



A CASE REPORT ON SURGICAL EMPHYSEMA- CO₂ COMPLICATION DURING LAPAROSCOPIC CHOLECYSTECTOMY

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ABSTRACT

Background: The laparoscopic method is the most common type of intra-abdominal surgery and known to reduce post operative morbidity, which instead have a complication of surgical emphysema. Surgical emphysema caused by insufflating gas tracking under pressure into the subcutaneous tissue planes clinically presented below skin. During laparoscopic surgery, absorption of CO₂ in the peritoneum is high leading to elevation of CO₂ in the blood which is compensated by assisting expiration from the lungs which has high aqueous solubility and infusibility.

Case Summary: A 56 years old female patient was admitted in the hospital who was diagnosed with cholelithiasis and proposed for laparoscopic cholecystectomy procedure. During the procedure the patient developed subcutaneous emphysema with elevation in ETCO₂. The patient was then stabilized, and the procedure was carried out successfully. **Conclusion:** Post operative complications are rare for laparoscopic surgery and this case report represents the pulmonary abnormality due to the etiology of absorption of CO₂. If misdiagnosed or untreated this emphysema may result in respiratory distress. With proper anaesthetic management, it can be resolved.

KEYWORDS: Cholelithiasis; Surgical Emphysema; Cholecystectomy; Laparoscopy.

INTRODUCTION

The laparoscopic method is the most common type of intra-abdominal surgery and known to reduce post operative morbidity, which instead have a complication of surgical emphysema. Surgical emphysema caused by insufflating gas tracking under pressure into the subcutaneous tissue planes clinically presented below skin. Cholecystectomy laparoscopic procedure is less painful than open surgery and as a benefit of minimally invasive surgery and has an important risk of producing insufflation with carbon dioxide gas. The increase in arterial CO₂ pressure (PaCO₂) during laparoscopy primarily has resulted in the diffusion of CO₂ from the peritoneal cavity.^[1] Insufflator settings for pressure and flow rate influence insufflation dynamics, the amount of gas absorption or extraperitoneal extravasation inducing higher pressures, and the net rates, flow rates contributing to the increased incidence of gas extravasation, noted as subcutaneous emphysema (tab1).The CO₂ absorption rate through the peritoneum during laparoscopy procedure ranges between 14 and 48 mL/min based on peritoneal cavity gas clearance which estimates the peritoneal blood flow being between 2% and 7% of cardiac output, to be 100 mL/min.^[2-3]

Pulmonary Complications of carbon dioxide include hypoxemia, barotrauma, pulmonary edema, gas embolism and subcutaneous emphysema, pneumothorax. Carbon-dioxide absorption reduces vital capacity, hypercapnia and acidemia. Abdomen insufflation due to CO₂ makes it difficult to ventilate due to high intra-abdominal pressure which cause difficulty in excursion during ventilation and leads to complication. During laparoscopy 0.3-3.0% of surgical emphysema has been noted.^[4]

FACTORS CAUSING SUBCUTANEOUS EMPHYSEMA

- Patient age and body weight
- Duration of procedure of surgery
- Volume of gas
- Trocar placement
- Flow rate and net rate
- Repeated attempts to create a pneumo-peritoneum

COMPLICATION OF LAPAROSCOPIC PROCEDURES

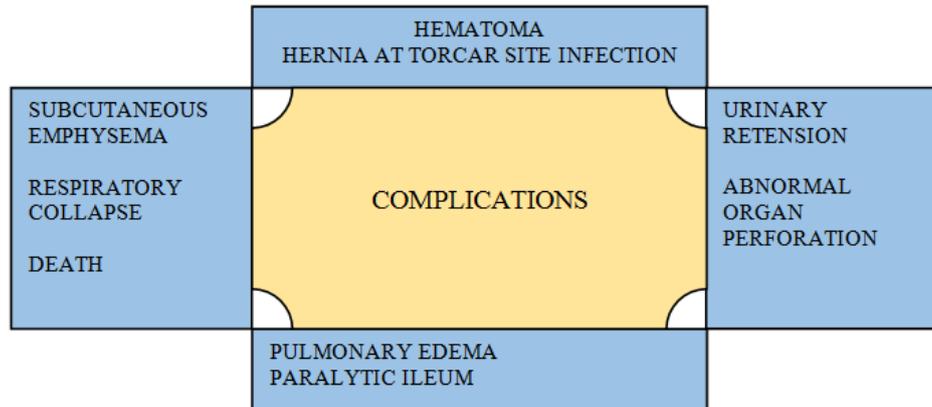


Fig 1: Complications of laparoscopic surgery. ^[5-6]

A case of subcutaneous emphysema and CO₂ complication is reported in patient undergoing laparoscopic cholecystectomy.

CASE SUMMARY

A 56 years old lady was admitted in surgery department in the tertiary care hospital with the complaints of on and off abdominal pain for past one month and also with a history of anorexia. She had also been reported with history of hypertension for twenty years with regular medication and previously hysterectomy done six years back and appendicectomy done twenty years back.

The patient BMI showed overweight and was not allergic to any medications. On examining the laboratory investigation was with abnormal liver function test and the imaging study report showed mild fatty liver, thickened folds in the stomach likely gastritis and status post hysterectomy. The patient was diagnosed with cholelithiasis and proposed for laparoscopic cholecystectomy procedure. The patient was given with T.Anxit 0.5 mg and T. Arkamine 0.1mg on the day before surgery and patient was on Inj.pan 10 ml, Inj. Emeset 2 ml, Inj. Taxim 0.2ml, Inj. Xylo 0.5 mg and Inj.TT 0.5 ml as preoperative medication. The patient gave consent for general anesthesia and all standard monitors were applied in the operating theatre. Presurgical vitals were of heart rate 74 b/min, blood pressure of 140/80 mmHg, respiratory rate of 22 b/min, 99% of oxygen saturation.

Induction of general anesthesia was administered with 100 mcg of fentanyl, 100mg of propofol, 100mg of scoline, 15mg of atracurium, oxygen and N₂O at 2.30 pm. A single grade III laryngoscopy view of vocal cord with size 75 and controlled ventilation on supine position was secured. The ET tube was placed and was confirmed with end-tidal carbon dioxide (ETCO₂). The perioperative procedure showed normal vitals with ventilator setting and peak inspiratory pressures. 5 trocar sites were used with carbon dioxide insufflation pressure of 10 mmHg.

Around 3.30 pm, the ETCO₂ level started to deviate from baseline of 24 mmHg. After 10 minutes patient baseline measures increased with blood pressure 185/110mmHg and ETCO₂ of 90 mmHg with air filled abdomen indicating immediate congestion of chest and with respiratory rate of 18 b/min. USG abdomen indicated that the patient was diagnosed with subcutaneous emphysema. The patient was then stabilized till blood pressure drops to 120/90 mmHg and propofol infusion 50 µg/kg/min was received. The ETCO₂ level was then normalized to 30-35 mmHg. Patient was reverted and the procedure started with anesthesia and completed successfully. Patient was extubated and postoperatively received a simple oxygen face mask of flow 2 liter per hour till the next day after the procedure and with continuous pulmonary observation. At-last the patient was recovered and discharged.

DISCUSSION

Clinical manifestations of hypercarbia, such as subcutaneous emphysema, have been well documented during or shortly after UGI and TEP procedures.

It has also been suggested that the incidence of surgical emphysema after pelvic laparoscopic surgery might be as high as 34% if examined radiologically through chest X-ray. According to McAlister, up to 56 percent of patients who had a laparoscopic cholecystectomy within the preceding 24 hours developed subcutaneous emphysema on a computed tomography. The exact pathophysiology behind the subcutaneous emphysema is tracking of gas along fascial planes from port sites i.e., increased ports may cause increase in the emphysema and also through diaphragmatic defects. Risk factors include age of patient (perhaps due to weaker tissues bonding fascial planes), increased number of ports, increased intra-abdominal gas insufflation pressures and long operating times greater than 200 min, allowing increased absorption of carbondioxide.^[7]

During laparoscopic surgery, absorption of CO₂ in the peritoneum is high leading to elevation of CO₂ in the blood. It is compensated by assisting expiration from the

lungs which has high aqueous solubility and infusibility. Impaired alveolar ventilation leads to reduction in the CO₂ clearance, which paves the way for hypercapnia, acidosis and EtCO₂ elevation. Hypercapnia results in increased sympathetic stimulation with elevated HR and BP. This may be corrected by increasing minute volume to 30%. A direct laryngoscope and a leak test should be considered. An airway exchange device is kept ready for a potential airway compromise. Anaesthesiologists must be aware of the risk factors and to take precautions to detect emphysema in its early stages.^[8]

CONCLUSION

After laparoscopic colorectal surgery, massive subcutaneous surgical emphysema is a rather uncommon consequence. Before treating the issue conservatively, surgeons should rule out any additional problems and if the condition is misdiagnosed or overlooked, subcutaneous emphysema may result in respiratory distress and cardiopulmonary collapse. Emphysema management will be a necessary skill for anesthesia provider.

CONSENT

Informed consent was obtained from patient.

CONFLICT OF INTERESTS

There is no conflict of interests.

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