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Case Report

Massive Subcutaneous Emphysema during Laparoscopic Cholecystectomy

A S M Moosa[1], M Baharul Islam [2], Shahina Akther[3], M Latifur Rahman[4], Nazim Uddin Ahmed[5]

Abstract

Laparoscopic surgical techniques are increasingly being applied to treat cholelithiasis and other indications of gallbladder diseases. These procedures however are not without potential morbidity. Herein we describe two patients treated with laparoscopic cholecystectomy; those cases were complicated with subcutaneous emphysema and hypercarbia per-operatively. After discontinuation of pneumoperitoneum, saturation of partial pressure of oxygen (SpO_2) gradually increased with improvement of the neck subcutaneous emphysema, at the same time the lung ventilation also improved. Our findings show that we have to stop pneumoperitoneum or decrease partial pressure of end carbon dioxide level immediately, when we find a sudden increase of the peak airway pressure or decrease SpO_2 with subcutaneous emphysema during laparoscopic cholecystectomy.

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Introduction

Laparoscopic surgical techniques are increasingly being applied to treat intra-peritoneal diseases. These minimally invasive techniques potentially offer decreased operation time, decreased morbidity, and decreased length of hospital stays. These procedures, however are not without potential morbidity.[1] Laparoscopic cholecystectomy is superior to open cholecystectomy due to postoperative benefits but we should be aware of physiological alterations caused by carbon dioxide (CO_2) insufflation and elevated intra abdominal pressure.[2]

CO_2 is the preferred gas for the creation of pneumo-peritoneum because it is inexpensive, highly soluble chemically stable, rapidly eliminated, physically inert, suppresses combustion and also provides fairly good illumination. CO_2 is a normal product of human metabolism and at physiological levels non-toxic. During pneumoperitoneum insufflation CO_2 is very rapidly absorbed from the peritoneal cavity into the circulation. Absorbed CO_2 is excreted only through the lungs.[2]

Subcutaneous emphysema may be a consequence of improper placement of trocars. The large absorption area in the subcutaneous tissue and the great partial pressure allow rapid absorption of CO_2, resulting in profound hypercarbia. Continuous capnography is useful in detecting CO_2 emphysema.[5] Insufflated CO_2 is capable of escaping from the abdominal cavity to

[1] Lecturer, Department of Pharmacology, Rajshahi Medical College, Rajshahi.
[2] Assistant Professor, Department of Surgery, Rajshahi Medical College, Rajshahi.
[3] Medical Officer, OPD, Rajshahi Medical College Hospital, Rajshahi.
[4] Professor, Department of Anesthesiology, Rajshahi Medical College, Rajshahi.
[5] Professor, Department of Pharmacology, Islami Bank Medical College Hospital, Rajshahi.

mediastinum through the soft tissue around the vena cava and aorta. Therefore, pneumothorax or pneumo-mediastinum and / or soft tissue emphysema can develop. As a result pulmonary dynamic compliance and an increase in airway pressures occur.[4] In the presence of CO_2 emphysema, CO_2 should always be discontinued and the procedure may be converted to open laparotomy.[6] We found following two cases similar with the references.

Case Report

Massive subcutaneous emphysema occurred in two cases of laparoscopic cholecystectomy per-operatively in the Islami Bank Medical College Hospital, Rajshahi.

Case one, A 36 year-old 56 kg woman with cholelithiasis was scheduled for laparoscopic cholecystectomy. Anesthesia was induced with fentanyl and thiopental sodium intravenously and endotracheal intubation was performed using succinylcholine 50 mg intravenous. Anesthesia was maintained with nitrous oxide - oxygen and halothane (0.75%) through Bein circuit. Vecuronium was used for muscle relaxation. The lungs were mechanically ventilated with tidal volume 500 ml and respiratory rate 12 / min. There was some difficulties during first and second probing and CO_2 was introduced for pneumoperitoneum. Partial pressure of end carbon dioxide ($PECO_2$) was 30 mmHg during operation. But about twenty minutes after, subcutaneous emphysema was noted around the right lower port of incision which was gradually increasing above. Ultimately emphysema developed whole of the chest and up to neck and face. Manual lung ventilation was very difficult and saturation of partial pressure of oxygen (SpO_2) fall down to 85%. At that time $PECO_2$ was >30 mmHg. Within ten minutes operation was finished. After discontinuation of $PECO_2$, SpO_2 gradually increased with improvement of the neck subcutaneous emphysema. At the same time the lung ventilation also improved.

Case two, 63 year old 42 kg woman with cholelithiasis was selected for laparoscopic cholecystectomy. Induction of anesthesia and operation was started accordingly. This case was very difficult due to massive adhesion, so soft tissue handling was more than other. At near the end of operation i.e. just before completion of resection of the gallbladder, gradually SpO_2 was decreased with difficulty in manual lung ventilation. Subcutaneous emphysema was noted upper abdominal region which was then gradually increased above and reached up to neck, when SpO_2 fall down to 83%. At that time $PECO_2$ was >30 mmHg. After lowering $PECO_2$ to <30 mmHg, gradually SpO_2 improved with improvement of subcutaneous emphysematous condition.

Discussion

Subcutaneous emphysema in laparoscopic cholecystectomy is not so common complication, but there is a risk of hypercapnia due to pneumoperitoneum produced by carbon dioxide.[1] Generally in laparoscopic cholecystectomy, subcutaneous emphysema is more common than in gynecological laparoscopic surgery.[5]

The large absorption surface area in the subcutaneous tissue and the large difference in the partial pressure cause the extensive gaseous interchange of CO_2 between subcutaneous tissue and blood perfusing into it at the moment between peritoneal cavity and blood perfuse the peritoneum.[2]

Carbon dioxide in subcutaneous tissue is more absorbable than that in peritoneal cavity. As carbon dioxide in subcutaneous tissue is absorbed continuously after the operation, the patient should be carefully observed postoperatively.[5]

In these two cases, subcutaneous emphysema developed when high pressure pneumoperitoneum i.e $PECO_2$ >30 mmHg was present which is desirable for surgery. After discontinuation of pneumoperitoneum or $PECO_2$ <30 mmHg, SpO_2 was gradually increased with improvement of the subcutaneous emphysema.

The present finding was in agreement with the finding of references that extensive subcutaneous emphysema was due to high pressure pneumoperitoneum i.e. $PECO_2$ > 30 mmHg.

Difficulty in ventilation may be due to poor compliance which is mostly speculated due to massive subcutaneous emphysema around chest and neck. Our findings show that we have to stop pneumoperitoneum immediately or decrease $PECO_2$ < 30 mm Hg, when we find a sudden increase of the peak airway pressure or decrease SpO_2 during laparoscopic cholecystectomy.

With the capnograph a sudden increase of the peak airway pressure or $PETCO_2$ could be identified earlier during laparoscopic cholecystectomy or hypercapnia even in post operative room. It should be emphasized that high pressure pneumoperitoneum or $PECO_2$ may the cause subcutaneous emphysema during laparoscopic cholecystectomy and should be adequately dealt with.

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All correspondence to:
Abu Saleh Md. Moosa
Lecturer
Department of Pharmacology
Rajshahi Medical College
Rajshahi.