REVIEW

Bagcilar Med Bull
DOI: 10.4274/BMB.galenos.2026.44154

Awake Tracheal Intubation During the COVID-19 Pandemic: A Systematic Literature Review

COVID-19 Pandemisi Sırasında Uyanık Trakeal Entübasyon: Sistematik Literatür Derlemesi

Yasemin Özşahin[1], Hülya Yılmaz Ak[2], Gözde Altun[1], Ayla Esin[1], Ziya Salihoğlu[3], Kerem Erkalp[1]

[1]İstanbul University-Cerrahpaşa, Institute of Cardiology, Department of Anesthesiology and Reanimation, İstanbul, Turkey
[2]University of Health Sciences Turkey, Kartal Dr. Lütfi Kırdar City Hospital, Department of Anesthesiology and Reanimation, İstanbul, Turkey
[3]İstanbul University-Cerrahpaşa, Cerrahpaşa Medical School, Department of Anesthesiology and Reanimation, İstanbul, Turkey

Abstract

Awake tracheal intubation (ATI) is a key strategy in managing anticipated difficult airways, particularly when maintaining spontaneous respiration and airway reflexes is critical. During the coronavirus disease-2019 (COVID-19) pandemic, concerns about aerosol generation shifted intubation practices toward methods prioritizing safety. However, published data on ATI in patients with suspected or confirmed COVID-19 remain scarce. This systematic review was conducted in accordance with the PRISMA 2020 guidelines. A comprehensive literature search was performed in PubMed (MEDLINE) and the Web of Science Core Collection from database inception to April 30, 2025. Studies involving adult patients (≥18 years) with confirmed or suspected COVID-19 infection who underwent ATI were included. Eligible study designs comprised case reports, case series, observational studies, and randomized or quasi-randomized trials. Simulation studies, animal studies, reviews, and non-clinical reports were excluded. Study selection and data extraction were independently performed by multiple reviewers, with disagreements resolved by consensus. Methodological quality was assessed using the Joanna Briggs Institute Critical Appraisal Checklist for Case Reports. Six studies met the inclusion criteria. All ATI procedures were performed using fiberoptic bronchoscopy; videolaryngoscopy was not reported in any case. Topical lidocaine anesthesia was used in most cases, while no patients received regional nerve blocks. Sedation was administered in most cases. Oxygen therapy was provided in the majority of patients, commonly via nasal cannula. Most procedures occurred in the operating room, although

Öz

Uyanık trakeal entübasyon (UTE), zor hava yolu öngörüldüğü durumların yönetiminde temel bir stratejidir. Özellikle spontan solunumun ve hava yolu reflekslerinin korunmasının kritik olduğu durumlarda kullanılmaktadır. Koronavirüs hastalığı-2019 (COVID-19) pandemisi sırasında aerosol oluşumu ile ilgili endişeler olması sebebiyle güvenliği ön planda tutan yöntemlerle entübasyon yaplmasına eğilim olmuştur. Bununla beraber, şüpheli veya doğrulanmış COVID-19 hastalarında UTE uygulamalarına ilişkin yayımlanmış veriler oldukça sınırlıdır. Bu sistematik derleme, PRISMA 2020 kılavuzu doğrultusunda yapılmıştır. PubMed (MEDLINE) ve Web of Science Core Collection veri tabanlarında, 30 Nisan 2025'e kadar yayımlanan çalışmalar kapsamlı bir şekilde taranmıştır. Doğrulanmış veya şüpheli COVID-19 enfeksiyonu olan ve UTE yapılan 18 yaş ve üzeri hastaları içeren çalışmalar dahil edilmiştir. Olgu sunumları, olgu serileri, gözlemsel çalışmalar ile randomize veya yarı randomize çalışmalar değerlendirmeye alınmıştır. Simülasyon çalışmaları, hayvan deneyleri, derlemeler ve klinik uygulama içermeyen yayınlar dışlanmıştır. Çalışmaların seçimi ve veri çıkarımı birden fazla araştırmacı tarafından bağımsız olarak yapılmış, görüş ayrılıkları uzlaşı yoluyla giderilmiştir. Metodolojik kalite değerlendirmesi, Joanna Briggs Institute Olgu Sunumları için Kritik Değerlendirme Kontrol Listesi kullanılarak yapılmıştır. Dahil edilme kriterlerini karşılayan toplam altı çalışma belirlenmiştir. Tüm UTE girişimleri fiberoptik bronkoskopi kullanılarak gerçekleştirilmiş olup, hiçbir olguda videolaringoskopi bildirilmemiştir. Çoğu olguda topikal lidokain ile lokal anestezi uygulanmış, ancak hiçbir hastada

Address for Correspondence: Yasemin Özşahin, MD, İstanbul University-Cerrahpaşa, Institute of Cardiology, Department of Anesthesiology and Reanimation, İstanbul, Turkey
E-mail: yasemin.ozsahin@iuc.edu.tr **ORCID:** orcid.org/0000-0002-8653-2272
Received: 26.06.2025 **Accepted:** 03.03.2026 **Epub:** 05.03.2026

Cite this article as: Özşahin Y, Yılmaz Ak H, Altun G, Esin A, Salihoğlu Z, Erkalp K. Awake tracheal intubation during the COVID-19 pandemic: a systematic literature review. Bagcilar Med Bull. [Epub Ahead of Print]

Abstract

one setting was unspecified. No major complications were reported. Despite the relevance of ATI in difficult airway management, its use during the COVID-19 pandemic appears underreported. The limited number of cases in the literature may not reflect rarity but rather hesitation in clinical practice or under documentation. Greater transparency and sharing of clinical experiences are essential to inform future practice, particularly under high-risk conditions like pandemics.

Keywords: Airway management, COVID-19, intratracheal intubation

Öz

bölgesel sinir bloğu kullanılmamıştır. Hastaların büyük kısmına sedasyon uygulanmıştır. Hastaların çoğuna oksijen desteği sağlanmış ve en sık nazal kanül kullanılmıştır. İşlemlerin büyük bölümü ameliyathanede gerçekleştirilmiş olup, bir çalışmada uygulama ortamı belirtilmemiştir. Hiçbir olguda majör komplikasyon bildirilmemiştir. UTE, zor hava yolu yönetiminde önemli bir yere sahip olmasına rağmen COVID-19 pandemisi sırasında kullanımına ilişkin literatür verileri sınırlıdır. Literatürdeki olgu sayısının azlığı, zor entübasyonun nadirliğinden çok klinik çekinceler veya raporlama azlığına bağlı olabilir. Özellikle pandemi gibi yüksek riskli durumlarda, klinik deneyimlerin daha şeffaf şekilde paylaşılması, gelecekteki uygulamalara rehberlik edebilmek açısından büyük önem taşımaktadır.

Anahtar kelimeler: COVID-19, hava yolu yönetimi, trakeal entübasyon

Introduction

A difficult airway is defined as a clinical scenario in which an anesthesia-trained clinician encounters, either expectedly or unexpectedly, difficulty or failure in performing airway management procedures such as face mask ventilation, laryngoscopy, supraglottic airway ventilation, tracheal intubation, extubation, or invasive airway access (1-3). Since maintaining adequate ventilation, oxygenation, and airway patency is vital, the initial consideration for patients with an anticipated difficult airway undergoing surgery is whether anesthesia should be provided under local infiltration, regional anesthesia, or general anesthesia. The second critical consideration is to assess the likelihood and potential clinical implications of difficulties during mask ventilation, supraglottic airway use, laryngoscopy, tracheal intubation, or surgical airway access (4-7).

Anticipating airway difficulty and preparing an appropriate airway management strategy in advance is widely recognized as safer and more effective than relying on emergency rescue interventions after complications arise (8,9). Over recent decades, technological advancements—including videolaryngoscopes, flexible bronchoscopes, and improved oxygenation techniques—have significantly mitigated many of the challenges associated with anatomically difficult airways (10-12). Providing a secure airway represents one of the most critical steps in perioperative care and poses a particular challenge in patients with coronavirus disease-2019 (COVID-19), in whom airway management is considered both high-risk and technically demanding (13,14). Difficult airway management remains a major concern for anesthesiologists (15), and the coexistence of COVID-19 infection with an anticipated difficult airway constituted a substantial clinical challenge during the pandemic. In the early stages of the COVID-19 pandemic, multiple recommendations and guidelines were rapidly developed to enhance the safety of tracheal intubation for both patients and healthcare providers (16-19).

These guidelines generally emphasized minimizing the number of personnel involved, using appropriate personal protective equipment (PPE), assigning the most experienced clinician to airway management, utilizing videolaryngoscopy (VLS) as the first-line device, and avoiding aerosol-generating procedures whenever feasible (20).

Awake tracheal intubation (ATI) enhances patient safety by maintaining spontaneous ventilation, airway patency, gas exchange, and protective airway reflexes throughout the procedure, and is therefore considered a preferred technique in the management of anticipated difficult airways (1,21-26). Fiberoptic bronchoscopy (FOB)-guided ATI has long been regarded as the gold standard in such cases (27,28). However, several COVID-19 specific airway management guidelines recommended avoiding ATI unless clearly indicated, primarily due to concerns regarding aerosol generation associated with coughing during the procedure (16,29,30).

In this systematic literature review, we aimed to evaluate reported clinical approaches to ATI in adult patients with suspected or confirmed COVID-19 infection and an anticipated difficult airway, with particular emphasis on procedural techniques, airway anesthesia, sedation strategies, and infection control measures.

Methods

Protocol and registration: This systematic literature review was conducted and reported in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 statement (31). Formal protocol registration was not undertaken, as this study involved a systematic review of published literature only and did not include individual patient-level data.

Literature search: A comprehensive literature search was performed in PubMed (MEDLINE) and the Web of Science Core Collection from database inception to April 30, 2025. The search strategy combined Medical Subject Headings (MeSH) and free-text terms related to difficult airway management, COVID-19, and ATI. The final search was rerun on April 30, 2025, immediately prior to manuscript submission to ensure inclusion of recently published articles.

For PubMed, the complete search strategy was as follows:

("Difficult Airway"[tiab] OR "difficult airway"[tiab]) AND ("COVID-19"[Mesh] OR "SARS-CoV-2"[tiab] OR "coronavirus"[Mesh]) AND ("Intubation, Intratracheal"[Mesh] OR "awake intubation"[tiab] OR "awake fibreoptic intubation"[tiab] OR "awake fiberoptic intubation"[tiab] OR "ATI"[tiab]).

Filters were applied to limit results to human studies, adult patients (≥18 years), and articles published in English. No additional date restrictions were applied.

For Web of Science Core Collection, the following search string was used: TS=("difficult airway") AND TS=("COVID-19" OR "SARS-CoV-2" OR "coronavirus") AND TS=("awake intubation" OR "awake fibreoptic intubation" OR "awake fiberoptic intubation" OR "ATI"). Results were limited to articles and early access publications written in English.

In addition, the reference lists of all eligible studies were manually screened to identify further relevant publications. When necessary, corresponding authors were contacted to obtain missing or unclear data. Articles for which no response was received were evaluated based on the available published data.

Eligibility criteria: We included studies reporting adult patients (≥18 years) with confirmed or suspected COVID-19 infection who underwent oral or nasal ATI for any indication. Given the novelty of the disease and the limited available evidence, we included case reports, case series, retrospective and prospective observational studies, as well as randomized or quasi-randomized trials. Simulation studies, animal studies, reviews, and articles not involving clinical ATI were excluded.

Study selection: All retrieved titles and abstracts were independently screened by four authors (Y-O, H-YA, G-A, and A-E). Reasons for exclusion were documented. Disagreements were resolved by discussion with two additional reviewers (K-E and Z-S), who made the final inclusion decision. Full texts of potentially eligible articles were subsequently reviewed.

Data extraction: Data extraction was independently performed by four reviewers and cross-checked for accuracy. Disagreements were resolved by consensus or consultation with a senior reviewer. Extracted data included study type, patient characteristics, airway assessment findings, intubation technique, sedation and topical anesthesia methods, oxygen supplementation, PPE use, procedural setting, and reported outcomes.

Quality and risk-of-bias assessment: Given that the included evidence consisted primarily of case reports and letters, methodological quality was assessed using the Joanna Briggs Institute (JBI) Critical Appraisal Checklist for Case Reports (32). Each study was evaluated independently by two reviewers. Disagreements were resolved by consensus. The results of this appraisal are summarized in Table 1.

Results

The literature search identified a total of 421 records. After removal of duplicate records (n=19), 402 records were screened by title and abstract, of which 198 were excluded as irrelevant. Full-text assessment was subsequently performed for 204 articles. Of these, studies focusing on tracheostomy (n=5), non-awake difficult airway management procedures (n=38), awake pronning (n=149), awake extracorporeal membrane oxygenation (n=3) and non-English language publications (n=3) were excluded. Ultimately, only six studies met the inclusion criteria. The study selection process is summarized in the PRISMA flow diagram (Figure 1).

Ultimately, six studies met the inclusion criteria and were included in the qualitative synthesis. These comprised three case reports, one correspondence, and two letters to the editor. Study characteristics are summarized in Table 2. The reported endotracheal tube sizes were 6.5 mm in two cases, 7.0 mm in two cases, and 7.5 mm in one case; in one report, tube size was not specified. Two studies described

oral intubation, two reported nasal intubation, and in two cases the intubation route was not clearly stated. VLS was not used in any of the included cases; all intubations were performed using FOB. An Ambu® aScope™ was used in two cases, while a C-MAC fiberoptic intubation scope (Karl Storz®) was used in one case; the bronchoscope brand was not reported in the remaining studies.

All ATIs were performed in patients with anatomical airway challenges, including tumors obstructing the visual field or restricted mouth opening. Airway anesthesia was achieved using topical local anesthetics in all cases. Sedation was administered in all but one patient, in whom sedation status was not reported. When sedation was used, spontaneous ventilation was preserved. Oxygen supplementation was reported in most cases, although two studies did not specify the oxygen delivery method. All procedures were performed in the operating room under full PPE, and no immediate airway-related complications were reported.

Ahmad et al. (33) reported ATI in a patient with a base-of-tongue tumor and suspected COVID-19. The procedure was conducted in the operating room with the entire team wearing PPE. The patient received dual-agent sedation with propofol and remifentanil in addition to topical airway anesthesia. Intubation was successfully performed using a 6.5 mm endotracheal tube and an Ambu® aScope™ 4 BronchoSlim (Ambu, Copenhagen, Denmark). Ghaly et al. (34) described ATI in a patient undergoing cervical spine surgery for stenosis and C6-C7 disc herniation with spinal cord compression. Although PPE use was not explicitly stated, it was visible in the accompanying photograph. Sedation and topical anesthesia protocols were not fully detailed; however, the patient reportedly had no recall following topicalization. A protective barrier device was used. Nasotracheal intubation was performed with a 7.5 mm tube using a C-MAC fiberoptic scope (Karl Storz®, Tuttlingen, Germany). Rajan et al. (35) reported ATI in a patient with restricted mouth opening due to tongue carcinoma and suspected COVID-19 infection. The

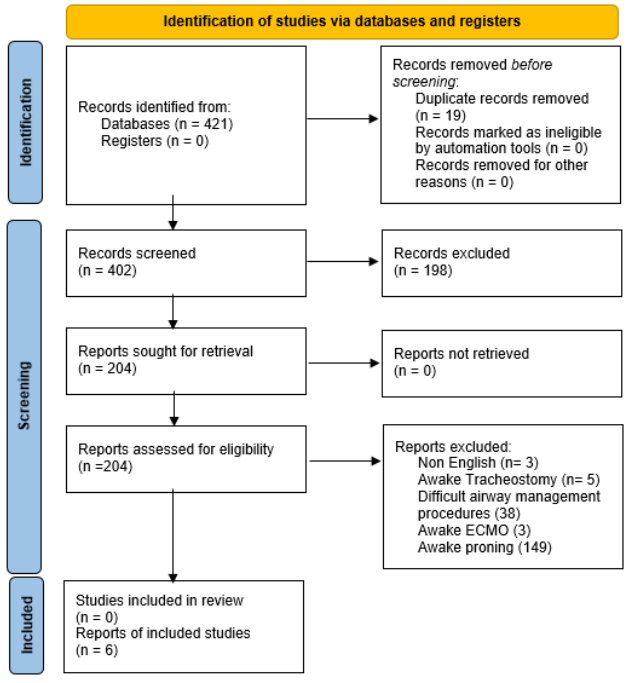

Figure 1. PRISMA 2020 flow diagram

ECMO: Extracorporeal membrane oxygenation, PRISMA: Preferred reporting items for systematic reviews and meta-analyses

Table 1. JBI critical appraisal checklist for case reports

JBI critical appraisal checklist for case reports	Phipps et al. (37)	Ahmad et al. (33)	Ip and Tham (36)	Ghaly et al. (34)	Rajan et al. (35)	Tone et al. (38)
Were patient's demographic characteristics clearly described?	No	Yes	No	Yes	Yes	Yes
Was the patient's history clearly described and presented as a timeline?	No	Yes	No	No	Yes	Yes
Was the current clinical condition of the patient on presentation clearly described?	Yes	Yes	Yes	Yes	Yes	Yes
Were diagnostic tests or assessment methods and the results clearly described?	No	Yes	No	No	Yes	Yes
Was the intervention(s) or treatment procedure(s) clearly described?	Yes	Yes	No	No	Yes	No
Was the post-intervention clinical condition clearly described?	Yes	Yes	Yes	Yes	Yes	Yes
Were adverse events (harms) or unanticipated events identified and described?	Yes	Yes	Yes	Unclear	Yes	Yes
Does the case report provide takeaway lessons?	Yes	Yes	Yes	Yes	Yes	Yes

Table 2. The characteristics of the included studies

Variables	Phipps et al. (37)	Ahmad et al. (33)	Ip and Tham (36)	Ghaly et al. (34)	Rajan et al. (35)	Tone et al. (38)
Article type	Correspondence	Case report	Letter to editor	Case report	Letter to editor	Letter to editor
COVID-19 PCR test result	Unknown	Unknown	Unknown	Unknown	Unknown	Positive
Indication for ATI	Maxillofacial surgery	Head and neck cancer	Head and neck cancer	Limited cervical-spine movement	Head and neck cancer	Abscess with airway compression
Antisialogogue	Glycopyrronium bromide	No	No	Unknown	Glycopyrronium bromide	No
Topicalisation	Lidocaine 4% atomiser device + lidocaine 10% spray + nazopharyngeal gazue packing coated with 4% lidocaine	Lidocaine 4% atomiser device + lidocaine 10% spray + nazopharyngeal gazue packing coated with 4% lidocaine	Lidocaine 4% atomiser device	Unknown	Lidocaine 2% nasal gel + lidocaine 10% spray	Lidocaine 4% with catheter
Oxygenation	Yes (4 L)	Yes (5 L)	Yes (2 L)	High flow	Unknown	Unknown
Sedation-analgesia (Y-N/agent)	Yes/remifentanyl	Yes/propofol + remifentanyl	Yes/remifentanyl	Unknown	No	Yes/unknown
Approach to ATI	Orotracheal	Nasotracheal	Unknown	Nasotracheal	Orotracheal	Unknown
FOB usage	Yes	Yes	Yes	Yes	Yes	Yes
Bronchoscope type	Ambu® aScope™ 4 Broncho size regular	Ambu® aScope™ 4 Broncho slim	Unknown	C-MAC fiber-optic scope (Karl Starz®, C-MAC)	Unknown	Unknown
ETT size ID (mm)	7	6.5	Unknown	7.5	7	unknown
Complications	No	No	No	Unknown	No	No
PPE	Yes	Yes	Unknown	Unknown	Yes	Yes
Barrier use	No	No	Yes	Yes	Yes	No
Operation room	Yes	Yes	Yes	Yes	Yes	Unknown
Number of patients	1	1	1	1	1	1

COVID-19: Coronavirus disease-2019, PCR: Polymerase chain reaction, ATI: Awake tracheal intubation, FOB: Fiberoptic bronchoscopy, PPE: personal protective equipment

procedure was performed in the operating room using topical anesthesia without sedation. Although PPE use was not explicitly described, it was visible in the published image. Nasotracheal intubation was successfully completed with a 7.0 mm tube using a fiberoptic bronchoscope. Ip and Tham (36), in a letter to the editor, described ATI in a patient with a tonsillar tumor. The procedure was conducted in the operating room with appropriate PPE. The patient received remifentanil sedation and topical anesthesia. The endotracheal tube size and route of intubation were not specified. Fiberoptic intubation was successfully achieved without reported complications. Phipps et al. (37), in a correspondence, described ATI in a patient undergoing emergency jaw surgery with suspected COVID-19 infection. The patient received remifentanil sedation and topical airway anesthesia. The procedure was performed in the operating room under full PPE. A 7.0 mm endotracheal tube was used, and intubation was completed using an Ambu® aScope™ 4 Broncho (regular size; Ambu, Ballerup, Denmark). Tone et al. (38) reported ATI in a patient with airway compression caused by a deep neck space abscess following tooth extraction and recent COVID-19 infection. The procedure was performed in the operating room with the entire team wearing PPE. Topical anesthesia was delivered using an epidural catheter advanced into the oropharynx. Preparations for emergency tracheostomy were described. The sedative agent, endotracheal tube size, and bronchoscope brand were not reported.

Bozych and Smith (39) described the case of a patient with Down syndrome (trisomy 21) and Ludwig's angina, diagnosed with COVID-19 pneumonia eight days prior. The patient was intubated due to respiratory distress in a hospital room. The authors did not specify the use of PPE, preoxygenation method, or bronchoscope brand. Topical anesthesia was administered via aerosolization, and ketamine was used for sedation. A video laryngoscope was employed during bronchoscope insertion, and intubation was completed with a 6.5 mm tube; consequently, the study was excluded from our review because of the use of VLS. Shamim et al. (40) described ATI in a COVID-19-positive patient with recurrent cancer and a Mallampati class IV airway. The entire team wore PPE during the procedure, which was performed in the operating room. To reduce gag reflex risk, no topicalization was performed. The patient was maintained under general anesthesia with propofol and sevoflurane while preserving spontaneous respiration. After two to three unsuccessful nasotracheal attempts, an orotracheal approach was adopted, and intubation was successfully completed with a 7.5 mm tube after approximately 20 minutes. The patient experienced two desaturation episodes; the bronchoscope brand was not specified. Because the procedure was performed under general anesthesia, this case was excluded from our review. Cai et al. (41) reported ATI in 12 COVID-19-positive ICU patients using a specially designed positive pressure protective hood. Sedation included midazolam, propofol, and morphine or fentanyl. Topical anesthesia was not mentioned. All intubations were uneventful. The article was excluded from our analysis because it was not written in English. Ontivero et al. (42) performed ATI in a patient with head and neck cancer undergoing surgery. The patient received oxygen via nasal cannula, dexmedetomidine sedation, and topical analgesia. Intubation was completed without complications. Similarly, Akavipat (43) reported a case involving a patient undergoing cervical spine fracture surgery, who was sedated with morphine and received topical lidocaine. Both case reports were excluded from our study due to their language.

When the case reports and letters to the editor were appraised using the JBI Critical Appraisal Checklist for Case Reports (Table 1), it was observed that, with the exception of two articles, all studies provided detailed demographic characteristics of the patients. Approximately half of the reports clearly described the patients' clinical status at presentation. All cases reported the current clinical condition and the indication for the procedure.

Assessment methods were described in roughly half of the articles, including airway evaluation parameters such as Mallampati classification, cervical range of motion, tongue characteristics, and the presence of symptoms such as dysphonia or stridor. In addition, some reports included radiological findings, such as computed tomography imaging, as part of the pre-procedural assessment.

Post-intervention clinical outcomes, specifically whether successful intubation was achieved, were reported in all studies. Adverse or unanticipated events were documented in all but one article, in which this domain was deemed unclear. Finally, all reports included key takeaway lessons or clinical implications derived from the cases.

Discussion

This systematic review demonstrates that published evidence regarding ATI in patients with suspected or confirmed COVID-19 and anticipated difficult airway is extremely limited and consists exclusively of low-level evidence, primarily case reports, letters to the editor, and

correspondence. As such, the observations presented herein are descriptive in nature and should be interpreted with caution, as they do not permit causal inference or formal comparisons between airway management strategies.

The primary objective of this review was to evaluate how ATI—indicated in approximately 1.06% of cases (27)—was implemented during the COVID-19 pandemic, given that the incidence of anticipated difficult airway ranges from 0.1% to 10.1% (44,45). This is particularly relevant because airway guidelines during the pandemic emphasized "safe, accurate, and fast" intubation (16). While ATI is an established airway management technique, the need to minimize aerosol generation during the pandemic led to a re-evaluation of its protocols and practices.

During this period, increasing patient cooperation, reducing the number of intubation attempts, and minimizing procedure duration became critical goals. Some studies suggested performing intubation and even extubation behind a protective plastic barrier to reduce aerosol spread (46,47). However, the use of plastic barriers declined over time due to the potential for increased contamination risk during their removal (48,49). Additionally, placing an awake patient under a plastic sheet may induce discomfort or trigger anxiety-related responses such as claustrophobia.

ATI comprises three fundamental components: Effective local anesthesia, adequate sedation, and accurate placement of the endotracheal tube. Coughing during intubation has been associated with increased transmission risk of SARS-CoV-2 to anesthesiologists, highlighting the importance of suppressing the cough reflex (50). Effective local anesthesia is therefore essential. Several COVID-19 guidelines advise against the use of atomized, sprayed, or nebulized local anesthetics (30,51-53). Alternatives such as local anesthetic gels, soaked swabs, or appropriate regional nerve blocks are recommended. The use of an endoscopic mask is another proposed method to reduce aerosol generation during ATI (53). In our review, topical anesthesia with lidocaine was used in most cases, and no patient received a nerve block. This preference may be attributed to the broader familiarity and ease of use of topical techniques compared to the expertise required for nerve blocks.

Sedation is another crucial factor in minimizing aerosolization. Guidelines generally support sedation to reduce patient anxiety and improve procedural tolerance (51). Although some researchers suggest that ATI can be performed safely without sedation (25,54,55), most agree that appropriate sedation enhances patient comfort and cooperation (56). Anxiety can activate sympathetic and parasympathetic responses, leading to elevated heart rate, hypertension, increased secretions, and heightened airway reflexes—all of which may hinder successful intubation (57). When administered at appropriate doses, sedation allows the patient to remain responsive to verbal commands while preserving airway reflexes, spontaneous breathing, and cardiovascular stability. Remifentanil and dexmedetomidine have been associated with high patient satisfaction in ATI (56), and single-agent use (rather than combination therapy) is generally considered safer (58). Propofol, although used, carries a higher risk of excessive sedation, coughing, and airway obstruction compared to remifentanil (59-62). Importantly, sedation should not be used as a substitute for insufficient airway anesthesia (63). In our analysis, sedation was used in all but one study, while in another, the use of sedation was not reported. No standardized sedation protocol was identified, suggesting that sedation strategies were based on patient-specific and clinical factors.

Importantly, variations in sedation techniques, topical anesthesia methods, and procedural settings across the included reports reflect individual clinical judgment rather than standardized protocols. These differences further limit the generalizability of the findings and underscore the exploratory nature of the available evidence.

FOB remains the gold standard for ATI in patients with anticipated difficult airway, especially when performed under sedation while preserving spontaneous respiration (1,64,65). However, proficiency with FOB requires significant training and frequent practice (23). VLS also offers excellent glottic visualization and enables successful intubation in difficult airway cases. Both FOB and VLS demonstrate comparable safety and success rates. Some guidelines even recommend VLS for ATI in COVID-19 patients, as it may allow faster intubation compared to FOB (66). VLS also accommodates the use of smaller-diameter endotracheal tubes (23). Despite this, all the studies included in our review utilized FOB. This may reflect clinicians' preference for the gold standard technique, particularly under the high-risk conditions of the pandemic. Although FOB was used in all included cases, this should not be interpreted as evidence of superiority over VLS. Rather, this finding likely reflects clinician preference, local expertise, and prevailing practice patterns during the early phases of the COVID-19 pandemic. According to COVID-19 airway guidelines, airway procedures should ideally be performed in isolated areas or negative pressure rooms (16,51,67-70).

An alternative is to convert a positive-pressure operating room into a negative-pressure environment (71). In most cases reviewed, ATI was conducted in the operating room; however, one case was performed outside the OR, and the setting was not specified in another. This setting is optimal for ATI, as it ensures access to skilled personnel, appropriate medications and equipment, and sufficient space (58).

Oxygen supplementation is essential during ATI. The reported incidence of desaturation during ATI with low-flow oxygen is 12-16%, whereas this drops to 0-1.5% when high-flow nasal oxygen is used (72-74). Most COVID-19 guidelines recommend preoxygenation with 100% oxygen via a tight-fitting face mask for five minutes prior to intubation (30,67-69). In our review, oxygen was generally administered via nasal cannula, although the flow rates varied between cases.

Finally, airway management should be performed by clinicians who are trained and experienced in the techniques they choose to use, especially under pandemic conditions (16). Procedures that generate aerosols should be avoided or minimized (19,69). The number of healthcare providers involved during such procedures should be kept to a minimum, and standard infection control precautions (e.g., hand hygiene and proper PPE) must be followed rigorously (19). According to the World Health Organization, the minimum PPE for airway management includes masks, eye protection, gowns, and gloves (75). Notably, approximately 39% of COVID-19 patients may require more than one airway intervention (76). Clinicians should therefore anticipate that ATI may be more challenging in this population, and that prolonged procedures, failed intubation, or the need for emergency surgical airways may occur more frequently.

Given the absence of controlled studies and the small number of reported cases, the conclusions drawn from this review should be regarded as hypothesis-generating rather than practice-directing. Future prospective studies and standardized reporting of awake intubation practices in high-risk infectious settings are needed to better inform clinical guidelines.

Conclusion

The COVID-19 pandemic markedly heightened awareness of both patient and provider safety during airway management. In this context, the principle of primum te ipsum protege ("protect yourself first") became as relevant as the longstanding maxim primum non-nocere ("first, do no harm").

This systematic review highlights the profound scarcity of published data on ATI in patients with suspected or confirmed COVID-19 infection and anticipated difficult airway. Given the low level of available evidence, conclusions should be regarded as hypothesis-generating rather than practice-changing.

The limited number of reported cases raises an inevitable question: Were such patients truly rare, or were their stories simply never written? It is conceivable that some of these patients—those with both suspected COVID-19 and anticipated difficult airways—never reached the point of publication due to clinical deterioration, resource limitations, or the inherent hesitation to perform aerosol-generating procedures under high-risk conditions. Ironically, it could be suggested that the presence of an anticipated difficult airway served as a form of passive protection—not biologically, but logistically—by prompting avoidance of intervention altogether. These silences in the literature may reflect not an absence of cases, but an absence of reporting.

We encourage clinicians to report and publish their experiences in this challenging clinical context. Transparent documentation of both successful and deferred airway management decisions may help inform future guidelines and preparedness for similar high-risk scenarios.

Footnotes

One of the authors of this article (K.E.) is a member of the Editorial Board of this journal. He was completely blinded to the peer review process of the article.

Authorship Contributions

Surgical and Medical Practices: Y.Ö., A.E., Concept: Y.Ö., A.E., Z.S., Design: Y.Ö., H.Y.A., K.E., Data Collection or Processing: H.Y.A., A.E., G.A., Analysis or Interpretation: H.Y.A., A.E., G.A., Literature Search: Y.Ö., G.A., Writing: Y.Ö., H.Y.A.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

References

1. Apfelbaum JL, Hagberg CA, Caplan RA, Blitt CD, Connis RT, Nickinovich DG, et al. Practice guidelines for management of the difficult airway: an updated report by the American Society of anesthesiologists task force on management of the difficult airway. Anesthesiology. 2013;118(2):251-270.

2. Markham T, AlFarra AS, Tejani M, Tate DJ, Barrera JE, Paladugu S, et al. Effectiveness of ventilation via an endotracheal tube in pharynx versus a facemask in patients with potentially difficult airway: a randomized, crossover, and blind trial. Anesth Analg. 2025;140(2):280-289.

3. De Rosa S, Bignami E, Bellini V, Battaglini D. The future of artificial intelligence using images and clinical assessment for difficult airway management. Anesth Analg. 2025;140(2):317-325.

4. Myatra SN, Shah A, Kundra P, Patwa A, Ramkumar V, Divatia JV, et al. All India difficult airway association 2016 guidelines for the management of unanticipated difficult tracheal intubation in adults. Indian J Anaesth. 2016;60(12):885-898.

5. Langeron O, Bourgain JL, Francon D, Amour J, Baillard C, Bouroche G, et al. Difficult intubation and extubation in adult anaesthesia. Anaesth Crit Care Pain Med. 2018;37(6):639-651.

6. Nørskov AK, Rosenstock CV, Wetterslev J, Astrup G, Afshari A, Lundstrøm LH. Diagnostic accuracy of anaesthesiologists' prediction of difficult airway management in daily clinical practice: a cohort study of 188 064 patients registered in the Danish anaesthesia database. Anaesthesia 2015;70(3):272-281.

7. Kollmeier BR, Boyette LC, Beecham GB, Desai NM, Khetarpal S. Difficult airway. 2023. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025.

8. Miller KA, Goldman MP, Nagler J. Management of the difficult airway. Pediatr Emerg Care. 2023;39(3):192-200.

9. Lee WS, Fletcher LR, Tosif S, Makar T, Graham JM. Assessing the efficacy of difficult airway alerts in electronic medical records: a quality improvement study. BMC Anesthesiol. 2024;24(1):381.

10. Myatra SN, Divatia JV, Brewster DJ. The physiologically difficult airway: an emerging concept. Curr Opin Anaesthesiol. 2022;35(2):115-121.

11. Wiles MD, Iliff HA, Brooks K, Da Silva EJ, Donnellon M, Gardner A, et al. Airway management in patients with suspected or confirmed cervical spine injury: Guidelines from the Difficult Airway Society (DAS), Association of Anaesthetists (AoA), British Society of Orthopaedic Anaesthetists (BSOA), Intensive Care Society (ICS), Neuro Anaesthesia and Critical Care Society (NACCS), Faculty of Prehospital Care and Royal College of Emergency Medicine (RCEM). Anaesthesia. 2024;79(8):856-868.

12. Köhl V, Wünsch VA, Müller MC, Sasu PB, Dohrmann T, Peters T, et al. Hyperangulated vs. macintosh videolaryngoscopy in adults with anticipated difficult airway management: a randomised controlled trial. Anaesthesia. 2024;79(9):957-966.

13. Saracoglu KT, Saracoglu A, Demirhan R. Airway management strategies for the Covid 19 patients: a brief narrative review. J Clin Anesth. 2020;66:109954.

14. Wu Z, McGoogan JM. Characteristics of and important lessons from the coronavirus disease 2019 (COVID-19) outbreak in China: Summary of a report of 72,314 cases from the Chinese center for disease control and prevention. JAMA. 2020;323(13):1239-1242.

15. Giordano G, Alessandri F, Zulian A, Bilotta F, Pugliese F. Pre-operative ultrasound prediction of difficult airway management in adult patients: a systematic review of clinical evidence. Eur J Anaesthesiol. 2023;40(5):313-325.

16. Cook TM, El-Boghdadly K, McGuire B, McNarry AF, Patel A, Higgs A. Consensus guidelines for managing the airway in patients with COVID-19: Guidelines from the Difficult Airway Society, the Association of Anaesthetists the Intensive Care Society, the Faculty of Intensive Care Medicine and the Royal College of Anaesthetists. Anaesthesia. 2020;75(6):785-799.

17. Patwa A, Shah A, Garg R, Divatia JV, Kundra P, Doctor JR, et al. All India difficult airway association (AIDAA) consensus guidelines for airway management in the operating room during the COVID-19 pandemic. Indian J Anaesth. 2020;64(Suppl 2):S107-115.

18. Sullivan EH, Gibson LE, Berra L, Chang MG, Bittner EA. In-hospital airway management of COVID-19 patients. Crit Care. 2020;24:292.

19. Wong P, Lim WY. Aligning difficult airway guidelines with the anesthetic COVID-19 guidelines to develop a COVID-19 difficult airway strategy: a narrative review. J Anesth. 2020;34(6):924-943.

20. Casey JD, Janz DR, Russell DW, Vonderhaar DJ, Joffe AM, Dischert KM, et al. PreVent Investigators and the pragmatic critical care research group. Bag-mask ventilation during tracheal intubation of critically ill adults. N Engl J Med. 2019;380(9):811-821.

21. Law JA, Broemling N, Cooper RM, Drolet P, Duggan LV, Griesdale DE, et al. Canadian airway focus group: the difficult airway with recommendations for management – part 2 – the anticipated difficult airway. Can J Anaesth. 2013;60(11):1119-1138.

22. Law JA, Morris IR, Brousseau PA, de La Ronde S, Milne AD. The incidence, success rate, and complications of awake tracheal intubation in 1,554 patients over 12 years: an historical cohort study. Can J Anaesth. 2015;62(7):736-744.

23. Alhomary M, Ramadan E, Curran E, Walsh SR. Videolaryngoscopy vs. fibreoptic bronchoscopy for awake tracheal intubation: a systematic review and meta-analysis. Anaesthesia. 2018;73(9):1151-1161.

24. Ajay S, Singhania A, Akkara AG, Shah A, Adalja M. A study of flexible fiberoptic bronchoscopy aided tracheal intubation for patients undergoing elective surgery under general anesthesia. Indian J Otolaryngol Head Neck Surg. 2013;65(2):116-119.

25. El-Boghdadly K, Onwochei DN, Cuddihy J, Ahmad I. A prospective cohort study of awake fibreoptic intubation practice at a tertiary centre. Anaesthesia. 2017;72(6):694-703.

26. Barbaro S, Carone P, Lanotte L, Scapini E, Debitonto M. Awake videolaryngoscopy for intubation in patients with laryngeal cancer: a case series. Cureus. 2024;16(6):e62993.

27. Simmons ST, Schleich AR. Airway regional anesthesia for awake fiberoptic intubation. Reg Anesth Pain Med. 2002;27(2):180-192.

28. Warwick E, Yoon S, Ahmad I. Awake tracheal intubation: an update. Int Anesthesiol Clin. 2024;62(4):59-71.

29. Wong J, Goh QY, Tan Z, Lie SA, Tay YC, Ng SY, et al. Preparing for a COVID-19 pandemic: a review of operating room outbreak response measures in a large tertiary hospital in Singapore. Can J Anaesth. 2020;67(6):732-745.

30. Malhotra N, Joshi M, Datta R, Bajwa SJS, Mehdiratta L. Indian society of anaesthesiologists (ISA national) advisory and position statement regarding COVID-19. Indian J Anaesth. 2020;64(4):259-263.

31. Page M J, McKenzie J E, Bossuyt P M, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ. 2021;372:n71.

32. Jun H, Yoon SH, Roh M, Kim S-H, Lee J, Lee J, et al. Quality assessment and implications for further study of acupotomy: case reports using the case report guidelines and the joanna briggs institute critical appraisal checklist. J Acupunct Res. 2021;38(2):122-133.

33. Ahmad I, Wade S, Langdon A, Chamarette H, Walsh M, Surda P. Awake tracheal intubation in a suspected COVID-19 patient with critical airway obstruction. Anaesth Rep. 2020;8(1):28-31.

34. Ghaly R, Perciuleac Z, Pleasca A, Pirvulescu I, Candido KD, Knezevic NN. Innovative overhead transparent plastic barrier with powered suction technique intended to limit coronavirus disease 2019 aerosols spread during fiber-optic intubation and throughout the surgery. Surg Neurol Int. 2020;11:473.

35. Rajan S, Babu KC, Abraham AS, Kadapamannil D. Awake fiberoptic bronchoscope-assisted intubation in a COVID-19 suspected patient with restricted mouth opening. Bali J Anaesthesiol 2020;4(Suppl 1):S28-29.

36. Ip V, Tham C. COVID-19 pandemic: negative-pressure tent during atomization of local anesthetic for awake fiberoptic intubation. Anesth Analg. 2020;131(3):e178-e179.

37. Phipps SJ, Scott AC, Legge CE. Awake tracheal intubation during the COVID-19 pandemic - an aerosol-minimising approach. Anaesth Rep. 2020;8(2):101.

38. Tone KJ, Busato GC, Aflaki S, Ip T, Lyn S. Emergency awake fibreoptic intubation with confirmed COVID-19. Can J Anaesth. 2021;68(11):1721-1722.

39. Bozych M, Smith E. An awake flexible scope intubation for a patient with trisomy 21, COVID-19, and Ludwig's angina. Cureus. 2023;15(8):e44370.

40. Shamim F, Sohaib M, Shahid K, Abbas SA. Head and neck cancer recurrence with limited mouth opening, radiation fibrosis and confirmed COVID-19 infection: approach to airway management. J Pak Med Assoc. 2023;73(4):912-914.

41. Cai SJ, Wu LL, Chen DF, Li YX, Liu YJ, Fan YQ, et al. Analysis of bronchoscope-guided tracheal intubation in 12 cases with coronavirus disease 2019 under the personal protective equipment with positive pressure protective hood. Zhonghua Jie He He Hu Xi Za Zhi. 2020;43(4):332-334. Chinese.

42. Ontivero MD, Del Basso AJ, Bett GA, Sánchez Freytes S, Fiorenza J. Difficult airway during pandemia: case report. Rev Chil Anest. 2020;49:737-741.

43. Akavipat P. Anesthesia for emergency open reduction and internal fixation of the unstable cervical spine fracture during Covid-19 pandemic. Thai Journal of Anesthesiology. 2020;46(3)Supplement.

44. Rose DK, Cohen MM. The incidence of airway problems depends on the definition used. Can J Anaesth. 1996;43(1):30-34.

45. Benumof JL. Management of the difficult adult airway. With special emphasis on awake tracheal intubation. Anesthesiology. 1991;75(6):1087-1110.

46. Akatsuka M, Yoshinaka A, Hagiwara H, Yamamoto S. Safe extubation of patients with Covid-19 for minimizing aerosolized droplets. J Prim Care Community Health. 2021;12:21501327211013291.

47. Matava CT, Kovatsis PG, Lee JK, Castro P, Denning S, Yu J, et al. Pediatric airway management in Covid-19 patients: consensus guidelines from the society for pediatric anesthesia's pediatric difficult intubation collaborative and the Canadian pediatric anesthesia society. Anesth Analg. 2020;131(1):61-73.

48. Fried EA, Zhou G, Shah R, Shin DW, Shah A, Katz D, et al. Barrier devices, intubation, and aerosol mitigation strategies: personal protective equipment in the time of coronavirus disease 2019. Anesth Analg. 2021;132(1):38-45.

49. Lee-Archer P, Boyd D, Du T, Elliott R, Graydon C, Paterson N, et al. A comparison of anesthetic protective barriers for the management of COVID-19 pediatric patients. Paediatr Anaesth. 2021;31(3):323-329.

50. Sun M, Zhang J, Zhang W, Li N, Zuo M, Qin L, et al. Factors affecting the risk of SARS-CoV-2 transmission to anesthesiologists performing endotracheal intubation in patients with SARS-CoV-2. Am J Transl Res. 2021;13(4):1915-1927.

51. Kim HJ, Ko JS, Kim TY. Recommendations for anesthesia in patients suspected of COVID-19 coronavirus infection. Korean J Anesthesiol. 2020;73(2):89-91.

52. Orser BA. Recommendations for endotracheal intubation of COVID-19 patients. Anesth Analg. 2020;130(5):1109-1110.

53. Zuo MZ, Huang YG, Ma WH, Xue ZG, Zhang JQ, Gong YH. Expert recommendations for tracheal intubation in critically ill patients with noval coronavirus disease 2019. Chin Med Sci J. 2020;35(2):105-109.

54. Woodall NM, Harwood RJ, Barker GL. Complications of awake fibreoptic intubation without sedation in 200 healthy anaesthetists attending a training course. Br J Anaesth. 2008;100(6):850-855.

55. Patil V, Barker GL, Harwood RJ, Woodall NM. Training course in local anaesthesia of the airway and fibreoptic intubation using course delegates as subjects. Br J Anaesth. 2002;89(4):586-593.

56. Johnston KD, Rai MR. Conscious sedation for awake fibreoptic intubation: a review of the literature. Canadian Journal of Anesthesia 2013;60(6):584-599.

57. Chavan G, Chavan AU, Patel S, Anjankar V, Gaikwad P. Airway blocks vs LA nebulization- an interventional trial for awake fiberoptic bronchoscope assisted nasotracheal intubation in oral malignancies. Asian Pac J Cancer Prev. 2020;21(12):3613-3617.

58. Ahmad I, El-Boghdadly K, Bhagrath R, Hodzovic I, McNarry AF, Mir F, et al. Difficult airway society guidelines for awake tracheal intubation (ATI) in adults. Anaesthesia. 2020;75(4):509-528.

59. Rai MR, Parry TM, Dombrovskis A, Warner OJ. Remifentanil target-controlled infusion vs propofol target-controlled infusion for conscious sedation for awake fibreoptic intubation: a double-blinded randomized controlled trial. Br J Anaesth. 2008;100(1):125-130.

60. Lallo A, Billard V, Bourgain JL. A comparison of propofol and remifentanil target-controlled infusions to facilitate fiberoptic nasotracheal intubation. Anesth Analg. 2009;108(3):852-857.

61. Zhang X, He W, Wu X, Zhou X, Huang W, Feng X. TCI remifentanil vs. TCI propofol for awake fiber-optic intubation with limited topical anesthesia. Int J Clin Pharmacol Ther. 2012;50(1):10-16.

62. Shah SV, Lacey O. A decade of using a remifentanil target-controlled infusion technique for awake fibreoptic intubations. Anaesthesia. 2021;76(2):284-285.

63. Cabrini L, Baiardo Redaelli M, Ball L, Filippini M, Fominskiy E, Pintaudi M, et al. Awake fiberoptic intubation protocols in the operating room for anticipated difficult airway: a systematic review and meta-analysis of randomized controlled trials. Anesth Analg. 2019;128(5):971-980.

64. Petrini F, Accorsi A, Adrario E, Agrò F, Amicucci G, Antonelli M, et al. Recommendations for airway control and difficult airway management. Minerva Anestesiol. 2005;71(11):617-657.

65. Frova G, Sorbello M. Algorithms for difficult airway management: a review. Minerva Anestesiol. 2009;75(4):201-209.

66. Piroli A, Marsili I, Marinangeli F, Costanzi S, Gentili L, Paladini A. Use of video laryngoscope in sedated spontaneously

breathing patients with predicted difficult tracheal intubation and impossibility of using fibreoptic bronchoscopy. Case Rep Anesthesiol. 2021;2021:5524240.

67. Greenland JR, Michelow MD, Wang L, London MJ. COVID-19 infection: implications for perioperative and critical care physicians. Anesthesiology. 2020;132(6):1346-1361. Erratum in: Anesthesiology. 2020;133(3):693.

68. Chen X, Liu Y, Gong Y, Guo X, Zuo M, Li J, et al. Perioperative management of patients infected with the novel coronavirus: recommendation from the Joint Task Force of the Chinese Society of Anesthesiology and the Chinese Association of Anesthesiologists. Anesthesiology. 2020;132(6):1307-1316.

69. Brewster DJ, Chrimes NC, Do TBT, Fraser K, Groombridge CJ, Higgs A, et al. Consensus statement: safe airway society principles of airway management and tracheal intubation specific to the COVID-19 adult patient group. Med J Aust. 2020;212(10):472-481. Erratum in: Med J Aust. 2020;213(7):312.

70. Sorbello M, El-Boghdadly K, Di Giacinto I, Cataldo R, Esposito C, Falcetta S, et al. The Italian coronavirus disease 2019 outbreak: recommendations from clinical practice. Anaesthesia. 2020;75(6):724-732.

71. Chow TT, Kwan A, Lin Z, Bai W. Conversion of operating theatre from positive to negative pressure environment. J Hosp Infect. 2006;64(4):371-378.

72. Sidhu VS, Whitehead EM, Ainsworth QP, Smith M, Calder I. A technique of awake fibreoptic intubation. Experience in patients with cervical spine disease. Anaesthesia 1993;48(10):910-913.

73. Fuchs G, Schwarz G, Baumgartner A, Kaltenböck F, Voit-Augustin H, Planinz W. Fiberoptic intubation in 327 neurosurgical patients with lesions of the cervical spine. J Neurosurg Anesthesiol. 1999;11(1):11-16.

74. Rosenstock CV, Thøgersen B, Afshari A, Christensen AL, Eriksen C, Gätke MR. Awake fiberoptic or awake video laryngoscopic tracheal intubation in patients with anticipated difficult airway management: a randomized clinical trial. Anesthesiology. 2012;116(6):1210-1216.

75. World Health Organization (WHO). Mask use in the context of COVID-19: interim guidance, 1 December 2020. Geneva: World Health Organization; 2020. Available from: https://iris.who.int/bitstream/handle/10665/338033/WHO-2019-nCoV-IPC_PPE_use-2020.4-eng.pdf

76. Figueiredo S, Gaultier E, Rodrigues A, Harrois A, Duranteau J. Airway management in patients with COVID-19: beyond the first endotracheal intubation. Anaesth Crit Care Pain Med. 2021;40(1):100797.