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CASE REPORT

Awake tracheotomy in a patient with stridor and dyspnoea caused by a sizeable malignant thyroid tumor: a case report and short review of the literature

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Key Clinical Message

Individual airway management is mandatory in patients with large goiters undergoing thyroid surgery. Preoperative endoscopic airway evaluation and imaging studies can support clinical decision making. Awake tracheotomy can be an effective and reasonable airway management strategy in such patients.

Keywords

Airway management, airway obstruction, awake tracheostomy.

Introduction

Sizeable thyroid tumors or goiters, respectively, often result in upper airway obstruction or tracheal stenosis. Airway management for surgery can be challenging in such patients, and these conditions often call for rare but potentially life-saving individualized decisions. Several case reports have been published so far, which discuss different strategies of airway management in such entities [1–5]. Awake tracheotomy can be a strategy and is performed electively while maintaining spontaneous breathing under local anesthesia. Typical indications are stenotic tumors in the region of the larynx and the hypopharynx [6].

Here, we report on an 88-year-old female patient with stridor and dyspnoea caused by a sizeable malignant thyroid tumor. After preoperative endoscopic airway evaluation, awake tracheotomy was considered to be the appropriate strategy for securing the airway and ensuring adequate ventilation and oxygenation. Furthermore, we discuss this approach in light of different strategies for airway management in such cases.

Ethics approval was waived by the local ethics committee of the responsible medical association (Landesärztekammer Nordrhein 163/2016) due to the retrospective and anonymous nature of the case report.

Case Report

An 88-year-old female patient (172 cm, 70 kg) with expanding thyroid cancer displacing the larynx to the left

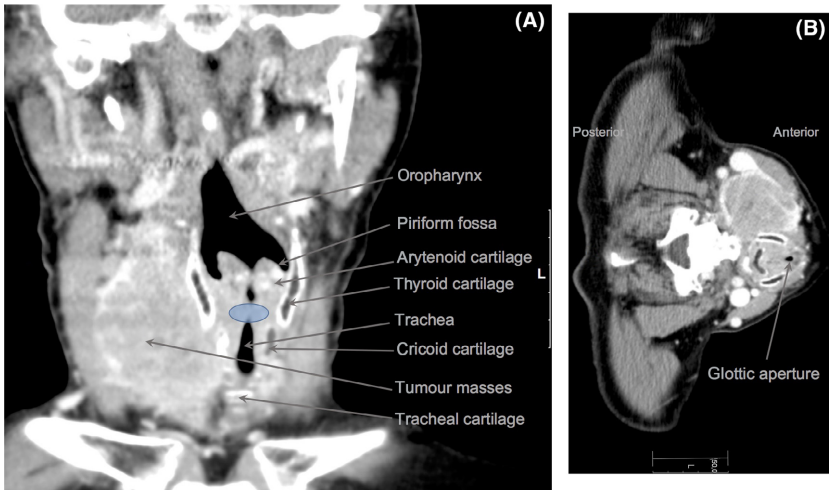

Figure 1. The CT scan demonstrates a dislocated larynx to the left due to bulky disease (A). (B) reveals a glottis aperture of 3 × 5 mm. Scale marking: (A) 10 mm per graduation mark; (B) 50 mm/10 mm per graduation mark, respectively. The blue ellipse in A shows the vocal cord plane.

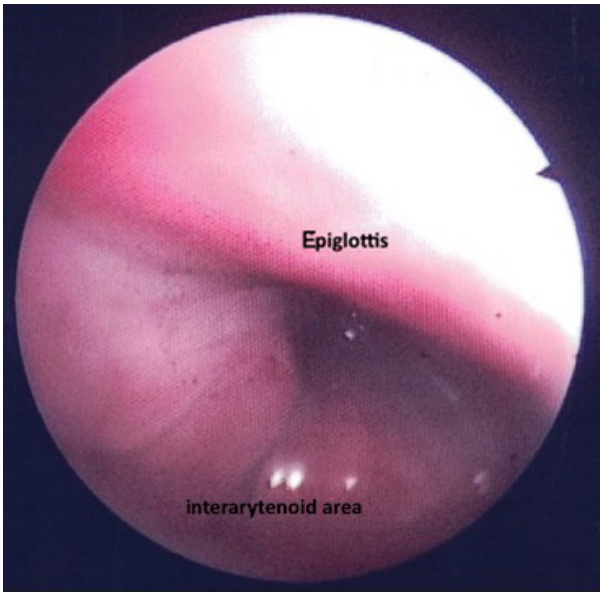

Figure 2. Awake fiber-optic laryngoscopy shows a swollen epiglottis with the impossibility of visualizing vocal cords.

was scheduled for total thyroidectomy. Further medical conditions were as follows: atrial fibrillation, chronic kidney disease (grade 3), arterial hypertension, and gastroesophageal reflux disease. The patient presented with stridor and dyspnoea during minimal physical exercise. The CT scan of the larynx demonstrated a dislocated larynx to the left and a glottis aperture of 3 × 5 mm (Fig. 1). Within the context of a preoperative airway evaluation by an anaesthesiologist, awake fiber-optic laryngoscopy proved a swollen epiglottis (Fig. 2). During this examination under light opioid-based sedation with 5 μg sufentanil intravenously and topical anesthesia using lidocaine spray, the patient became short of breath and visualization of vocal cords was impossible.

Overviewing these clinical findings, we expected difficulties with maintenance of airway patency under sedation or general anesthesia, and we decided to schedule the patient for preoperative awake tracheostomy to secure the patient′s airway. Preoperatively, continuous standard monitoring with electrocardiogram, pulse oximetry, and invasive blood pressure measurement was applied to the patient. In addition, oxygen was administered by nasal probe (4L O_2/min), and 150-μg clonidine was administered intravenously because of high arterial pressure, tachycardia, and the sedative side effect without compromising spontaneous respiration.

Awake tracheotomy was carried out by experienced general surgeons in the operating room under local anesthesia with 30 mL of prilocaine (20 mg/mL). Equipment for difficult airway (i.e., video laryngoscope, different laryngoscope spatulas, Eschmann introducer) and a bronchoscope was available in case of emergency. The patient was hemodynamically and respiratorily stable during the surgical procedure. After tracheotomy was performed successfully, a tracheotomy cannula (8.0 mm) was placed and bronchoscopy verified the correct intratracheal position. Following this, induction of balanced anesthesia with sufentanil and sevoflurane for thyroid cancer surgery was started. Postoperatively, the patient was transferred to the surgical intensive care unit.

At first, the tracheostomy tube could not be removed due to persistent swelling in the area of vocal cord plane. The otolaryngologist suspected infiltration of the thyroid tumor into the trachea. Thus, tracheal cannula was left in situ, and the patient was discharged from the intensive care unit on day 8 after surgery. She left hospital on day

17 with a tracheotomy tube in place and was transferred to radiotherapy to a hospital close to her home.

Discussion

Patients with sizeable thyroid tumors are challenging for anesthesiologists to provide secure ventilation. The airway problems in thyroid surgery are noted in patients presenting with large goites causing tracheal deviation and/or compression, with malignant thyroid problems such as uni- or, rarely, bilateral paralyzed vocal cords, causing acute airway distress. Also rare, however, a life-threatening entity is the anaplastic thyroid carcinoma presenting with severe stridor and airway difficulties [7]. Whereas the large goite is not associated with a more frequent difficult endotracheal intubation, the presence of a cancerous goiter is a major factor for predicting difficult intubation [8]. We decided for awake tracheostomy because of the anatomic difficulties found in the preoperative airway evaluation and the clinical presentation with dyspnoea and stridor under a light sedation and topical anesthesia with lidocaine. Probably, transcricothyroid injection of local anesthetics might have been better tolerated and more effective in this case. However, we supposed that fiber-optic-guided intubation might fail due to the impossibility to intubate the trachea or due tosevere hypoxia under sedation. Furthermore, we were afraid of increasing the swelling of the larynx by manipulation with the fibrescope, and even a small pediatric bronchoscope would have caused complete airway obstruction during bronchoscopy. Although rarely chosen, international guidelines recommend tracheostomy a primary strategy in difficult airway management [9, 10]; especially, in patients in which there is potential for a different laryngoscopy, supralaryngeal ventilation cannot be used, and the patient will not tolerate an apnoeic period awake surgical airway access is an appropriate strategy [11].

Different ways have been reported to achieve safe anesthesia for this group of patients [1, 2, 12]. Awake bronchoscopy with subsequent endotracheal intubation is considered a "gold standard" today [6]. However, several different methods are reported. Garg and colleagues report on a patient scheduled for total thyroidectomy for multinodular goiter. After topic anesthesia induction of general anesthesia with sevoflurane, there was a significant difficulty to achieve tracheal intubation under direct laryngoscopy due to the size and position of the tumor. Tracheotomy was also not possible due to the same reasons. After multiple failed attempts to place an endotracheal tube, ventilation was achieved after insertion an intubating laryngeal mask (ILMA). Subsequently, after establishment of the best ventilation possible with optimal capnography, blind tracheal intubation was accomplished [2].

Alternatively, video laryngoscopy or optical stylets, known to be efficient in cases for unexpected and expected difficult airways, can be used to facilitate endotracheal intubation. However, in our case, we were afraid of increasing swelling of the larynx and epiglottis by manipulation with a laryngeal mask or an endotracheal tube.

Ashok and colleagues report on a patient with a neck tumor. Intubation was difficult due to the size of the tumor. During induction of anesthesia, the anesthesiologist experienced difficulties in mask ventilation accompanied with a drop of oxygenation. Emergency tracheostomy was performed through a lateral approach where the trachea was the most superficial considering the size of the tumor. The airway was secured without hypoxia in the patient; tracheostomy tube was fixed with stay sutures to prevent accidental dislodgement [13].

In our case, preoperative flexible laryngoscopy and medical imagining were helpful for airway risk assessment and clinical decision making. Thus, we were able to choose a safe strategy for our patient. Already in 1991, Barker and colleagues described computerized axial tomography of the trachea as a useful investigation when a goiter causes symptomatic tracheal compression [14].

There is rising evidence from the literature that ultrasound can be a valuable tool for assessment of airway anatomy, verification of endotracheal tube placement, or guiding of percutaneous needle tracheostomy [15, 16]. Airway ultrasound examination is not routinely performed at our institution and hence was not done in this case.

Additionally, planning airway management can be supported by endoscopic preoperative airway evaluation like performed in our case. In a study of 138 patients who underwent preoperative endoscopic airway evaluation, this preoperative diagnostic intervention affected the planned airway management in 26% of the cases [17]. Nevertheless, implementation of local standards for difficult airway management and continuous training on the airway devices available may play an important role in patient safety.

Liou and colleagues reported a case of a patient with a large thyroid carcinoma with tracheal and esophageal invasion who presented with preoperative stridor scheduled for total thyroidectomy. Intubation with bronchoscopic guidance failed twice, but succeeded using a video laryngoscopy technique (Glidescope®) [12]. Interestingly, the authors report that intubating the trachea with the fibrescope was successful, but the tracheal stenosis (2 cm below the vocal cords) could not be passed and the position of the fiber optic was lost during the procedure. Finally, an intubation attempt with awake laryngoscopic intubation using a video laryngoscope was successful. This

case report impressively demonstrates that an individual approach and dynamic decision making are necessary. Furthermore, different airway devices should be available to modify the chosen airway-management strategy. Optimally, second-line strategies should be planned properly in advance to secure the patient′s airway if the chosen approach fails. Which alternative strategy is the best depends mainly on the kind of complication, on which devices are available, and on when the complication occurs. For example, whereas stopping the procedure due to patient′s agitation may have been an appropriate approach at an early stage, bleeding complications during tracheotomy might call for a forward strategy to secure the patient's oxygenation.

Percutaneous cardiopulmonary support (e.g., ECMO) prior to anesthesia induction might increase patient′s safety or can serve as a rescue strategy when conventional approach fails [18–21]. In this context, possible risks and complications of an extracorporeal circulation should be balanced individually against the risk of losing the airway.

In some cases, local anesthesia for tracheotomy is not possible if there is an inflammation (e.g., abscess) of the neck skin. Cho and colleagues reported on a successful bilateral superficial cervical plexus block for tracheal dissection in a patient with severe tracheal stenosis caused by papillary thyroid cancer with tracheal invasion [22]. In our case, the patient had dyspnoea at rest, and airway control during the whole procedure seemed to be the safest approach in this situation.

Evidence for an optimal airway strategy in patients with sizeable thyroid tumors or other neck or tracheal masses, respectively, is mostly limited to case reports, and there are only few data from cohort studies or case series.

In retrospective chart review of 112 patients undergoing surgery for benign goiter, all patients could be managed using conventional laryngoscopy or fiber-optic intubation. Surprisingly, more than 10% fiber-optic intubation failed, and those patients were successfully intubated using conventional direct laryngoscopy. The authors concluded that benign nodular goiter disease does not pose significant challenges to intubation in their patient cohort [23].

In a cohort of 919 patients with retrosternal goiter, no tracheotomy or extracorporeal circulation was required for airway management [3]. In a subcohort of 133 patients, 32 were identified as having a potentially difficult airway. Seventeen underwent awake fiber-optic tracheal intubation, but two of these were abandoned and converted to intravenous induction and general anesthesia. Eleven had inhalational induction; two of these were also abandoned and converted to intravenous induction and general anesthesia. Of those suspected of having a difficult airway, 28 (87.5%) subsequently had direct laryngoscopy where the laryngeal inlet was clearly visible [3].

Gao and colleagues reported on 15 patients with mediastinal masses. The approach for peroperative airway management depended on the extent of the tracheal obstruction (more or less than 50%), the location of the masses (upper or lower part of the trachea), and the severity of dyspnea. In one patient with severe respiratory distress, percutaneous cardiopulmonary support was introduced before anesthetic induction [18].

The successful airway management of tracheal masses depends on the degree and location of stenosis and the severity of dyspnea. Extracorporeal circulation is an optimal choice for those with critical airway occlusion, and adequate oxygenation cannot be accomplished with conventional anesthesia.

The available case reports and cohort studies show that there is a large heterogeneity in airway-management strategies in patients with neck tumors or tracheal masses. The anesthetic approaches mainly depend on the local standards, the anesthetists′ experience, the airway-management devices available, and not least on the patient′s conditions. Thus, it is necessary to evaluate each case and choose the best and most suitable method for airway management individually.

Conclusion

In our patient with a sizeable thyroid tumor, awake tracheostomy was an appropriate airway-management strategy. Evidence for an optimal approach in such patients is limited to few case reports and retrospective cohort studies. Thus, it is essential to adhere to international guidelines and properly planning the airway-management strategy. Preoperative endoscopic airway evaluation and imaging studies can support individual decision making.

Authorship

AH, TK, and SS: prepared the manuscript. JH, SGR, KK, and SK: helped with the literature and contributed to the manuscript. AK: provided the radiological images. All authors proofread the final manuscript.

Conflict of Interest

The authors declare that they have no competing interests.

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