

Sudden Refractory Increase in End-tidal Carbon Dioxide A Diagnostic Dilemma

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Introduction

A 64 year old male without significant medical or family history, undergoing an elective laparoscopic unilateral inguinal hernia repair, experienced a sudden refractory increase in end-tidal carbon dioxide (ETCO₂).

Case Description

Induction was carried out uneventfully with propofol, remifentanyl, and rocuronium. Anaesthesia was maintained with total intravenous anaesthesia (TIVA).

Early in the case, a TIVA pump pressure alarm necessitated the brief use of sevoflurane for ~2-3 minutes, to ensure maintenance of anaesthesia until line patency was confirmed and TIVA was resumed.

Shortly following both abdominal insufflation and this brief sevoflurane exposure, a sudden and significant rise in ETCO₂ was observed.

The ETCO₂ rose from 4.9kPa to 8.9kPa, and then to 10.2kPa over 5-10 minutes.

The rise continued and was refractory to increased ventilation, increased fresh gas flow, and change of soda lime cannister.

No tachycardia or increased oxygen requirement was observed. Saturations and airway pressures remained stable. A rise in temperature of 0.4°C (35.6 to 36.0°C) was also noted.

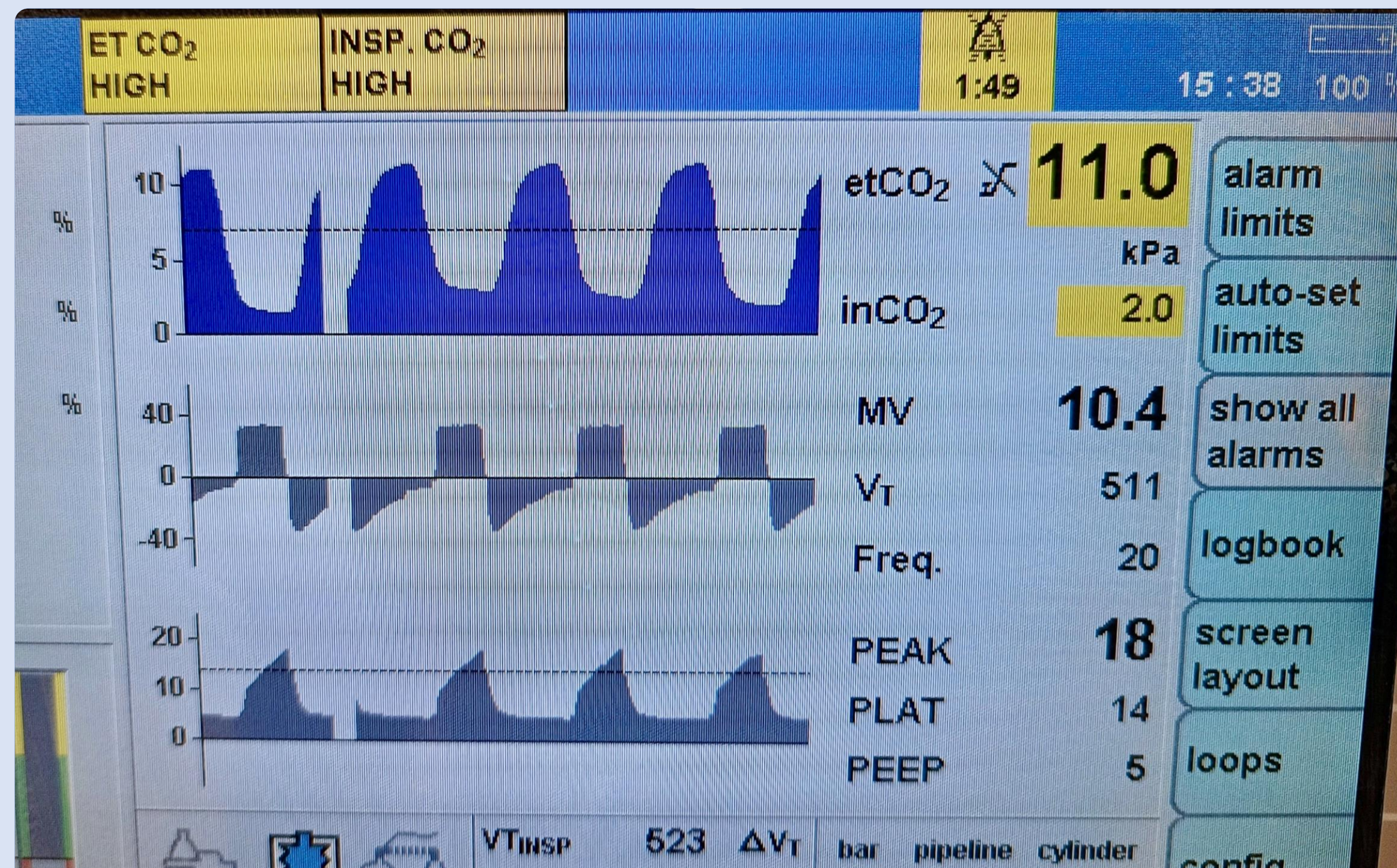


Fig. 1: Anaesthetic machine screen at peak ETCO₂ following change of soda lime.

Examination of the patient found bilateral air entry without added sounds, but on palpation revealed the presence of supraclavicular subcutaneous emphysema, which explained the observed rise in ETCO₂.

The surgical team was informed. They reported no palpable subcutaneous emphysema in the surgical field, but agreed to reduce insufflation pressures, and the operation was completed promptly. ETCO₂ remained high.

Following removal of the surgical drapes, significant widespread posterolateral chest wall and flank subcutaneous emphysema was discovered.

Anaesthesia and mechanical ventilation was continued until ETCO₂ returned to acceptable levels, and the patient was extubated uneventfully.

Discussion

This case provided a clinical diagnostic challenge. A rapid, refractory increase in ETCO₂ with concurrent temperature rise, following an unplanned exposure to a malignant hyperthermia triggering agent, made malignant hyperthermia the primary differential diagnosis.

This created a clinical scenario where the true diagnosis could have been missed in a rush to treat the most serious, and potentially lethal¹, cause.

The presence of grossly detectable subcutaneous emphysema secondary to laparoscopy is uncommon, reported to be between 0.43% and 2.3%².

Risk factors for its development include multiple attempts at abdominal entry, use of 4 or more trocars, high intra-abdominal pressures, and procedures lasting >3.5 hours², none of which were present in this instance.

The case highlights the importance of clinical examination, alongside the use of appropriate monitoring, as without the physical finding of supraclavicular subcutaneous emphysema, the diagnosis may have been delayed or an inappropriate treatment could have been provided to the patient.

Overall the case provided an opportunity to consider the immediately life threatening causes of an acute rise in ETCO₂, and narrow down differential diagnoses to identify the true culprit.

Acknowledgements

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References

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