



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

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

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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 yapılmasına eğilim olmuştur. Bununla beraber, şüpheli veya doğrulanmış COVID-19 hastalarında UTE uygulamalarına ilişkin yayımlanmış veriler oldukça sınırlıdır. Bu sistemik 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 uygulamaya içermeyen yayınlar dışlanmıştır. Çalışmaların seçimi ve veri çıkarımı birden fazla araştırmacı tarafından bağımsız olarak yapılmış, görüş ayrılıkları uzlaşılı 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



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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 fiberoptic 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 fiberoptic 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 remifentanyl 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

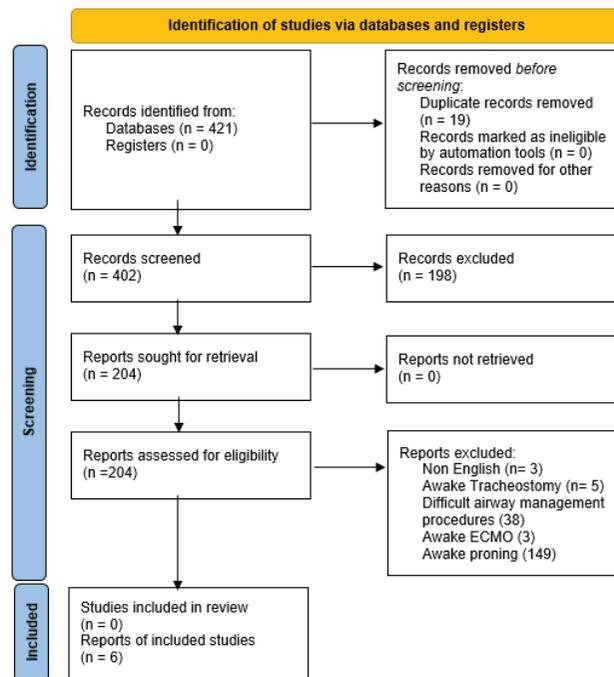


Figure 1. PRISMA 2020 flow diagram

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
Antisialagogue	Glycopyrronium bromide	No	No	Unknown	Glycopyrronium bromide	No
Topicalisation	Lidocaine 4% atomiser device + lidocaine 10% spray + nasopharyngeal gauze packing coated with 4% lidocaine	Lidocaine 4% atomiser device + lidocaine 10% spray + nazopharyngeal gauze 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	Orotacheal	Nasotracheal	Unknown	Nasotracheal	Orotacheal	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 Storz®, 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 remifentanyl 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 remifentanyl 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. Remifentanyl 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 remifentanyl (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 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

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