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Successful awake intubation using Airtraq® in a low-resource setting for a patient with severe post-burn contractures

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Abstract

Background In resource-limited settings, advanced airway management tools like fiberoptic bronchoscopes are often unavailable, creating challenges for managing difficult airways. We present the case of a 25-year-old male with post-burn contractures of the face, neck, and thorax in Nigeria, who had been repeatedly denied surgery due to the high risk of airway management complications. This case highlights how an awake intubation was safely performed using an Airtraq® laryngoscope, the only device available, as fiberoptic intubation was not an option. The patient had a mouth opening of 3.5 cm, a Mallampati score of 4, and no neck extension, making intubation challenging. Pre-procedural counseling was provided, and after explaining the risks, the patient gave informed consent.

Case presentation Preoxygenation was performed, followed by topical anesthesia using lidocaine gargles and incremental spraying of lidocaine to the vocal cords via a feeding tube. The Airtraq® laryngoscope enabled glottic visualization despite limited neck mobility and challenging anatomy. Procedural challenges included managing aspiration during gargling, precise lidocaine application without advanced tools, and maintaining patient cooperation. The procedure was successfully completed, allowing surgery for contracture release.

Conclusions This case emphasizes that safe awake intubation with an Airtraq® laryngoscope is feasible in low-resource environments when key principles—oxygenation, topical anesthesia, and careful procedural steps—are followed. The reuse of a single-use device like the Airtraq® laryngoscope extends its utility in resource-constrained settings, enabling complex airway management when alternatives are unavailable. The patient tolerated the procedure well and reported minimal discomfort. This experience underscores the critical importance of innovation, resourcefulness, and patient cooperation in managing difficult airways when standard tools are unavailable, offering valuable lessons for similar resource-constrained environments.

Keywords Awake intubation, Low-resource setting, Airtraq® laryngoscope, Anticipated difficult airway, Patient safety

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Background

The World Health Organization (WHO) reports that burns cause over 250,000 deaths and result in the loss of approximately 18 million disability-adjusted life years (DALYs) annually, with more than 90% of these cases occurring in low- and middle-income countries (LMICs) [1]. Post-burn contractures affecting the face, neck, and thorax can severely limit neck mobility and mouth opening, complicating airway management during surgical procedures. Additionally, airway management is particularly challenging in low-resource settings, where the risk of difficult intubation is significantly higher [2]. Awake intubation is an essential technique for managing difficult airways, particularly in patients with complex anatomical issues like post-burn contractures [3]. Recent guidelines emphasize the importance of standardized protocols and advanced tools like video laryngoscopes and fiberoptic bronchoscopes in managing difficult airways effectively [4, 5]. However, these resources are often unavailable in low-resource settings, necessitating innovative approaches tailored to local constraints. Awake intubation is especially crucial when the difficult airway arises from predictable and well-documented conditions like retractile scars and sequelae from facial and cervical burns, which have a very high prevalence in sub-Saharan Africa [6]. However, in low-resource settings, the equipment required for advanced awake intubation techniques is often unavailable [7]. The scarcity of essential tools can make it difficult to perform procedures safely, and in some cases, patients may be denied surgery due to the high risks involved. Direct laryngoscopy was deemed highly likely to fail due to the patient's significant neck contracture, which severely limited mobility and alignment of airway structures. Consequently, a decision was made to proceed with video laryngoscopy using the Airtraq® laryngoscope as the primary approach, given its ability to provide indirect visualization of the glottis and overcome the anatomical challenges posed by the patient's condition. Additionally, the Airtraq® laryngoscope is relatively easy to use, portable, and cost-effective compared to fiberoptic bronchoscopes or other video laryngoscopes, making it a practical choice in resource-constrained settings where simplicity and reliability are critical. This case report illustrates how an awake intubation using an Airtraq® laryngoscope was successfully performed in a low-resource setting in Nigeria, highlighting the challenges and solutions associated with airway management when standard equipment is lacking.

Case presentation

A 25-year-old male with severe post-burn contractures involving both hands, forearms, thorax, neck, and face presented for surgery (Fig. 1). The burns, sustained three years earlier, caused significant scarring, completely limiting neck extension. Mouth opening was 3.5 cm with a limited tongue protrusion and thyromental distance was 4 cm. His Mallampati score was 4. All of these factors indicated a certain difficulty in airway management, including tracheal intubation, ventilation, and the need for surgical access for a rescue airway if required. Despite numerous attempts to seek surgery, the patient had been denied treatment due to the high risk of intubation failure. Aside from the contractures, the patient was otherwise healthy, with no known comorbidities.

The ideal approach was traditionally considered to be awake nasal intubation via fiberoptic bronchoscopy; however, recent studies suggest that hyperangulated blade video laryngoscopes (like the Airtraq® laryngoscope) offer comparable success rates, faster intubation times, and a shorter learning curve, making the Airtraq® a viable and effective alternative in this case [8–10]. The awake intubation procedure was explained to the patient, and no premedication or sedative was administered, as propofol was the only available option and its use could have compromised airway safety and the patient's ability to maintain spontaneous respiration. The risk of complications, such as aspiration during lidocaine administration or failed intubation due to the patient's severely restricted anatomy, was acknowledged, and contingency plans were prepared to address potential challenges. In the event of intubation failure, a surgical release of the neck contracture under local anesthesia was considered as a viable option to improve neck extension and facilitate a subsequent intubation attempt.

The procedure began with pre-oxygenation (0–5 min) using a high-concentration oxygen mask at 12 L/min to optimize oxygen reserves. Following this, topical anesthesia of the oropharyngeal region (5–35 min) was initiated by administering 1% lidocaine gargles twice, spaced 15 min apart. Challenge 1: The patient experienced difficulty gargling while seated, requiring him to tilt his body backward to achieve adequate anesthesia. This led to near choking and likely aspiration of lidocaine, causing intense coughing. Despite this, effective local anesthesia of the mouth, pharynx, upper larynx, and possibly the glottis was eventually achieved. To anesthetize the vocal cords, a feeding tube was inserted through a preloaded endotracheal tube (35–45 min). The feeding tube was advanced under direct vision with the Airtraq® laryngoscope into the oral cavity to administer 2 mL of 1% lidocaine directly onto the vocal cords. After a five-minute interval, the process was repeated with an additional 2 mL of lidocaine to ensure sufficient glottic anesthesia. Challenge 2: The absence of a recommended epidural catheter required the innovative use of a feeding tube for precise and progressive delivery of local anesthesia, ensuring patient safety and effective airway anesthesia. The intubation process followed in three stages (45–50 min).

Fig. 1 Photograph of the patient with severe post-burn contracture of the face, neck, arms, and thorax, completely limiting neck extension

First, the Airtraq® laryngoscope, preloaded with a 7.5 mm endotracheal tube (ETT), was activated early to prevent fogging and inserted. Visualization of the vocal cords was achieved despite an anterior and deviated glottis, yielding a percentage of glottic opening (POGO) score of 50%. The ETT was successfully advanced, and the cuff was inflated. Challenge 3: The absence of capnography required reliance on direct visualization of the airway to confirm successful intubation. Once airway control was confirmed, intravenous propofol was administered for sedation. The entire intubation procedure lasted approximately 50 min. Challenge 4: Effective communication was critical throughout the process, as all instructions had to be translated and reassurance provided to maintain the patient's cooperation. Despite the stress of the situation, the patient remained calm and cooperative.

The surgical procedure, which released the facial cervical and thoracic contractures, significantly improved the patient's neck mobility. The patient remained stable during the surgery and was extubated without complication. Twenty-four hours later, he reported a pain score of 1/10 and expressed gratitude for the successful procedure.

Discussion and conclusions

This case illustrates the feasibility of awake intubation using an Airtraq® laryngoscope in a low-resource setting. Though ideal equipment such as a fiberoptic scope was unavailable, the Airtraq® laryngoscope proved to be an effective alternative [11]. Compared to traditional direct laryngoscopy, the Airtraq® laryngoscope offers a significant advantage in managing difficult airways by providing an indirect view of the glottis. In this case, the patient's restricted neck mobility and limited mouth opening made direct laryngoscopy impractical and highly likely to fail. While video laryngoscopes provide superior visualization and are considered a first-line tool for many difficult airway scenarios, they were not available in this setting. The Airtraq® laryngoscope served as an effective alternative due to its affordability, portability, and ability to achieve glottic visualization in anatomically challenging airways. Studies have demonstrated that the Airtraq® laryngoscope is particularly useful in difficult airway cases, with high success rates comparable to video laryngoscopy, especially when managed by experienced users [4]. The four essential pillars of awake intubation (oxygenation, topicalization, careful procedural execution, and sedation) are not easily transposable to low-resource settings. Firstly, oxygen in sub-Saharan African countries is almost universally present but in limited quantities and with sometimes very complex supply chains [12]. Secondly, airway anesthesia with topicalization posed a significant challenge due to the absence of 10% lidocaine spray usually recommended [13]. Using 1% lidocaine without spray and step-by-step anesthesia with gargling and progressive injection through the feeding tube took 50 min. Clearly, this time was necessary to achieve sufficient anesthesia. Transtracheal injection for local anesthesia was not an option because the retractile scar covered the entire cervical region. Thirdly, sedation was not available due to the lack of pharmacological and material resources. We opted not to compromise our procedure by using small doses of propofol or ketamine which were available but not recommended [14]. Having a nurse who translated each step clearly and supported the patient during difficult moments was likely essential in maintaining the calm and cooperation the patient exhibited throughout this lengthy procedure [15].

Awake intubation using a non-video Airtraq® laryngoscope has been successfully described multiple times, even in cases of difficult airways [16]. However, this technique requires expertise, and it should be honestly stated that before attempting an awake intubation in a predicted difficult case, one must have practical experience with the Airtraq® laryngoscope. Unlike the Airtraq-video®, where all observers can provide guidance, the Airtraq® laryngoscope, with its eyepiece, offers limited and lower-quality vision [11, 17]. While the Airtraq® laryngoscope proved effective in this case, it has notable limitations compared to more advanced devices like video laryngoscopes. In fact, it provides a limited field of view through its eyepiece, which can make navigation of challenging anatomy more difficult. Unlike video laryngoscopes, the Airtraq® laryngoscope lacks real-time visual feedback that can be shared with the entire team, reducing the ability for others to assist during the intubation process or provide input.

Undoubtedly, the least visible but most impactful element, extending far beyond this single case report, is the context of severely limited resources in which this anesthesia and surgery were performed (lack of monitoring, lack functional anesthesia machine, lack of basic pharmacology), a situation that afflicts most of sub-Saharan African countries, with disparities at national, regional, and local levels especially for airway management [18, 19]. While high-income countries routinely use single-use equipment, healthcare providers in resource-limited settings often need to reuse such equipment due to supply constraints. The reuse of single-use equipment has been documented in several countries over the years and remains controversial from an environmental perspective and not recommended from a hygiene and ethic standpoint [20–23]. The WHO acknowledges the reuse of single-use devices in emergency settings while emphasizing the importance of balancing risks and benefits [24]. Additionally, research on device reuse in resource-limited settings has highlighted its prevalence and necessity while calling for clear policies and improved sterilization technologies to mitigate associated risks

[25]. The absence of capnography significantly impacted decision-making. Confirmation of endotracheal tube placement relied entirely on direct visualization through the Airtraq® laryngoscope and clinical assessment (e.g., observing chest rise and auscultation). This increased the procedural complexity and required the team to exercise heightened vigilance to avoid misplacement of the tube or hypoxia. The lack of capnography also emphasized the importance of ensuring an awake and responsive patient during intubation, further supporting the choice to avoid sedation until the airway was secured.

This case highlights the successful use of an Airtraq® laryngoscope for awake intubation in a low-resource setting, emphasizing the importance of adaptability and expertise. To improve airway management in such environments, targeted training programs on alternative devices like the Airtraq® laryngoscope and building local expertise are essential. Efforts to improve access to basic airway equipment and develop protocols for safe reuse of single-use devices can further address resource constraints. Promoting low-cost innovations and international collaborations will help strengthen healthcare systems and improve patient outcomes.

Abbreviations

DALYs	Disability-Adjusted Life Years
ETT	Endotracheal tube
LMICs	Low- and Middle-Income Countries
POGO	Percentage of glottic opening
WHO	World Health Organization

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S. P. Wrote the main manuscript text and prepared Fig. 1. M. O. Reviewed the manuscript. B. G. Reviewed the manuscript. L. D. Wrote the main manuscript text.

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Declarations

Ethics approval and consent to participate
The patient provided informed consent for the procedure.

Consent for publication
Written authorization form the patient was provided for submission of a case report.

Competing interests
The authors declare no competing interests.

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