

CASO CLÍNICO

Intraoperative Hypercapnia in Transanal Minimally Invasive Surgery: A Case Report

Hipercápnia Intraoperatória em Cirurgia Transanal Minimamente Invasiva: Um Relato de Caso

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Palavras-chave

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Keywords

Emphysema/etiology; Hypercapnia/etiology; Intraoperative Complications; Minimally Invasive Surgical Procedures

ABSTRACT

Transanal minimally invasive surgery (TAMIS) was first described in 2015 and allows resection of early stage malignant rectal lesions or more advanced lesions when the patients are clinically unable to undergo more aggressive surgery.

We report a case of hypercapnia during TAMIS presumably related to gas leak from the rectum cavity and absorption into the arterial blood. Although the patient was treated conservatively and showed no clinical consequences of the events described, this report highlight the need for awareness about the gas leak as a possible complications related to this techniques and need for closer monitoring as these might result in immediate or delayed respiratory failure.

RESUMO

A cirurgia transanal minimamente invasiva (TAMIS) foi descrita pela primeira vez em 2015 e permite a ressecção de lesões rectais malignas em estadios precoces ou lesões mais avançadas quando a condição clínica do doente não permite cirurgia mais agressiva.

Reportamos um caso de hipercápnia durante TAMIS presumivelmente relacionada com fuga de gás da cavidade rectal e absorção arterial.

Apesar de a doente ter sido tratada conservadoramente e não apresentar conseqüências do evento descrito, este caso enaltece a necessidade de atenção à fuga de gás como uma complicação relacionada com esta técnica e de monitorização apertada uma vez que esta pode levar a insuficiência respiratória imediata ou tardia.

INTRODUCTION

Over the last decades there were important improvements in transanal surgery with local treatment of cancer arising as an alternative to a more invasive removal of the rectum, particularly in patients with early stage tumors but also for those considered medically unfit for major procedures.¹⁻⁴

In 1983 the transanal endoscopic microsurgery (TEM) was introduced by Buess *et al*⁵ for the treatment of early rectal cancer and other benign lesions as a technique to improve the conventional Parks transanal excision (TAE).⁶ Almost 30 years later Atallah *et al*⁷ described (transanal minimally invasive surgery) TAMIS. It has progressively gained popularity as a safe procedure that is believed to require a shorter learning curve for those with laparoscopic single port experience, less complex equipment and overall being more affordable.^{3,4}

This report describes a possible complication resulting from the inflation with carbon dioxide (CO₂) gas.

The patient in this case was properly informed and gave written informed consent for the publication of this clinical information.

CASE REPORT

An 80-year-old female patient (weight 56 kg) was admitted for transanal minimally invasive surgery for a rectal adenocarcinoma. With a past medical history of hypertension, insulin dependent diabetes mellitus type 2 and a surgical history of mastectomy under general anaesthesia for breast cancer, American Society of Anesthesiologists (ASA) physical status classification was III. Pre-anaesthetic assessment data, including electrocardiogram (EKG), chest x-ray and routine laboratory tests, were within normal limits. On arrival at the operating room (OR) we administered 1.5

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mg midazolam and induced anaesthesia with 100 µg fentanyl, 120 mg propofol and 40 mg rocuronium. The airway was secured using a size 7 orotracheal tube and the patient was positioned in lithotomy-Trendelenburg. As the procedure began additional 50 µg fentanyl and 10 mg rocuronium were administered and anaesthesia was maintained using sevoflurane (MAC 1). Within half an hour end tidal CO₂ (EtCO₂) rapidly increased and, despite attempts to optimize volume and minute ventilation, reached 69 mmHg. Simultaneously the patient became hypertensive (175/75 mmHg) and the electrocardiogram (EKG) showed a decrease in QRS complexes' amplitude. Peripheral saturation was only slightly decreased to 94%.

Suspecting a pneumothorax or atelectasis the procedure was interrupted and we began manual ventilation of the patient. Intraoperative chest x-ray and 12 derivations EKG were requested and an arterial blood gas sampling (ABG) (Table 1) was obtained.

Table 1. Arterial Blood Gas Sampling Results

	pH	pCO ₂ (mmHg)	pO ₂ (mmHg)	Hb (g dL ⁻¹)	K ⁺ (mmol/L ⁻¹)	Na ⁺ (mmol/L ⁻¹)	Ca ²⁺ (mmol/L ⁻¹)	Cl ⁻ (mmol/L ⁻¹)	Lac (mmol/L ⁻¹)	SatO ₂ (%)	HCO ₃ ⁻ (mmol/L ⁻¹)
After EtCO₂ sudden rise	7.207	73.3	145	11.5	3.8	141	1.16	105	0.4	98,8	24.2
Before extubation	7.330	52.7	103	11.2	3.7	140	1.09	103	0.6	97,5	25.4
1 hour after extubation	7.368	48.7	83.6	10.8	3.7	138	1.10	103	0.7	95,8	26.2
24 hours after surgery	7.370	41.2	85.1	10.1	3.8	140	1.10	106	0.8	96,7	25.8

LEGEND:
 pCO₂, partial pressure of carbon dioxide; pO₂, partial pressure of oxygen; Hb, hemoglobin; Lac, lactates; SatO₂, oxygen saturation

No obvious perforation of the rectal wall was reported by the surgeons.

By the time the technicians got to the OR the patient was hemodynamically stable, the EKG in our monitors within baseline and EtCO₂ decreasing. Both exams showed no relevant changes.

After discussion, considering only the rectal wall defect needed to be repaired, we proceeded to finish the surgery and for about 20 minutes permitted a rise in EtCO₂ that began immediately after CO₂ source re-activation.

After 1 hour and 40 minutes (delayed by the necessity of intraoperative exams) the neuromuscular blockade was antagonized with 200 mg sugammadex and with adequate minute ventilation and full recovery of the train of four (TOF) responses the patient was safely extubated. ABGs were obtained before, 1 hour and 24 hours after extubation (Table 1).

In the Post Anaesthesia Care Unit (PACU) the patient showed no neurological complications but had a distended abdomen and tympanic sounds on percussion. Considering the outstanding recovery the patient was transferred to the

surgical ward after discussion with the intensive care unit team with recommendation for closer monitoring for any signs or symptoms of respiratory distress.

At observation in the first 12 hours the patient was asymptomatic but at the 24 hours postoperative physical exam there was a small area of subcutaneous emphysema on the upper right hemithorax which lead us to the assumption that the clinical presentation during the surgery was due to CO₂ leak. No further measures were taken and on daily physical exams she showed progressive improvement of the emphysema being discharged on the fourth postoperative day fully recovered.

DISCUSSION

Since its first introduction by Atallah *et al*⁵ several reports have shown results that support TAMIS as an important technique for the management of rectal cancer.^{2,6-8} Concurrently

several complications have been described for both TEM and TAMIS with bleeding and urinary retention as the most common but also sepsis, peritoneal perforation, urinary tract infection, rectal stenosis, hemorrhoid thrombosis.^{2,6,7,9-11} Non traumatic emphysema following TEM though very rare has been reported¹²⁻¹⁴ and is expected to increase with the growth of TAMIS.

During the procedure CO₂ is the preferred gas for rectal distention since it is more rapidly absorbed than air.

Considering the full clinical presentation we assumed it was probably due to a leak of CO₂ from the rectum cavity to the retroperitoneum and consequently to the mediastinum and subcutaneous tissue as a result of anatomic continuity between these structures.¹⁵ Even though no further testing was performed mainly because the patient had an almost immediate recovery this could explain the sudden CO₂ increase as a result of it's rapid absorption to the blood stream and the change to a low voltage EKG as a result of a subcutaneous emphysema or a pneumomediastinum. Additionally, the patient presented a distended, tympanic

abdomen in the PACU. Having not fully considered this hypothesis at the time of the first signs we did not actively look for subcutaneous emphysema in the areas we could not reach during surgery nor in the recovery room.

The slight crepitation felt on the following 24 hour observation showed some evidence the patient might have had a larger emphysema that had already been absorbed. The abdomen exam was also normal without any tenderness and the postoperative x-ray did not show any changes from the pre-operative exam.

Furthermore there is the fact that when the surgery was temporarily stopped and the CO₂ source was suspended there was some degree of decrease in the EtCO₂ and, when it was resumed, it increased again coming to a normal value after the end of surgery.

Despite the surgeons not reporting any obvious wall perforation it might have happened as the mesorectal fat might not be enough to prevent the CO₂ from entering the cavities, as described by Simkens *et al.*¹³

LEARNING POINTS

This complications should be considered whenever this clinical picture is seen during TAMIS.

Although it is possibly life threatening there are several cases in the literature of full recovery with expectant management, highlighting the role of close observations and early recognition of respiratory failure signs and symptoms.

Responsabilidades Éticas

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Ethical Disclosures

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