

PERIOPERATIVE AIRWAY EDEMA DUE TO PROLONGED TRENDLENBURG
POSITION

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ABSTRACT

Airway edema is an uncommon but potentially life-threatening complication following prolonged surgery in the Trendelenburg position, particularly during laparoscopic pelvic procedures. Early recognition and appropriate airway assessment are essential to prevent post-extubation airway compromise. We report the case of a 37-year-old woman who developed clinically significant airway edema following a prolonged laparoscopic total hysterectomy performed in the lithotomy and steep Trendelenburg position. Bilateral conjunctival edema was noted and subsequent negative cuff leak test suggested significant upper airway edema. Extubation was delayed, and the patient was managed with reverse Trendelenburg positioning, intravenous corticosteroids, diuretics, and continued mechanical ventilation. She was successfully extubated later after positive cuff leak test. This case highlights the importance of anticipating airway edema in patients undergoing prolonged laparoscopic pelvic surgery in the Trendelenburg position with conjunctival edema and emphasizes the value of the cuff leak test in guiding safe extubation.

KEYWORDS: Conjunctival edema, Cuff leak test, Delayed extubation, Trendelenburg position.

INTRODUCTION

The Trendelenburg position is routinely employed during laparoscopic pelvic surgery to improve surgical exposure by displacing abdominal viscera away from the operative field. However, prolonged steep Trendelenburg positioning combined with pneumo-peritoneum can lead to significant physiological changes, including increased venous pressure in the head and neck, reduced lymphatic drainage, facial and airway edema, elevated intracranial and intraocular pressures and altered respiratory mechanics.^[1,2]

Although postoperative airway edema is relatively uncommon, it may result in failed extubation, respiratory distress, or the need for emergency re-intubation.^[3,4] Several risk factors have been identified, including prolonged surgical duration, excessive intravenous fluid administration, obesity, prolonged pneumo-peritoneum, and extended periods in the Trendelenburg position. Careful airway assessment before extubation, particularly using the cuff leak test in selected patients,

can facilitate early recognition of clinically significant laryngeal edema and improve patient safety.^[5,6]

We present a case of perioperative airway edema following prolonged laparoscopic total hysterectomy in the Trendelenburg position, which was successfully managed with delayed extubation and conservative treatment.

CASE REPORT

A 37-year-old woman weighing 55 kg, with no known comorbidities, was scheduled for elective laparoscopic total hysterectomy with bilateral salpingectomy under general anesthesia for fibroid uterus. Preoperative evaluation, including airway assessment and routine laboratory investigations, was unremarkable. She was classified as American Society of Anesthesiologists (ASA) physical status I.

After establishing routine monitoring, anesthesia was induced using a standard intravenous induction technique, and the trachea was intubated uneventfully.

Anesthesia was maintained with oxygen, nitrous oxide, and sevoflurane, with intermittent top-up doses of cisatracurium to facilitate muscle relaxation.

The patient was positioned in lithotomy, and pneumo-peritoneum was established. Surgery was performed in the 30 degree Trendelenburg position. There was no significant hemodynamic changes during this. Intraoperatively, dense adhesions between the urinary bladder and uterus resulted in technically challenging dissection, significantly prolonging the surgical duration. Surgery lasted for 6 hours and patient remained in the Trendelenburg position for approximately four hours.

Throughout the intraoperative period, hemodynamic parameters remained stable. Mild subcutaneous emphysema was noted over the right side of the chest; however, end-tidal carbon dioxide remained within normal limits. Estimated blood loss was approximately 700–800 ml. The patient received 3 L of crystalloid solution intraoperatively, and urine output was 400 ml. Arterial blood gas analysis performed at the end of surgery was within normal limits.

Following completion of the procedure, which included vaginal specimen retrieval and vault closure, bilateral conjunctival edema was observed. In view of the prolonged Trendelenburg positioning and conjunctival edema, underlying airway edema was suspected. Thus extubation was deferred. The patient was placed in the reverse Trendelenburg position, and a cuff leak test was performed. The test was negative, with no audible air leak around the endotracheal tube and no reduction in expired tidal volume after cuff deflation, suggesting significant airway edema.

Based on these clinical findings, perioperative airway edema was diagnosed. The patient received intravenous hydrocortisone 100 mg, dexamethasone 8 mg, and furosemide 10 mg. Mechanical ventilation was continued while maintaining the reverse Trendelenburg position.

A repeat cuff leak test was done after 30 minutes which demonstrated an adequate air leak, indicating improvement in airway edema. Neuromuscular blockade was reversed, and the patient was extubated uneventfully. She was fully awake, maintained adequate spontaneous ventilation, and showed no evidence of stridor, respiratory distress, or oxygen desaturation. She was nebulized and transferred to the intensive care unit for close postoperative observation.

Her postoperative recovery was uneventful. No further airway-related complications occurred, and she was discharged home on the third postoperative day.

DISCUSSION

Steep Trendelenburg positioning is frequently used during laparoscopic gynecological and robotic pelvic surgeries to optimize surgical visualization. However,

prolonged duration in this position, particularly when combined with pneumo-peritoneum, can predispose patients to significant upper airway edema due to increased venous hydrostatic pressure, impaired venous return from the head and neck, and reduced lymphatic drainage.^[1,2]

In the present case, the patient remained in the Trendelenburg position for nearly four hours because of difficult dissection caused by dense bladder adhesions. Although she was not obese and had no significant comorbidities, prolonged positioning together with administration of approximately 3 L of crystalloid solution likely contributed to tissue fluid accumulation.^[2,4] The development of conjunctival edema served as an external indicator of generalized cephalad fluid shift and prompted careful airway evaluation before extubation.

The cuff leak test remains a valuable bedside tool for identifying clinically significant laryngeal edema.^[5] Although its sensitivity is variable, a negative cuff leak test has relatively high specificity for predicting post-extubation airway obstruction. In this patient, the initial absence of a cuff leak prompted delayed extubation, thereby reducing the risk of post-extubation respiratory compromise.^[5,6] Following conservative management, the repeat cuff leak test became positive, allowing safe extubation.

The management of perioperative airway edema primarily involves delaying extubation until airway swelling subsides while maintaining adequate oxygenation and ventilation.^[3,4] Reverse Trendelenburg positioning facilitates venous drainage from the head and neck.^[1,4] Corticosteroids such as dexamethasone and hydrocortisone are commonly administered to reduce inflammatory edema, although evidence regarding their efficacy in acute postoperative airway edema remains variable. Diuretics may be considered in selected patients with suspected fluid overload. Careful clinical reassessment remains the cornerstone for determining readiness for extubation.^[3,6]

Several reports have described airway edema following prolonged robotic pelvic surgery, radical prostatectomy, and gynecological laparoscopic procedures, particularly when operative time exceeds three to four hours.^[2,4] This case further emphasizes that airway edema can also occur during conventional laparoscopic hysterectomy when prolonged Trendelenburg positioning becomes necessary due to intraoperative technical difficulties.

Anesthesiologists should maintain a high index of suspicion for airway edema in patients undergoing prolonged laparoscopic pelvic surgery. Clinical indicators such as facial or conjunctival edema, prolonged operative duration, substantial intravenous fluid administration, and difficult surgical exposure

should prompt thorough airway assessment before extubation.^[5,6,7]

CONCLUSION

Prolonged Trendelenburg positioning during laparoscopic pelvic surgery can result in clinically significant airway edema despite stable intraoperative physiological parameters. Careful postoperative airway assessment is essential in patients with prolonged operative duration, conjunctival edema, periorbital edema or other risk factors. The cuff leak test serves as a useful adjunct in evaluating airway patency before extubation. Delayed extubation combined with conservative management, can facilitate safe recovery and prevent potentially life-threatening post-extubation airway obstruction.

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