Anesthetic Cooperation and Emergency Nursing Care for Awake Intubation in a Patient with Giant Goiter Complicated by Difficult Airway

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Abstract: Objective: This study aims to explore optimized anesthetic nursing strategies for awake intubation in patients with giant goiter complicated by difficult airway, and to establish a standardized nursing process based on evidence-based guidelines. Methods: The clinical data of one patient with bilateral grade III goiter (neck circumference 50 cm, narrowest tracheal segment 0.4 cm) was retrospectively analyzed. Key perioperative nursing points during video-assisted fiberoptic bronchoscope-guided awake intubation were summarized, including multidimensional airway assessment, stratified psychological intervention, standardized airway preparation, refined perioperative collaboration during intubation, and intraoperative risk prevention. Results: Guided by the 2022 American Society of Anesthesiologists (ASA) Practice Guidelines for Management of the Difficult Airway, the patient received dual topical airway anesthesia (2% lidocaine) via "nebulization + local spray", combined with stepwise psychological intervention and precise operational coordination. The preoperative anxiety score (measured by the Amsterdam Preoperative Anxiety and Information Scale, APAIS) decreased from 14 to 9, representing a 35.7% reduction. The first-attempt success rate of awake intubation was 100%. Intraoperative vital signs remained stable, with no complications such as airway injury or cutaneous pressure damage. The patient was discharged successfully on the 7th postoperative day without anesthesia-related complications. Conclusion: For patients with difficult airway caused by giant goiter, implementing an evidence-based systematic nursing process can significantly reduce perioperative airway risks, providing clinical reference for similar cases.

***Keywords*:** giant goiter, difficult airway, awake tracheal intubation, fiberoptic bronchoscope, evidence-based nursing

1. Introduction

According to the 2022 ASA Practice Guidelines for Management of the Difficult Airway [1], difficult airway is defined as the difficulty or failure in one or more of the following procedures experienced by a trained anesthesiologist: mask ventilation, laryngoscopy, supraglottic airway ventilation, tracheal intubation, extubation, or establishment of invasive airway. A U.S. analysis of claims for adverse anesthetic events [2] showed that deaths related to difficult intubation increased from 42% in 1993–1999 to 73% in 2000–2012. Among difficult airway litigations between 2000 and 2012, 76% of patients had predictive factors for difficult airway. A domestic summary and analysis of perioperative adverse events [3] indicated that difficult airway is one of the five main causes of perioperative adverse events.

Giant goiter is defined differently: internationally, it refers to goiter where the cricoid cartilage cannot be palpated superiorly, the inferior margin extends into the thorax, tracheal deviation exceeds 1 cm, or tracheal stenosis is detected on chest radiography. Domestically, it is commonly defined as grade III goiter, or goiter weighing >500 g, or with the longest diameter >8 cm. The incidence of difficult airway due to compression by giant goiter reaches 41.5% [4]. Giant goiter often has a long course; its posteromedial growth can compress the trachea and esophagus, causing symptoms such as chest tightness, dyspnea, and dysphagia. Long-term local compression may lead to tracheal deviation, stenosis, or malacia [5], and such patients are listed in guidelines as a typical population with "predictable difficult airway", posing great challenges to anesthetic intubation and perioperative management. Guidelines recommend awake intubation as the preferred approach for high-risk difficult airway with preserved spontaneous breathing, and its success depends on the accuracy of preoperative assessment, adequacy of airway preparation, and professionalism of nursing cooperation. This article retrospectively analyzes the anesthetic nursing process of one patient with bilateral giant nodular goiter complicated by moderate airway stenosis, summarizes clinical nursing experience based on evidence-based guidelines, and provides reference for airway management in similar cases.

2. Clinical Data

2.1 General Information

A 36-year-old male patient, with a height of 171 cm, weight of 69 kg, and BMI of 23.6 kg/m², was classified as ASA physical status II. He was admitted due to "palpitations and hand tremors for 4 years, and progressive enlargement of the anterior cervical region for 1 year". In the past six months, he developed intermittent dysphagia and a sense of obstruction during forced breathing. He had a 20-year smoking history (20 cigarettes daily, switched to e-cigarettes in the past 2 years).

Physical examination: Neck circumference was 50 cm; bilateral grade III goiter was palpable, soft in texture, with audible vascular murmurs; positive hand tremor test.

Laboratory tests: Hyperthyroidism [triiodothyronine (T3): 5.26 nmol/L (reference range: 0.92–2.79 nmol/L); free triiodothyronine (FT3): 13.86 pmol/L (reference range: 3.5–6.5 pmol/L); thyroid-stimulating hormone (TSH): <0.01 uIU/ml]; significantly elevated thyroid autoantibodies [thyroid peroxidase antibody (TPO-Ab): >1126 uIU/ml] .

Imaging findings: Thyroid ultrasound showed bilateral nodular goiter (TR3 grade), with the left lobe measuring 12.0 cm×5.2 cm×4.9 cm, right lobe 12.7 cm×5.7 cm×4.2 cm, and isthmus thickness 1.6 cm ; ① Enlarged thyroid volume with compression and deviation of surrounding soft tissues, tracheal compression and stenosis (compressed length: 5 cm; narrowest segment: approximately 0.4 cm, still midline), and mild deformation of the hypopharynx due to local compression; ② Focal atelectasis in the outer segment of the right middle lung; ③ Fatty liver, nodules in liver segments S6 and S8; Echocardiography showed left atrial and ventricular enlargement (ejection fraction: 73%) with mild mitral regurgitation.

Diagnosis: ① Toxic diffuse goiter; ② Bilateral nodular goiter (grade III).

2.2 Anesthetic and Surgical Outcomes

Oxygen supply was maintained via awake nasal intubation under video-assisted fiberoptic bronchoscopy [6-7]. Topical anesthesia was achieved with 5 ml of 2% lidocaine nebulization for 10 minutes (to anesthetize nasal, pharyngeal, and laryngeal mucosa). Nasal vessels were constricted with ephedrine. Additional 2 ml of lidocaine was sprayed via the side hole of the bronchoscope before reaching the glottis (to enhance anesthesia of the glottic area). A 6.0# reinforced endotracheal tube was successfully inserted (depth: 26 cm; cuff pressure: 25 cmH_2O). The patient underwent total bilateral thyroidectomy + recurrent laryngeal nerve exploration under general anesthesia. Intraoperative blood loss was 200 ml, and end-tidal carbon dioxide partial pressure ($PETCO_2$) was maintained at 35–40 mmHg. The patient was transferred to the ICU with the tube postoperatively, extubated on day 1, transferred back to the general ward on day 2, and discharged on day 7 without anesthesia-related complications such as laryngospasm or laryngeal edema.

3. Anesthetic Cooperation And Emergency Nursing

3.1 Preoperative Multidimensional Assessment

3.1.1 Airway Risk Stratification

Comprehensive assessment combining subjective and objective indicators showed: modified Mallampati grade III, mouth opening of 3.5 cm (2 finger-breadths), neck extension of 30° (normal >35°), and neck CT indicating tracheal stenosis to 0.4 cm, meeting the diagnostic criteria for "predictable difficult airway" [8]. In addition, the patient's long-term smoking history (20 years) might exacerbate airway hyperreactivity, increasing intubation risks [9].

3.1.2 Psychological Status Assessment

Preoperative anxiety refers to the state of unease or tension caused by concerns about disease, hospitalization, anesthesia, surgery, or unknown reasons [10]. The Expert Consensus on Preoperative Anti-Anxiety points out that the incidence of preoperative anxiety ranges from 25% to 80%, which can increase intraoperative anesthetic dosage and affect prognosis (e.g., exacerbating postoperative pain, cognitive impairment, increasing complications and mortality), and is closely related to the type of surgery/anesthesia and social factors. Preoperative anxiety is more common in patients with uncertainty and helplessness regarding surgery, anesthesia, operating room environment, medical team, perioperative risks, complications, and postoperative pain, especially those with unknown information, adverse surgical experiences, or specific fears. APAIS has good psychological measurement properties and is a commonly used scale for clinical assessment of preoperative patients [10].

Assessment using the Amsterdam Preoperative Anxiety and Information Scale (APAIS) showed: total anxiety score of 14 (indicating anxiety), including 7 points for anesthesia-related anxiety and 7 points for surgery-related anxiety; information demand score of 8 (8–10 points indicating high information demand). The patient's main fears were discomfort during awake intubation and airway risks.

3.2 Stepwise Evidence-Based Psychological Intervention

Individualized intervention based on APAIS scores:

Cognitive restructuring: The surgeon explained the necessity of surgery using imaging data (showing the relationship between goiter enlargement and airway compression); the anesthesiologist showed videos of successful intubation in similar cases, clarifying that "awake intubation is a key measure to ensure airway safety" [1,7].

Operation rehearsal: The anesthetic nurse demonstrated the fiberoptic intubation path using an airway model, explained that "nebulization anesthesia can significantly reduce discomfort", and guided the patient to simulate cooperative actions such as "deep and slow breathing" and "no head shaking" [11].

Pharmacological synergy: 30 minutes preoperatively, 20 μg dexmedetomidine diluted in 100 ml of 0.9% sodium chloride injection was intravenously infused as prescribed [10], utilizing its synergistic effects of "anti-anxiety, sedation, and analgesia" (without significant respiratory depression); 5 μg sufentanil was intravenously injected as prescribed for analgesia to reduce stimulation.

After intervention, APAIS scores improved: total anxiety score decreased to 9, information demand score decreased to 4, and the patient actively expressed willingness to cooperate with intubation.

3.3 Standardized Preparation for Difficult Airway

3.3.1 Preparation of Items and Equipment

Difficult airway cart [10]: Video-assisted fiberoptic bronchoscope system (3.8 mm diameter, compatible with narrow airways), 5.5#–7.0# reinforced endotracheal tubes (6.0# as the primary choice, 5.5# prepared for more severe stenosis), cricothyroidotomy kit (22G puncture needle for emergency airway access), video laryngoscope (alternative), oropharyngeal/nasopharyngeal airways (5#–10#), breathing bag, stethoscope.

Monitoring equipment: Anesthesia machine, multi-parameter monitor (including ECG, invasive blood pressure, SpO_2), sidestream $PETCO_2$ monitor (to confirm intubation position in real-time), high-flow oxygen device (for pre-oxygenation).

Medication preparation: Anesthetic kit (2% lidocaine, dexmedetomidine, ciprofol, etc.), emergency kit (epinephrine, dexamethasone, etc.).

3.3.2 Personnel Preparation

An airway management team was established [8], including 1 senior anesthesiologist (primary operator), 1 anesthetic nurse (assisting intubation + vital sign monitoring), and 1 surgical nurse (preparing emergency items). A division plan was clarified: "immediate initiation of cricothyroidotomy in case of intubation failure".

3.4 Standardized Nursing Process for Awake Intubation

Table 1. Standardized Nursing Process for Awake Intubation in Anesthesiology Department

Step	Key Operational Points	Evidence-Based Basis
Clearance of oral and nasal secretions	Check oral and nasal dryness before intubation; promptly suction secretions	[11,12] Ensure clear intubation view.
Pre-oxygenation	High-flow mask oxygenation (6 L/min) for 5 minutes, maintaining SpO_2 >99% to increase oxygen reserve in functional residual capacity	[1,6] Prevent hypoxia during intubation.
Nasal preconditioning	Gently apply 0.5% ephedrine swabs to bilateral nasal mucosa to constrict blood vessels and lubricate, reducing intubation-related bleeding risk	[7,12] Ephedrine reduces nasal mucosal injury.
Airway anesthesia	① Nebulization phase: 5 ml of 2% lidocaine with oxygen flow 6 L/min; instruct the patient to inhale deeply to deposit the drug on the glottis; ② Enhancement phase: spray 2 ml of 2% lidocaine via the side hole when the fiberoptic bronchoscope reaches the pre-glottic area to block the superior laryngeal nerve	[6,7] Dual anesthesia improves patient tolerance.
Intubation operation	Advance the fiberoptic bronchoscope nasally; after the scope tip passes through the glottis, confirm the carina position; insert the endotracheal tube along the scope to "1–2 cm above the carina"; inflate the cuff with 5 ml (pressure 25 cmH_2O)	[6,7] Precise positioning avoids excessively deep/shallow tube placement.
Post-intubation confirmation	① Bilateral lung auscultation (symmetric breath sounds); ② $PETCO_2$ monitoring (continuous waveform, value 36 mmHg); ③ Secondary confirmation via fiberoptic bronchoscope (tube tip 1 cm from the carina)	[1,6] Triple confirmation ensures successful intubation.

3.5 Intraoperative Position Management and Airway Maintenance

3.5.1 Safe Placement of Neck Hyperextension Position

The patient was placed in a supine position with a 10 cm soft pillow under the shoulders to hyperextend the head by 15° [13], ensuring the mandible, trachea, and sternum were aligned horizontally (facilitating surgical operation). A "homemade inflatable rubber glove pad" (pressure ≤32 mmHg) was placed at the contact point between the anaesthesia breathing circuit

and the face to prevent pressure injury from tube compression. During positioning, the anesthetic nurse continuously secured the endotracheal tube to prevent displacement or kinking.

3.5.2 Dynamic Prevention and Control of Airway Risks

Pharmacological prevention: After intubation, 5 mg dexamethasone was intravenously injected as prescribed to inhibit airway mucosal inflammation and prevent laryngeal edema.

Enhanced monitoring: Continuous monitoring of peak airway pressure (maintained ≤25 cmH_2O), $PETCO_2$ (35–40 mmHg), and SpO_2; lung auscultation every 30 minutes to detect tube displacement or obstruction promptly.

Skin protection: Pulse oximeter probes were replaced every 2 hours; gauze was placed under the blood pressure cuff (to reduce upper arm compression); sterile eye patches were used to close the eyelids (to prevent corneal injury in patients with thyroid-associated exophthalmos).

4. Discussion

4.1 Characteristics of Airway Compression by Giant Goiter and Key Assessment Points

Giant goiter (right lobe 12.7 cm×5.7 cm×4.2 cm in this case) has "chronic progressive" effects on the airway: ① Direct tracheal compression causing luminal stenosis (0.4 cm in this case, meeting the definition of "severe stenosis" by Jiang et al [14]); ② Long-term compression may lead to tracheal cartilage ring malacia (not observed intraoperatively but prepared as a "potential malacia" preoperatively).

Preoperative assessment should combine "subjective signs + objective imaging": modified Mallampati classification and neck circumference (>50 cm) indicate intubation difficulty, while neck CT 3D reconstruction can accurately measure the location, degree, and length of airway stenosis (5 cm compressed length in this case), providing a basis for tube selection (6.0# reinforced tube) [13].

4.2 Key Points of Nursing Cooperation in Awake Intubation

The success of fiberoptic bronchoscope-guided awake intubation depends on the balance between "patient tolerance, anesthetic efficacy, and operational accuracy" [5,7]. Optimized points in this case: ① Anesthetic regimen: total 2% lidocaine dose of 120 mg (<5 mg/kg safety threshold); "nebulization + local spray" covers the area from the nose to the subglottis, more effective than single nebulization [7]; ② Cooperation details: instructing the patient to "inhale through the nose and exhale through the mouth" during nebulization to ensure full contact of the drug with the nasopharynx; pausing the operation and advising deep breathing if the patient coughs during intubation to avoid oxygen desaturation due to severe reactions; ③ Monitoring focus: heart rate (HR) fluctuations during intubation (from 80 to 85 beats/min in this case) reflect patient stress; if HR >100 beats/min, the operation should be paused to assess the adequacy of anesthesia [6].

4.3 Construction of Perioperative Airway Safety System

For such patients, a "three-level prevention" system should be established:

Primary prevention (preoperative): Based on CT-based grading of airway stenosis (0.4 cm/1.5 cm = 26.7% as moderate stenosis), awake intubation was formulated as the first choice [13].

Secondary prevention (intraoperative): Early identification of tube obstruction (e.g., sudden drop in waveform with increased pressure) through combined analysis of $PETCO_2$ waveform and airway pressure [1].

Tertiary prevention (postoperative): During ICU stay, a "three-step extubation assessment" was implemented—spontaneous tidal volume >5 ml/kg, peak inspiratory flow >15 L/min, and recovery of swallowing function (Wada drinking test grade I) [12]—to reduce airway risks after extubation.

4.4 Core Value of Psychological Assessment in Difficult Airway Management

Preoperative psychological assessment is a key part of perioperative management for patients with giant goiter complicated by difficult airway. Its core value lies in identifying the patient's psychological state through quantitative tools, providing a precise basis for individualized intervention. The Amsterdam Preoperative Anxiety and Information Scale (APAIS) used in this case not only distinguishes between anesthesia-related and surgery-related anxiety (7 points each in this case) but also assesses the degree of information demand (8 points, high demand), which is more targeted than traditional qualitative assessment [10].

From a pathophysiological perspective, patients with giant goiter already have dyspnea due to airway compression; combined with fear of awake intubation, they are prone to sympathetic excitation, leading to tachycardia, hypertension, or even laryngeal spasm, increasing intubation difficulty [10]. The patient's initial APAIS score of 14 indicated significant anxiety, whose psychological stress might be related to: ① Unknown fear of "intubation in an awake state", worrying about pain or suffocation; ② Hyperthyroidism itself can enhance nervous system sensitivity, amplifying anxiety; ③ Airway

hyperreactivity due to long-term smoking, reducing tolerance to airway manipulation [9].

The guiding significance of psychological assessment results for intervention strategies is reflected in three aspects: ① For high information demand, a "cognitive restructuring + operation rehearsal" model was adopted, transforming abstract risks into concrete cognition through interpretation of imaging data, display of successful cases, and model demonstration, satisfying the patient's sense of control over the medical process; ② For anesthesia-related anxiety, emphasis was placed on explaining the efficacy of topical anesthesia and the sedative effect of dexmedetomidine to eliminate "fear of pain"; ③ Pharmacological intervention was coordinated with psychological counseling: dexmedetomidine not only reduced anxiety scores but also maintained patient cooperation through its "arousable sedation" property, avoiding respiratory depression from deep sedation [5,10]. The 35.7% reduction in anxiety scores after intervention confirmed that targeted intervention guided by precise assessment can effectively improve the patient's psychological state.

In addition, psychological assessment should be conducted throughout the perioperative period. Intraoperatively, verbal comfort was used to strengthen patient trust; postoperatively, timely notification of successful intubation and recovery progress was provided to avoid secondary anxiety caused by the ICU environment. This case suggests that the synergy between psychological assessment and airway assessment can form a "physiological-psychological" dual safety barrier, which is of great significance for the prognosis of patients with difficult airway.

5. Conclusion

Perioperative nursing for patients with giant goiter complicated by difficult airway should be "evidence-based and precision-oriented". A closed-loop nursing system can be formed through multidimensional airway assessment to clarify risk stratification, stepwise intervention to relieve preoperative anxiety, standardized processes to ensure intubation safety, and dynamic monitoring to prevent intraoperative risks. This system can effectively reduce airway complications and provide a replicable nursing path for similar clinical cases.

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