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Case Report

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Opioid-Free Mastectomy in A Spontaneously Breathing Patient with Severe Tracheal Stenosis

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Abstract

Background: *Mastectomy remains the mainstay of treatment of breast cancer and is traditionally performed under general anesthesia and invasive ventilation, often complemented with regional techniques. Tracheal stenosis is a rare condition presenting as a challenge to anesthesiologists, as airway management is difficult in this setting.*
Case Presentation*: A 68-year-old female with recurrent idiopathic severe subglottic tracheal stenosis and invasive breast cancer presented for simple mastectomy. Surgery was successfully performed without airway instrumentation under an opioid-free regimen consisting of thoracic epidural, propofol and dexmedetomidine perfusion, and non-opioid analgesics. The patient remained sedated in spontaneous ventilation, with adequate perioperative pain control.*
Conclusions: *Opioid-free anesthesia without airway instrumentation is a suitable option for patients presenting for mastectomy.*

Keywords: *tracheal stenosis; mastectomy; thoracic epidural; opioid-free anesthesia.*

Introduction

Breast cancer is the most frequently diagnosed malignancy in women worldwide [1]. Surgery remains the primary form of treatment and is routinely performed under general anesthesia [2]. However, patient comorbidities can increase perioperative morbidity and mortality, prompting the need for adaptations in the anesthetic approach. Tracheal stenosis is a rare condition [3] that represents a challenge in airway management, as endotracheal intubation is difficult in this setting and can further aggravate the stenosis. Regional anesthetic and analgesic techniques are available for breast procedures but are often used to complement general anesthesia. Sporadically, regional anesthesia alone has been reported to be successfully employed in surgical breast procedures [2,4-7]. We present the case of a patient with severe subglottic tracheal stenosis who underwent mastectomy under opioid-free anesthesia without airway instrumentation.

Case report

A 68-year-old female, American Society of Anesthesiologists (ASA) physical status III, was scheduled for simple mastectomy due to invasive breast cancer (cT1bN0Mx). Relevant medical history included: paroxystic atrial fibrillation medicated with apixaban; lung cancer (cT1bN0Mx) undergoing stereotactic body radiation; marked thoracic kyphosis; and severe idiopathic subglottic stenosis undergoing multiple and frequent therapeutic dilations due to recurrent stenosis.

Two weeks prior to the event, airway optimization was performed with rigid bronchoscopic dilation. Bronchoscopy revealed a circumferential subglottic stenosis measuring less than 6.2 mm, resulting in 90% reduction of the tracheal lumen, located 5 mm inferiorly to the vocal cords and extending 2 cm in length (Figures 1A and 1B).

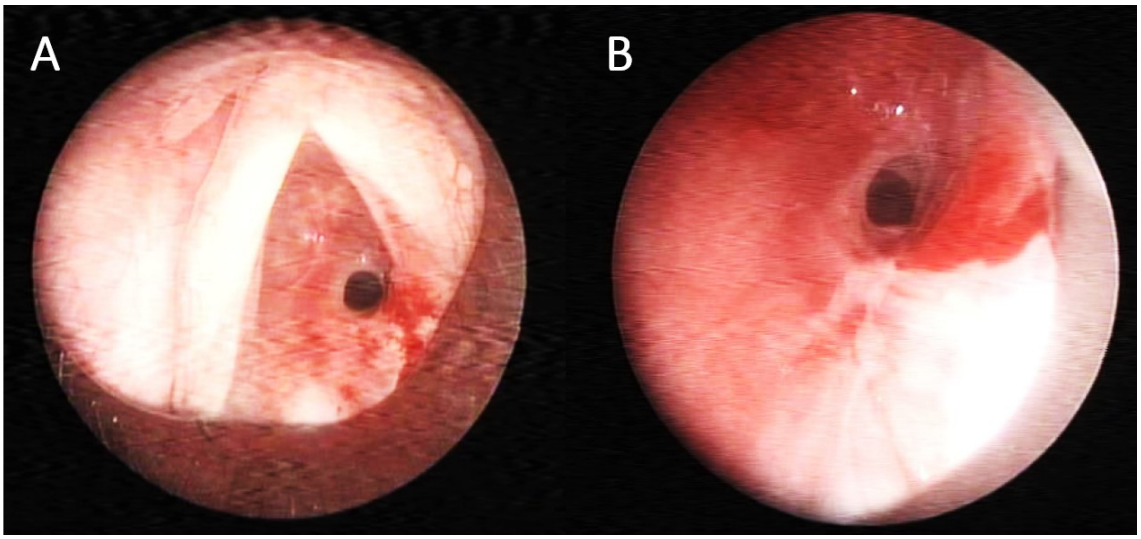

Figure 1: Bronchoscopic view of the vocal cords (A) and subglottic tracheal stenosis (B).

Therapeutic dilation and mechanical extraction of fibrotic tissue was performed yielding a final diameter of 7.5 mm (Figure 2).

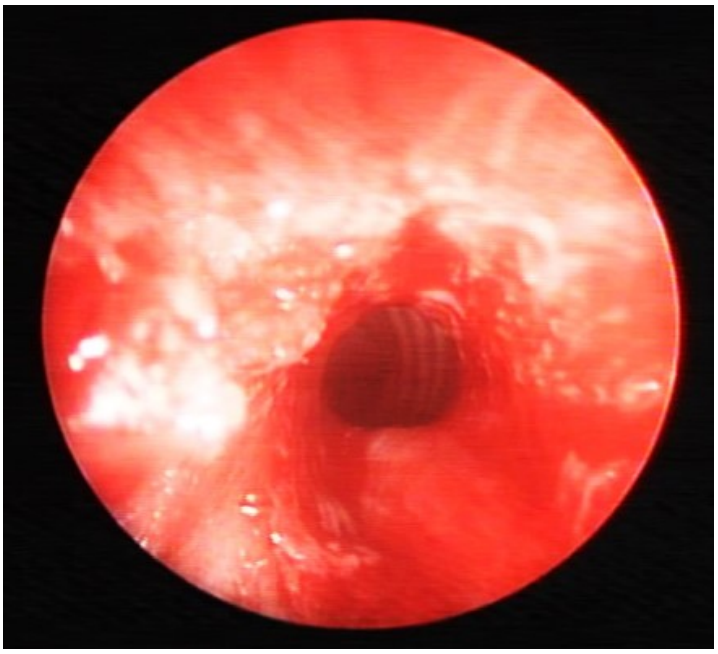

Figure 2: Final appearance after rigid bronchoscopic dilation and mechanical extraction of fibrosis.

Pulmonary function tests showed reduced expiratory flow (Figure 3).

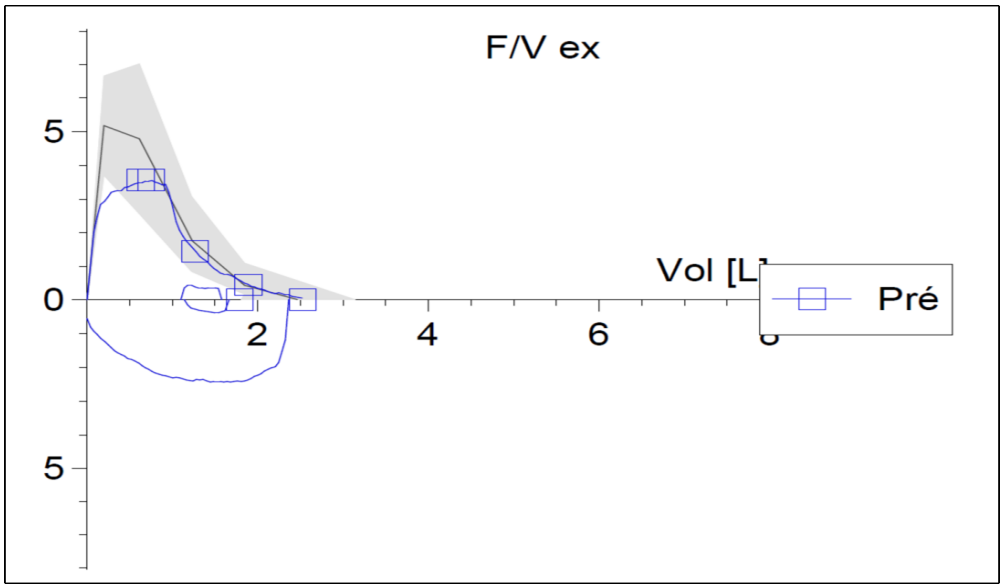

Figure 3: Flow-volume loop revealing decreased maximal expiratory flow in the context of tracheal stenosis.

Pulse oximetry revealed a baseline saturation of 97%. Preoperative airway assessment revealed: Mallampati class I; inter-incisor gap greater than 3 cm; upper lip bite test class I; thyromental distance greater than 6 cm and preserved cervical mobility. The patient mentioned exertional dyspnea but was able to perform daily activities. Although stridor was described in medical records, it was not present at the time of assessment, perhaps due to the recent dilation procedure.

Due to the presence of severe subglottic stenosis, avoiding airway instrumentation was considered fundamental, as endotracheal tube (ETT) placement would be difficult and could result in additional trauma, airway bleeding and subsequent worsening of the stenosis. Thus, performing mastectomy under regional anesthesia, while preserving spontaneous ventilation, was considered the most adequate approach. Apixaban was discontinued 72 hours prior to the procedure and bridging with enoxaparin was instituted following specialized immunohematology guidance. Preoperative coagulation parameters were within a normal range.

On the day of the procedure, the patient was monitored according to ASA standards. Supplemental oxygen was administered at 3L/min through a nasal cannula with end-tidal carbon dioxide (EtCO2) monitoring. Bispectral index (BIS) monitoring was used to assess depth of sedation.

Under sedation with propofol, administered by target-controlled infusion (TCI) with Shnider's pharmacokinetic model (effect site target of 0.8 - 1.2 µg/mL), the patient was placed in the right lateral decubitus for thoracic epidural catheter (TEC) placement. Although marked thoracic kyphosis increased the difficulty of epidural placement (Figure 4), an 18-gauge Tuohy needle was easily inserted and a loss-of-resistance to air was detected at 5 cm. The TEC was threaded easily cephalad, placed at a depth of 10 cm from the epidural space to the skin and 12 mL of 0.5% ropivacaine were administered. Prior to the surgical incision, the patient was placed in the supine position and a "pinch test" was performed without eliciting pain.

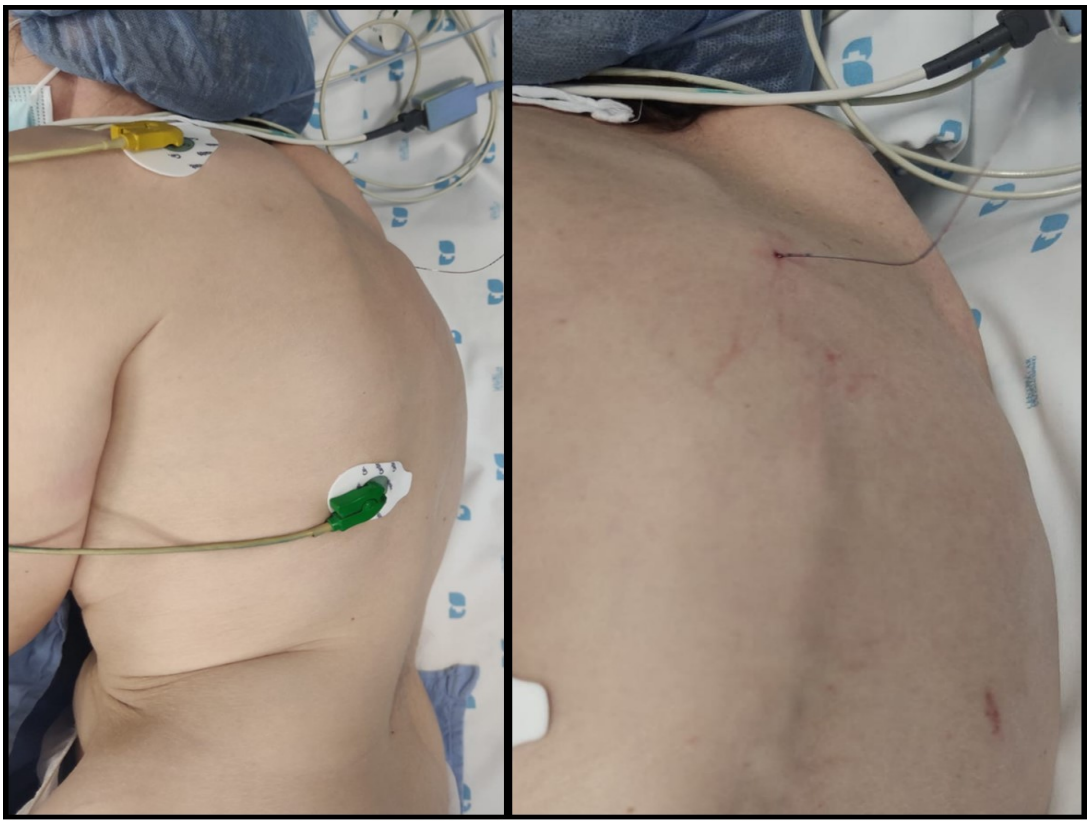

Figure 4: Marked thoracic kyphosis.

For patient comfort, propofol TCI was maintained with an effect site target ranging between 1 and 2 μg/mL and dexmedetomidine was infused at a rate of 0.55 μg/kg/h. BIS values ranged between 40 and 60, yet the patient remained in spontaneous ventilation and did not require artificial airway devices. Nevertheless, airway management equipment was readily accessible and prepared.

The intraoperative period was uneventful. The procedure lasted two hours and approximately 100 mL of blood were lost. The patient remained in spontaneous ventilation with a mean peripheral oxygen saturation of 99% throughout the entire procedure. Hemodynamic changes, such as tachycardia and hypertension, suggestive of inadequate analgesia were not observed and no epidural local anesthetic top-ups were needed during surgery. Intraoperative analgesia was supplemented with intravenous acetaminophen (1g), metamizol (2g), ketorolac (30 mg), lidocaine (1.5 mg/kg) and magnesium sulphate (40 mg/kg), warranting an intra and postoperative opioid-free technique. Postoperative nausea and vomiting prophylaxis was provided with intravenous dexamethasone (4 mg) and ondansetron (4 mg). Blood gas analysis in the immediate postoperative period was within normal limits (pCO2 44 mmHg; pO2 177mmHg; pH 7.38; sO2 100%). Optimal surgical conditions were reported by the surgical staff. Emergence was rapid and pain was not reported.

The patient was transferred to the Post-Anesthesia Care Unit for periodic assessment and monitoring. She remained conscious, hemodynamically stable and her respiratory rate and oxygen saturation varied within the normal range. Unilateral upper limb paresthesia was reported, which subsided within 24 hours. Neurological assessment was unremarkable. Neither intraoperative awareness, post-operative recall, pain, shivering, nausea or vomiting were experienced.

For the remaining in-hospital stay, the patient was transferred to a level one care unit. Postoperative pain relief was adequately achieved with patient-controlled epidural analgesia with 0.2% ropivacaine (PIB 8mL - 8id, PCA 4mL - Lockout 20 minutes) and acetaminophen. Pain level varied between 0 and 2 out of 10 in the Numeric Rating Scale. Rescue opioid analgesia was not necessary. The TEC was removed without complications and the patient was discharged on the second postoperative day, rating the procedure 5 out of 5 in terms of overall satisfaction. Informed consent was provided for publication of this report.

Discussion

We have described the case of a successful opioid-free combined anesthetic technique without airway instrumentation in a patient with severe idiopathic subglottic tracheal stenosis undergoing simple mastectomy. Tracheal stenosis is a rare condition [3] that may be congenital or acquired, the latter most commonly related to trauma induced by intubation or tracheostomy [8]. Our patient was diagnosed with idiopathic subglottic stenosis during the perioperative workup for thyroidectomy.

Spontaneous ventilation with EtCO2 monitoring was pursued since endotracheal intubation in this setting would be difficult. Tube placement would result in trauma, with subsequent formation of fibrotic tissue and further narrowing of the pre-existent stenosis [9]. Airway hemorrhage could also ensue with a potential fatal outcome. Additionally, mechanical ventilation would be challenging. Selection of the best-fit ETT would have to take its outer diameter (OD) into account. Therefore, the stenosis could accommodate a maximum internal diameter (ID) of 5.5 mm (OD of 7.2 mm) [10]. A reduction in ID would result in increased turbulence and resistance. Consequently, airflow would decrease, higher driving pressures would be necessary to deliver tidal volume and the time required to exhale would increase, resulting in air trapping and auto-PEEP with potential hemodynamic implications [11].

The patient's position in the supine allowed full access to the airway at all times. In the event of central apnea, airway equipment was readily accessible and rescue ventilation would be delivered with the LMA Fastrach ™ supraglottic airway device (SGD). Since definitive airway protection is only achieved with endotracheal intubation [12], placement of a SGD was not deemed necessary ad initium, as long as the patient's respiratory drive and airway patency was maintained. In the event of having to secure the airway, the LMA Fastrach ™ would be advantageous, as fiberoptic-intubation would be possible.

Avoiding endotracheal intubation influenced our anesthetic technique. Many case reports have documented successful breast surgery under regional anesthesia with the use of nerve blocks or epidural anesthesia [2,4-7]. In order to achieve effective surgical anesthesia, a sensory block between the second and seventh thoracic dermatomes is necessary [7]. Nerve blocks have demonstrated positive results in breast surgery, however, multiple blocks must be combined in order to achieve complete anesthesia of the breast [5,6,13]. Thoracic epidural was chosen due to successful reports [2,7] and our superior experience with this technique. It is able to provide adequate surgical anesthesia in breast procedures and has been described as a suitable option for patients with airway disease [7]. In addition to providing regional anesthesia, thoracic epidural attenuates the surgical stress response, improves pulmonary function and provides postoperative analgesia, allowing prompt recovery and hospital discharge [14].

To optimize patient comfort, intravenous analgesics and sedatives were used. Propofol was administered due to its rapid onset and recovery, amnestic and antiemetic properties [15]. Furthermore, if airway management or inadequate surgical anesthesia were to ensue, it would allow rapid deepening of anesthesia. TCI allowed careful titration without compromising spontaneous ventilation [15]. Due to its sedative, analgesic and anxiolytic properties, dexmedetomidine was infused, reducing the requirements of propofol. Additionally, evidence suggesting its postoperative morphine-sparing effect and reduction of nausea and vomiting in breast surgery reinforced its use [16-18].

Opioid-based anesthesia is associated with an increased risk of respiratory depression, nausea and vomiting, increased postoperative pain scores and delayed discharge [19]. By implementing a multimodal regimen, opioid-free anesthesia is possible and has been proposed as a means to enhance recovery after surgery [19]. However, ensuring adequate postoperative pain relief is as important as decreasing intraoperative opioid use [20] and achieving an opioid-free postoperative period may be challenging [21]. By combining non-opioid analgesics that act in different sites of the pain cascade, we were able to attenuate the sympathetic response during the intraoperative period and maintain adequate analgesia in the postoperative period. The patient did not experience pain during emergence of anesthesia, reported low pain scores in the postoperative period and did not require rescue opioid therapy, reporting an overall high level of satisfaction.

Conclusion

Although tracheal stenosis increases patient morbidity and mortality and represents a challenge to anesthesiologists in terms of airway management, alternatives to traditional general anesthesia and mechanical ventilation are possible. An opioid-free approach, using thoracic epidural in combination with sedatives and other non-opioid adjuvants, avoids airway instrumentation, allows spontaneous ventilation to be maintained, and provides adequate postoperative analgesia, representing a suitable option for patients presenting for mastectomy.

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