

CASE REPORT

Massive surgical emphysema during laparoscopic surgery

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ABSTRACT

A case of massive surgical emphysema (SE) during laparoscopic indirect inguinal hernia repair is reported. The complication was undetected intra operatively in spite of increase in EtCO₂ level. Common potential causes of increase in EtCO₂ were looked for and were ruled out. The diagnosis was made only at the end of surgery. With aggressive postoperative management in surgical ICU the patient made good recovery.

Key words: Indirect inguinal hernia repair; Laparoscopy; Surgical emphysema; Hyperventilation

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INTRODUCTION

Surgical emphysema (subcutaneous emphysema) (SE) is one of the uncommon complications of laparoscopic surgery in which insufflating gas (usually carbon dioxide) diffuses within the tissues beneath the skin. Its incidence is approximately 0.3 to 3%.¹ The risk is higher in elderly patients, those undergoing extraperitoneal surgery, more than five entry ports, use of high insufflation pressure (>14 mmHg) and prolonged surgical time.² Here we report a case of massive SE which developed during laparoscopic extraperitoneal surgery but was undetected till the whole surgical procedure was over and posed a challenge in subsequent management in the postoperative period. It was successfully managed in the surgical ICU.

CASE REPORT

A sixty year old male hypertensive patient weighing 60 Kg was posted for lap indirect inguinal hernia repair under general anaesthesia (GA). Preoperatively his blood pressure (BP) was well controlled on antihypertensive medication. His pre anaesthetic evaluation including laboratory and other relevant investigations were normal. He was accepted for surgery under GA in American Society of Anaesthesiologists (ASA) grade II.

The patient was pre medicated intravenously (IV) with glycopyrrolate 0.2 mg, ondansetron 4 mg, pentazocine 0.3 mg/Kg body weight (BW) and midazolam 0.02 mg/Kg BW. GA was induced with propofol 2 mg/Kg BW followed by atracurium 0.5 mg/Kg BW to facilitate tracheal intubation.

Anaesthesia was maintained with nitrous oxide (N₂O 67%) in oxygen (O₂ 33%), isoflurane 0.6 – 0.8% and controlled ventilation in closed breathing system with CO₂ absorber (soda lime) and incremental doses of atracurium 5 mg as and when required. During surgery he was monitored with pulse oximetry, electrocardiogram (ECG), noninvasive BP (NIBP) monitor, end tidal CO₂ (Et CO₂) monitor and CO₂ insufflation pressure which was not allowed to exceed beyond 14 mmHg at any time. Initial half an hour of surgery was uneventful with all vital parameters remaining within normal limits. Subsequently it was noticed that Et CO₂ was steadily increasing from base line values of 30-35 mmHg to 50-55 mmHg. During surgery patient's pulse rate varied between 76 to 95 beats/min, systolic BP (SBP) between 134 to 153 mmHg and diastolic BP (DBP) between 78 to 94 mmHg. Efforts were made to look for possible causes of rise in Et CO₂ such as kinking or obstruction of tracheal tube (TT), bronchial displacement of TT, light plane of anaesthesia, bronchospasm and exhausted soda lime. All these causes of hypercarbia were ruled out. So we continued to hyperventilate the patient mechanically by increasing the tidal volume (VT) and respiratory rate (RR). In spite of our best efforts, Et CO₂ remained persistently high throughout surgery which lasted for 130 min. At the end of surgery, after dressing the surgical wounds when the surgical drapes were removed, to our surprise we observed that patient's eyelids were swollen with puffiness and swelling of face and neck which was extending up to chest, abdomen and mid thighs on both the sides. There was also crepitus on palpation all over these areas. So mechanical ventilation

was continued. Arterial blood gas (ABG) analysis done at this time revealed pH 7.28, partial pressure of CO₂ in arterial blood (PaCO₂) 64 mmHg, bicarbonate 28 mmol/l and PaO₂ 130mmHg which confirmed the diagnosis of respiratory acidosis. The patient was subsequently managed in surgical intensive care unit (SICU) on ventilator using high tidal volume and respiratory (RR), other supportive measures and close monitoring of vital parameters and Et CO₂. ABG analysis was done thrice at 2 hourly interval, which showed progressive and significant improvement. At 4 hours ABG report was pH 7.31, PaCO₂ 41 mmHg and bicarbonate 27 mmHg. At 6 hours ABG values were pH 7.36, PaCO₂ 41 mmHg, PaO₂ 190 mmHg and bicarbonate 25 mmHg. So the patient was weaned off the ventilator in step wise manner. Subsequent postoperative course was uneventful and he was discharged from the hospital on 10th postoperative day.

DISCUSSION

Laparoscopic surgery is widely practiced all over the world due to its many benefits as compared to conventional laparotomy.³ Though laparoscopy is more expensive than similar procedures performed by open technique it has overall positive economic benefits.³ However lap surgery is associated with a few serious complications such as surgical emphysema (SE) pneumopericardium, pneumothorax, gas embolism and visceral injuries.² SE is more common during extra peritoneal lap surgery than during intra peritoneal lap surgery due to large CO₂ absorption surface area provided by large extra peritoneal space. Inguinal hernia repair is done by extra peritoneal approach. During insufflation inadvertent entry of gas is known to occur and even large volume can occasionally accumulate in the tissue. CO₂ can also leak through the trocar sites as they pass through the skin and muscle. If the inner seal around the trocar site is

not tight and the skin seal is tight, CO₂ can escape into the subcutaneous tissue. If the skin incision is also small for advancement of trocar, manipulation of instruments can also tear the seal as well as muscles further accentuating the SE.² CO₂ accumulated in subcutaneous tissue diffuses through the capillaries to the venous system where it is carried via the pulmonary arteries to the lungs and eliminated through exhalation. If CO₂ is not eliminated through the lungs, it can lead to hypercapnia. Another possible cause of hypercapnia is exhausted soda lime (though we excluded this cause) or inadequate ventilation. Subcutaneous emphysema as result of CO₂ insufflation has negative effect on pulmonary and chest wall compliance which results in ventilation/perfusion (V/Q) mismatch, increased airway pressure and difficulty in ventilating the patient during lap surgery leading to hypercapnia and rise in Et CO₂. In the present case EtCO₂ increased up to 55 mmHg and persisted at this level till the end of surgery as there was difficulty in ventilating the patient. Other workers have also reported hypercapnia due to SE during laparoscopic surgery.⁴

Our patient developed massive SE grade 3 on 4 point scale of SE.⁵ We failed to detect it intra operatively due to oversight and partly due to failure to examine and palpate the chest wall, neck and arms of the patients as these were completely covered by the surgical drapes. Though this complication was diagnosed quite late, we were able to successfully manage it by mechanically hyperventilating the patient and providing other supportive measures without causing any other morbidity. There was dramatic and rapid improvement in patient's clinical condition within 6 hours. Other studies have also reported complete recovery from SE within 4 hours postoperatively.⁴

Following precautions have been recommended to be taken during laparoscopic surgery;⁶

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