

Successful Anaesthesia Management for Elective Laparoscopic Sterilization in a Patient with Burn Scar Contracture of the Neck: A Case Report

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Abstract

Background: Burn scar contractures, particularly in the neck region, present significant anatomical challenges that complicate airway management during anesthesia.

Case Report: A female patient with an anterior neck burn scar contracture resulting in restricted neck extension presented for elective laparoscopic sterilization. Due to the anticipated airway difficulties, Monitored Anesthesia Care (MAC) with titrated sedation was utilized to maintain spontaneous ventilation, leading to an uneventful procedure and recovery.

Conclusion: With comprehensive preoperative planning, a multidisciplinary approach, and tailored anesthesia management, elective surgical procedures can be safely performed in patients with complex burn scar contractures.

Keywords: Difficult intubation, post burn contractures, MAC.

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Introduction

Burn scar contractures, especially those located in the neck, can induce anatomical changes that severely complicate airway management during anesthesia. These structural alterations may include limited neck mobility, reduced mouth opening, and distorted regional anatomy, all of which make endotracheal intubation and mask ventilation highly challenging. [1] Successful anesthetic management in this patient population requires thorough preoperative assessment and meticulous planning. Clinicians must often be prepared to employ advanced airway techniques, such as awake fiberoptic intubation. Furthermore, a multidisciplinary approach combined with strict preparedness for emergency surgical airway access is critical to ensuring patient safety. [2,3]

Case Report

A 25-year-old female patient presented to our tertiary care facility for an elective laparoscopic sterilization procedure. Her past medical history was highly significant for a severe thermal injury sustained to the anterior cervical region during

childhood. The wound had healed by secondary intention, resulting in a mature, rigid, and non-compliant burn scar contracture (BSC) across the anterior neck. The patient reported no history of dyspnea, dysphagia, or active airway obstruction in daily life, but noted severely restricted head and neck mobility.

A specialized, comprehensive airway assessment was conducted during the preoperative evaluation. The findings showed that the patient exhibited a severe, fixed-flexion deformity of the neck with 0° of atlanto-occipital extension, rendering the standard "sniffing position" completely impossible. The Thyromental Distance (TMD) was marked at 4 cm, which is well below the standard 6.5 cm safety threshold.

Modified Mallampati Score was assessed as Class III, secondary to rigid perioral scarring and an inability to adequately protrude the tongue. Inter-incisor Mouth Opening was limited to approximately 3.5 cm. Submandibular Compliance was also severely compromised, indicating that the

tongue could not be displaced during traditional laryngoscopy. Given these extreme parameters, a standard general anesthesia approach carried a critical risk of a "Cannot Intubate, Cannot Ventilate" (CICV) scenario. Informed written consent was obtained, detailing the high-risk nature of the airway, and strict nil per os (NPO) status was verified.

The patient was transferred to the operating theater, where standard American Society of Anesthesiologists (ASA) monitors—including non-invasive blood pressure, continuous electrocardiography, and pulse oximetry—were applied. Because the surgical site (pelvic/infraumbilical) was anatomically distant from the cervical contracture, the anesthesia team elected to implement Monitored Anesthesia Care (MAC) with meticulous, titrated intravenous sedation. This plan explicitly aimed to preserve spontaneous ventilation, maintain native upper airway reflexes, and entirely avoid upper airway instrumentation trauma. We prepared and kept ready the difficult airway trolley, if we land up in CICV situation beforehand as per AIDAA guidelines. Ent team was also kept in loop beforehand.

To counter the physiologic challenges of laparoscopic surgery under MAC (diaphragmatic

splinting and reduced functional residual capacity), a strict protocol was implemented:

Positioning: The patient was positioned cautiously to avoid any traction or worsening tension on the neck contracture band.

Insufflation Pressures: Peritoneal insufflation with carbon dioxide (CO₂) was strictly limited to a low-pressure threshold (10–12 mmHg) to mitigate respiratory distress and patient discomfort.

Sedation Titration: Intravenous sedatives were titrated with extreme precision to achieve a calm, compliant state while reliably maintaining a robust respiratory drive and baseline normocapnia.

The laparoscopic sterilization was executed uneventfully. The patient tolerated the pneumoperitoneum comfortably under MAC without any episodes of hypoxia, hypercarbia, or hemodynamic instability.

No advanced airway adjuncts or surgical rescues were required.

Following the completion of the surgery, the patient was transferred to the post-anesthesia care unit (PACU) alert, oriented, and completely pain-free. She met all standard day-surgery discharge criteria without any respiratory or surgical complications and was safely discharged home later that same day.



Figure 1: Image showing post burn scar and contractures.

Discussion

Managing patients with post-burn contractures (PBC) of the face and neck presents a formidable challenge to anesthesiologists, primarily due to severe anatomical and structural distortions. [1]

Thermal injuries in the anterior cervical region frequently result in rigid, non-compliant scar tissue that limits neck mobility and impedes standard airway axes alignment. In a patient with a post-burn neck contracture (PBNC), the fundamental mechanism complicating airway management

involves the restricted hyperextension of the atlanto-occipital joint and limited mandibular protrusion. [1,4] This structural limitation restricts the alignment of the oral, pharyngeal, and laryngeal axes, making standard direct laryngoscopy exceptionally difficult or impossible.

Furthermore, dense scar tissue often reduces submandibular space compliance. This prevents the displacement and compression of the tongue into the submandibular space during laryngoscopy, pushing the larynx into an acutely anterior and superior position. Concomitant microstomia or facial scarring can further limit mouth opening, precluding the effective insertion of supraglottic airway devices (SADs) or standard rigid laryngoscope blades.

While reconstructive surgeries for PBNC (such as scar release and grafting) inherently require securing a definitive airway under general anesthesia, the present case involved an elective laparoscopic sterilization. Because the surgical site was distant from the airway deformity, the anesthesia team had the unique opportunity to bypass the risks of a "cannot intubate, cannot ventilate" (CICV) scenario by selecting Monitored Anesthesia Care (MAC) with titrated sedation.

This clinical choice stands in sharp contrast to traditional airway interventions documented in similar cases:

Awake Fiberoptic Intubation (AFOI): Widely accepted as the gold standard for anticipated difficult airways in post-burn neck contractures. For instance, Mishra et al. (2022) [1] successfully managed a severe mentosternal contracture utilizing planned awake fiberoptic intubation combined with an i-gel supraglottic airway device to secure a fixated flexion deformity. While highly reliable, AFOI is a stimulating, technically demanding procedure that requires absolute patient cooperation and expensive equipment.

Indirect Video Laryngoscopes & Optical Devices: In resource-constrained settings where fiberoptic scopes are unavailable, operators often rely on specialized video laryngoscopes or optical devices. Ponthus et al. (2025) [5] and Ali et al. (2013) [6] demonstrated that awake or asleep intubations using the Airtraq® optical laryngoscope could successfully bypass axial alignment issues owing to the device's exaggerated blade curvature. However, these techniques still subject the patient to airway instrumentation risks, such as local trauma, edema, or laryngospasm.

Pre-intubation Scarotomy: In extreme situations where facial/neck anatomy is completely distorted and mask ventilation is impossible, some centers advocate for a surgical neck release (scarotomy)

under local anesthesia or ketamine sedation prior to attempting intubation.

By choosing MAC, our approach successfully bypassed the need for any invasive airway instrumentation, eliminating the risks of upper airway trauma, edema, or the sudden loss of a native airway.

By opting for MAC and carefully titrating sedatives, the primary goal of maintaining spontaneous ventilation was successfully met. This strategy aligns closely with the core principles of the American Society of Anesthesiologists (ASA) Difficult Airway Algorithm, which emphasizes the preservation of spontaneous ventilation when a difficult airway is anticipated. [7]

Executing a laparoscopic procedure under MAC requires close monitoring and a cautious approach. Peritoneal insufflation with carbon dioxide (CO₂) increases intra-abdominal pressure, pushes the diaphragm cephalad, reduces functional residual capacity (FRC), and can cause discomfort or respiratory compromise in a sedating patient.

To mitigate these physiologic strains, the patient was carefully positioned to avoid tension on the neck contracture, insufflation pressures were kept at the minimum effective threshold to minimize diaphragmatic splinting. Sedation was meticulously balanced to preserve respiratory drive while ensuring patient compliance.

Conclusion

With careful planning and vigilant clinical monitoring, elective surgical procedures can be safely and successfully performed on patients with burn scar contractures, despite the unique anatomical challenges they present.

This case highlights the critical importance of a multidisciplinary approach—bringing together surgeons, anesthesiologists, and other specialists—to collaboratively address complex physiological issues. Tailored anesthesia management, encompassing thorough airway assessment and individualized pain control, plays an indispensable role in optimizing outcomes and ensuring patient safety.

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