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Successful Airway Management in A Patient with Severe Post Burn Contracture of the Upper Body Using MAC Assisted Preliminary Release Followed by Awake Fiber Optic Intubation: A Case Report

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Abstract | **Case Report**

Background: Extensive cervicofacial post-burn contracture (PBC) can render mask ventilation, supraglottic airway placement, tracheal intubation, and eFONA simultaneously difficult. While awake tracheal intubation (ATI) is recommended, extreme scarring may prevent classic ATI. We describe a staged, oxygenation-first approach: limited release under local anesthesia to create access, objective confirmation of ventilatability with a second-generation supraglottic device, then awake fiberoptic intubation (FOI) under cooperative sedation. ***Case:*** A 24-year-old man with severe cervicofacial PBC, fixed neck flexion, and microstomia had CT showing soft-tissue thickening without intrinsic airway stenosis. Under monitored anesthesia care with dexmedetomidine–remifentanil, continuous nasal oxygen, capnography, and staged topicalization (lidocaine governed to ≤9 mg/kg lean body weight with dose summation), a limited mentosternal release was performed. An i-gel® confirmed effective positive-pressure ventilation. The device was removed and oral FOI placed a 6.5mm reinforced tube without desaturation. Definitive release and grafting proceeded uneventfully (9 h). He remained intubated overnight for edema surveillance and underwent planned extubation on day 1 without complications. ***Conclusion:*** In extreme PBC, MAC-assisted "release before intubation," combined with disciplined oxygenation, topicalization, and predefined rescue, enables safe awake FOI and definitive surgery, providing a pragmatic, guideline-concordant option when classic ATI is not feasible.

Keywords: Post-burn contracture; Difficult airway; Awake fiberoptic intubation; Dexmedetomidine–remifentanil; Supraglottic airway.

INTRODUCTION

Extensive cervicofacial post-burn contracture (PBC) concentrates multiple airway hazards—difficult facemask ventilation, supraglottic airway device (SAD) insertion, tracheal intubation, and even emergency front-of-neck access (eFONA). Contemporary difficult-airway guidance therefore prioritizes awake tracheal intubation (ATI) when loss of airway after induction would be dangerous and when re-establishing oxygenation may be challenging [1,2]. We report a case in which monitored anesthesia care (MAC) using dexmedetomidine and remifentanil enabled a limited pre-intubation contracture release to regain partial neck extension and permit awake fiberoptic intubation (FOI), followed by definitive surgery.

A staged strategy mitigates risk when a physical bottleneck and an unfavorable laryngotracheal angle preclude classic awake FOI: perform minimal contracture release under local anesthesia to create an access window, objectively verify ventilatability with a second-generation SAD, then proceed to definitive endoscopic intubation—all while maintaining continuous oxygen delivery and predefined fail-safe transitions [1–3].

This report follows a standard case report format while embedding practical points regarding oxygenation, topical anesthesia and lidocaine dose governance, dexmedetomidine remifentanil MAC for cooperative sedation, indications and technique for "release before intubation," a predefined failure-to-secure-airway pathway, and a guideline-concordant extubation plan.

CASE DESCRIPTION

A 24-year-old man from Myanmar (height 141.9 cm, weight 43.9 kg) sustained major thermal injury 12 years earlier with inadequate post-healing care. Examination revealed dense, inelastic scarring fusing the face, neck, upper chest, and shoulders; a fixed flexion neck deformity; obliteration of the cervicomental and mentosternal angles; and microstomia. The nares and mouth were pulled inferiorly (Figure 1).

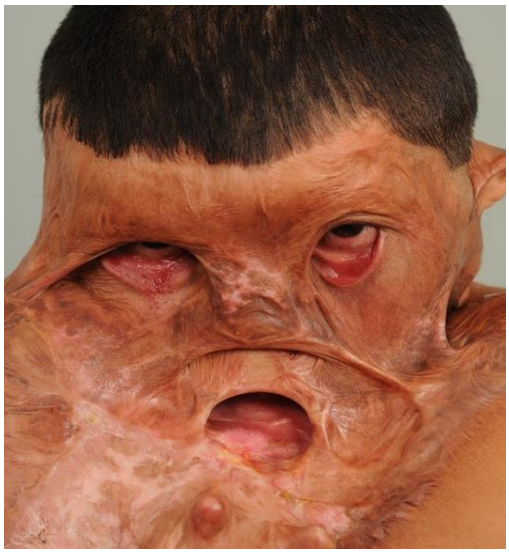

Figure 1: Preoperative external appearance.

Face-to-chest adhesion effacing the anterior neck with inferior traction of nasal and oral openings; mechanical ectropion with exposed lower palpebral conjunctiva.

Computed tomography demonstrated marked anterior cervical soft-tissue thickening with an anteriorly angulated laryngeal inlet but no intrinsic airway stenosis (Figure 2A–B). Pulmonary function and arterial blood gases were normal.

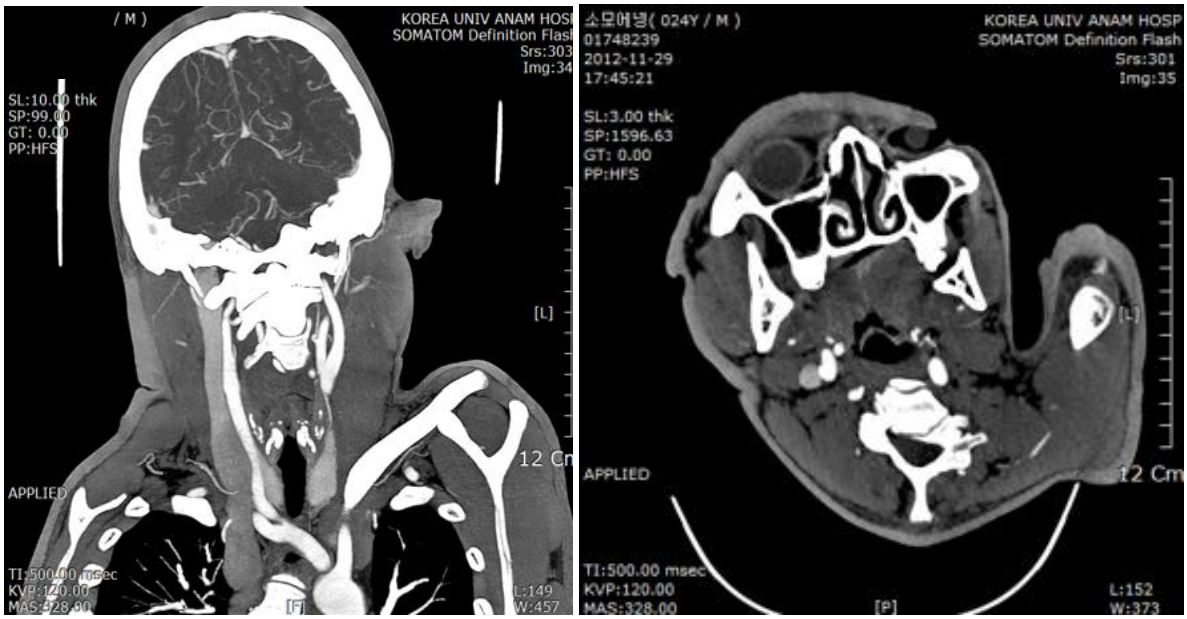

Figure 2 A–B. Preoperative cervical CT.

A, Coronal view showing dense anterior cervical scarring with narrowed upper airway and anterior laryngeal inlet. B, Axial view demonstrating airway narrowing and scar-related distortion.

Given anticipated difficult mask ventilation, difficult SAD insertion, and infeasibility of direct laryngoscopy, the multidisciplinary team (plastic surgery, anesthesiology, otolaryngology) agreed on a staged awake plan: (i) meticulous preoxygenation with the patient ramped; (ii) continuous nasal oxygen throughout airway steps; (iii) MAC with dexmedetomidine remifentanil to maintain cooperation and spontaneous ventilation; (iv) staged topical airway anesthesia within lidocaine dose limits; (v) limited mentosternal contracture release under local anesthesia to gain partial neck extension; (vi) ventilation confirmation with an i-gel®; and (vii) removal of the i-gel® followed by FOI-guided orotracheal intubation using a 6.5 mm ID reinforced tube [1–3,4,5].

Monitoring and pre-oxygenation. Standard monitoring (ECG, NIBP, SpO_2) plus BIS was applied. Pre-oxygenation with 100% O_2 for 5 min was performed with the head elevated. Continuous nasal oxygen was maintained throughout airway manipulation; high-flow nasal oxygen (HFNO/THRIVE) is preferred where available because it extends the safe apneic window and facilitates step-to-step oxygenation [1,2,4,5]. Capnography was connected to the nasal cannula to confirm ventilation per guideline recommendations [1]. Glycopyrrolate 0.2 mg IM was administered.

Sedation/analgesia (MAC**).** Dexmedetomidine 0.5 µg/kg over 10 min was followed by 0.5 µg/kg/h (typical target 0.2–0.7 µg/kg/h). Remifentanil target-controlled infusion (Minto model) commenced at 1.0 ng/mL with gentle titration in the 1–3 ng/mL range to blunt airway reflexes while preserving respiration. Midazolam 1–2 mg was reserved as rescue; none was required. Sedation was targeted to OAA/S 3–4 (cooperative, obeys commands). This dexmedetomidine remifentanil approach is supported by randomized trials and a meta-analysis showing broadly similar first pass success to remifentanil-based regimens, with dexmedetomidine often reducing desaturation and recall when carefully titrated [6–8].

Airway topicalization and lidocaine dose governance. Upper-airway anesthesia was delivered in stages with 4% lidocaine spray to the oral/nasopharynx and "spray as you go" through the bronchoscope channel to the supraglottis, supplemented by a trans-laryngeal injection (2–3 mL of 4%). Topical dose limits followed DAS ATI guidance: lidocaine ≤ 9 mg/kg based on lean body weight [2]. Lean body weight (Janmahasatian formula) for this patient was ≈ 35.7 kg, giving a topical ceiling ≈ 322 mg [9]. For local scar infiltration (with epinephrine), we adhered to common maxima of ≤ 7 mg/kg total body weight (≈ 307 mg for 43.9 kg) and, without epinephrine, ≤ 4.5 mg/kg (≈ 198 mg), consistent with pharmacology references and product labeling [10]. Topical and infiltration doses were recorded and summated to avoid local-anesthetic systemic toxicity.

Preliminary release → intubation. Under local infiltration anesthesia, the plastic surgeon incised the mentosternal scar band and performed layer-by-layer release, including limited division of strap muscles, until partial neck extension was achieved. An i-gel® was inserted to confirm efficient positive pressure ventilation (imaging suggested preserved airway caliber). The i-gel® was then removed, and a fiberoptic bronchoscope preloaded with a 6.5mm ID Lo-Contour reinforced tube was advanced orally; the cords were visualized, the tube was railroaded, and tracheal position was confirmed by capnography and auscultation. No desaturation occurred (Figure 3).

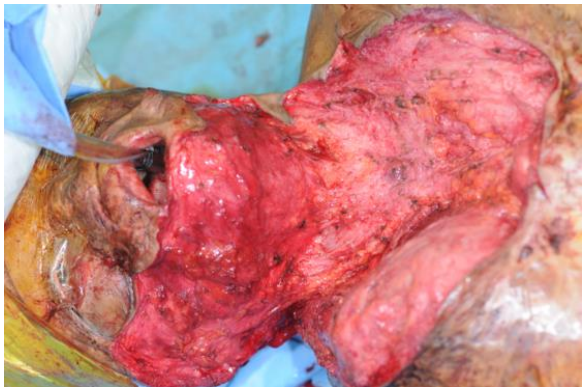

Figure 3: Post-release neck extension with endotracheal tube in situ following fiberoptic orotracheal intubation.
Orotracheal intubation with a Mallinckrodt™ Lo-Contour cuffed reinforced tube (6.5 mm ID) was performed under fiberoptic guidance.

Maintenance and surgery. After intubation, anesthesia was converted to propofol–remifentanil TCI. Extensive facial/mandibular release and debridement were completed, followed by split-thickness skin grafting (primarily from the left thigh). The total operative time was 9 hours. Intraoperatively we emphasized active warming, ocular protection, and conservative fluid therapy.

Postoperative course and extubation plan. The patient remained intubated overnight in ICU for airway-edema surveillance. The next day, with stable gas

exchange, minimal laryngeal edema, and adequate consciousness and cough, planned extubation was performed. Because reintubation was judged feasible after the releases, an airway-exchange catheter was not used; otherwise, it would have been our default bridge for high-risk extubation. He was transferred to the ward the same day without airway complications, following principles from extubation guidelines [16].

DISCUSSION

Why awake FOI? With fixed neck flexion, markedly reduced mouth opening, and distorted anatomy, induction-first strategies risk a "can't intubate, can't oxygenate" scenario. ATI is therefore a first-line option when loss of airway would be hazardous and oxygenation may not be easily recovered; success hinges on four pillars—oxygenation, topicalization, minimal goal-directed sedation, and disciplined performance [1,2]. However, classic AFOI may be impractical when scarring creates a physical bottleneck and an unfavorable laryngotracheal angle. In such cases, a staged pathway—minimal surgical release under local anesthesia, objective proof of ventilatability with a SAD, then definitive endoscopic intubation—aligns with modern algorithms that emphasize continuous oxygen delivery, attempt limits, and early transition to an alternative plan when difficulty is encountered [1–3].

Oxygenation strategy matters. In severe cervicofacial contracture, the dominant hazard is loss of oxygenation after induction. Guidance emphasizes oxygen delivery throughout difficult-airway management—including between procedural steps—and verification of ventilation with capnography [1,2]. A head-elevated position with 3–5 min of pre-oxygenation is recommended. Continuous nasal oxygen—preferably HFNO/THRIVE—can further prolong the safe apneic window by combining apneic oxygenation with low-level CPAP and dead-space washout; adult series in endoscopic airway work describe prolonged apnea without desaturation, supporting its use [4,5]. This "double safety net" is especially valuable when a surgical step precedes intubation.

Topicalization is half the battle. Inadequate upper-airway anesthesia provokes cough/laryngospasm and derails awake intubation. We followed DAS ATI guidance using lean body weight based topical lidocaine ≤ 9 mg/kg and kept a running total that included infiltration doses [2]. Staged "spray-as-you-go" plus trans-laryngeal anesthesia allowed effective yet safe dosing, while adherence to standard infiltration maxima (≤ 7 mg/kg with epinephrine; ≤ 4.5 mg/kg without) minimized the risk of local-anesthetic systemic toxicity [10].

Sedation should be minimal, slow, and goal directed. Dexmedetomidine provides cooperative sedation with little respiratory depression; remifentanil adds rapid, titratable antitussive/analgesic effects. Randomized trials and a meta-analysis support both agents for ATI, with dexmedetomidine frequently improving patient comfort and recall and reducing desaturation when appropriately titrated [6–8]. We used dexmedetomidine 0.2–0.7 µg/kg/h and remifentanil TCI 1–3 ng/mL as a practical balance; deeper targets risk airway obstruction or apnea.

"Release first" is a modern reappraisal of a classic idea. Since Tanzer's 1964 description, pre-intubation neck release under local anesthesia has been used selectively in PBC to gain extension and landmarks [11]. Subsequent series describe safe, rapid release to facilitate intubation in severe contracture [12,13]. In our patient, release created room for a SAD and improved the trajectory for FOI—without sacrificing spontaneous ventilation.

High-risk airways require explicit stop-rules and a rehearsed rescue plan. Always define failure and the rescue. We limited attempts to a "3 + 1" rule (internal limit) with explicit triggers for immediate eFONA (e.g., SpO_2 < 90% persisting ~60 s, or failure to ventilate). Our default eFONA was scalpel bougie tube per DAS 2015, with role allocation and rehearsal [3]. Scarred necks can obscure the cricothyroid membrane; pre-marking with ultrasound improves accuracy and is advisable when feasible [14,15].

Extubation is another high-risk procedure. Difficult airway guidelines emphasize that extubation planning is as important as intubation planning. The DAS extubation guideline recommends a stepwise strategy: risk stratification, optimization, clear logistics, readiness for re-intubation, and consideration of an airway-exchange catheter with enhanced monitoring in selected patients [16]. Our decision to maintain intubation overnight for edema surveillance and to extubate in a controlled setting is consistent with these principles.

CONCLUSION

In a patient with extreme cervicofacial PBC, a staged, oxygenation-first strategy—MAC-assisted limited release under local anesthesia, careful topicalization with dose governance, minimal cooperative sedation (dexmedetomidine–remifentanil), ventilation confirmation with a SAD, and awake FOI—enabled safe airway control and definitive surgery. Predefined rescue to scalpel bougie tube and a guideline concordant extubation plan were integral to safety.

Ethics: Written informed consent for publication of this case and de-identified images was obtained from the patient. Institutional case-report policies were followed.

Conflict of Interests: The authors declare no conflict of interests

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