time was 195 minutes and anesthesia time was 245 minutes. Therefore 2, nearly 3 risk factors are involved. If $EtCO_2$ continues to increase despite hyperventilation during laparoscopic surgery, subcutaneous emphysema should be suspected. If subcutaneous emphysema occurred, usually crackling-feel is palpated where trocar is located, or if the patient is in head-up position, palpitation will be felt in the face, shoulder and neck.

Subcutaneous emphysema often causes minimal symptoms, and is not dangerous in itself. Even more it requires no specific treatment. But If it involves the deeper tissues of the thoracic outlet, chest, and abdominal wall, it will be a severe, stressful, and life-threatening condition[6]. And it requires invasive treatment, such as subcutaneous incisions, needles, drains or cervical mediastinotomy[6].

More over unlike laparoscopic surgery, laparoscopic thyroidectomy need to reduce cervical CO2 insufflation pressure. Some papers suggested not to raise more than 10mmg, because of it can increase in intracranial pressure, acidosis, hemodynamic change and delay return to normal due to decreased cervical venous blood flow.[7]. In our case, it was

thought that PIP would have increased by compressing the airway area to make a better surgical field. As a result the operation had to be stopped and need to perform manual ventilation.

Consider all these things, during laparoscopic thyroidectomy, it is very important that the limitation of CO_2 insufflation pressure and the monitoring of $EtCO_2$. Moreover, for anesthesiologist a better understanding of surgical and anesthesiological complications that may occur during laparoscopic thyroidectomy should be required, and more thorough monitoring of anesthesiologists is required, too.

4. CONCLUSION

Subcutaneous empysema is the accumulation of air in subcutaneous space. This can occur for a number of reasons, but one of the causes is laparoscopic surgery. Among them, laparoscopic thyroidectomy's the surgical site is neck, and subcutaneous emphysema may further progress and increase the patient's morbidity. We should be able to quickly recognize and manage the occurrence of subcutaneous emphysema.

5. REFERENCE

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