



Anesthetic considerations for microlaryngeal surgery

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Abstract

Introduction:

Microlaryngeal surgery encompasses a wide range of laryngeal procedures. Patients presenting for microlaryngeal surgery frequently have a difficult airway. The chosen approach to this airway depends on the pathology and the patient's symptoms. The *Aim* of the study is to determine the risk factors and anesthetic problems during microlaryngeal surgery.

Materials and Methods:

A prospective cohort study including 100 patients undergoing microlaryngeal surgery in the Department of Otorhinolaryngology at the University Hospital „Queen Giovanna“ – ISUL, Sofia, in the period 2020–2021; Medical University-Sofia. Preoperative examination of the larynx is performed in all patients by Storz 8402 ZX fiber optic laryngoscope with video capability.

Results and discussion: In 69% of the patients the tumor mass causing obstruction is localized in the area of the larynx, and in 31% of them the tumor mass is localized in the area of the hypopharynx. From the patients with tumor mass causing laryngeal obstruction 42% are with 1st degree of obstruction, 29% are with 2nd degree, 27% are with 3rd degree and 2% are with respiratory failure at rest. Twenty six percent (26%) of the patients had pulse rate < 45 beats per minute during putting on the tube of Kleinsasser. This is very dangerous reflex reaction of the heart, which we believe is caused by parasympathetic nervous system. The rate of difficult endotracheal intubation among patients presenting for microlaryngeal surgery is higher than among the general surgical patient population. Difficulties during endotracheal intubation in our study are due to higher percent of laryngeal obstruction and pharyngeal restriction because of the intraoral masses.

Conclusion: Anesthesia for microlaryngeal surgery has always been demanding, as often pathology interferes with the anesthesiologist's field of work.

Key words: Microlaryngeal surgery, difficult airway, laryngeal obstruction, risk factors

Introduction

Patients presenting for microlaryngeal surgery frequently have a difficult airway. The chosen approach to this airway depends on the pathology and the patient's symptoms. Factors indicating difficult intubation also need to be considered.^{1,2,29} Successful anesthetic management of microlaryngeal cases requires a high degree of cooperation with the surgeon, a reciprocal understanding of the potential problems, and adequate preparation on both sides to meet the anticipated challenges that may arise.^{3,4} Microlaryngeal surgery encompasses a wide range of laryngeal procedures that can be organized in different categories: benign and malignant vocal cord lesions, laser laryngeal surgery, vocal cord paralysis and motion disorders, stenosis of the glottic, subglottic, and tracheal areas, and laryngeal trauma.⁵ Many patients presenting for laryngeal surgery have a long history of heavy smoking and drinking, which are directly linked to the development of squamous cell carcinoma of the larynx. Laryngeal carcinoma is the eleventh of the most common malignant neoplasms found in men. Epidemiologically it represents 1.6–2% of all malignant tumors in males and 0.2–0.4% in females.^{6–8} Ontogenetically the larynx is subdivided into three parts – supraglottis, glottis and subglottis. Each part includes a different number of anatomically and physiologically defined structures. These parts are extremely important when predicting the mode of development and spreading of the malignant process.^{9–11} The presence of laryngeal carcinoma requires precise assessment of the feasibility of endotracheal intubation. Expectation of a difficult intubation requires

a preliminary preparation for ventilation if endotracheal intubation is not possible.^{12–16}

The **AIM** of the study is to determine the risk factors and anesthetic problems during microlaryngeal surgery.

Materials And Methods

A prospective cohort study including 100 patients undergoing microlaryngeal surgery in the Department of Otorhinolaryngology at the University Hospital “Queen Giovanna” – ISUL, Sofia, in the period 2020–2021; Medical University-Sofia. Pre-operative examination of the larynx is performed in all patients by Storz 8402 ZX fiber optic laryngoscope with video capability. The degree of laryngeal obstruction is determined by modified Cotton-Myer scale with 4 degrees of obstruction: up to 50% (1st degree), 51–70% (2nd degree), 71–99% (3rd degree) and full obstruction (4th degree). In all patients we used quamatel 20 mg for premedication. For induction in general anesthesia we used propofol 2.5 mg · kg⁻¹ and succinylcholine 1 mg · kg⁻¹ as muscle relaxant. Endotracheal intubation was performed by endotracheal tube №6.0 or №6.5 from the anesthesiologist and mechanical ventilation was performed. For maintenance of general anesthesia we used sevoflurane inspiratory concentration of 2.5 vol. % and fentanyl 4–5 µg · kg⁻¹ for pain relief.

Results

The mean age of the patients is 61.3 years. According to anesthesia risk assessment 9% of the patients are with ASA 1 class, 28% of them are with ASA 2 class, 58% are with ASA 3 class and 5% are with ASA 4 class.

We found that 72% of the patients were men and 28% were women (fig.1).

In 69% of the patients the tumor mass causing obstruction is localized in the area of the larynx, and in 31% of them the tumor mass is localized in the area of the hypopharynx (fig.2).

From the patients with tumor mass causing laryngeal obstruction 42% are with 1st degree of obstruction, 29% are with 2nd degree, 27% are with 3rd degree and 2% are with respiratory failure at rest (fig.3).

Thirty five percent (35%) of the patients had pulse rate between 45–60 beats per minute during putting on the tube of Kleinsasser, 39% of them had pulse

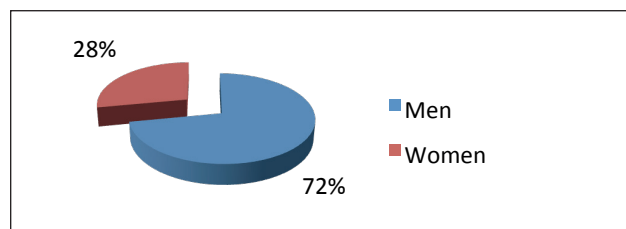


Fig. 1. Distribution according to gender

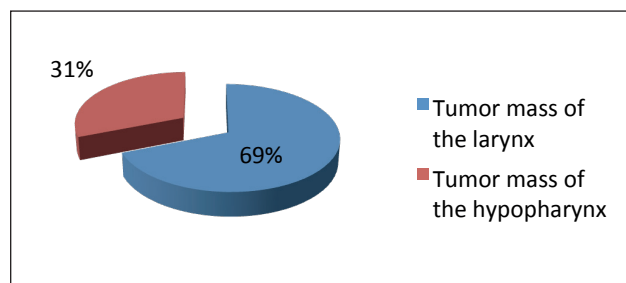


Fig. 2. Distribution according to localization of the tumor mass

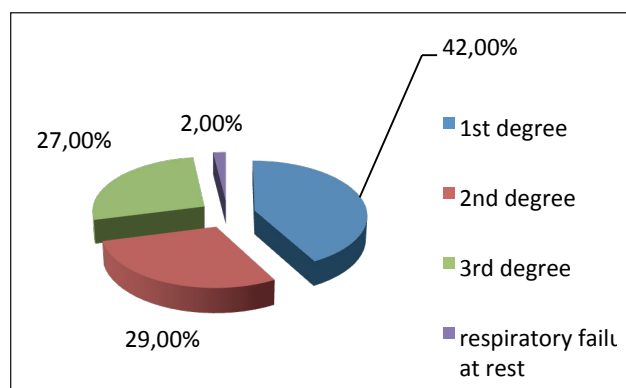


Fig. 3. Distribution according to the degree of laryngeal obstruction

rate > 60 beats per minute during putting on the tube of Kleinsasser and 26% had pulse rate < 45 beats per minute during putting on the tube of Kleinsasser (fig.4).

Discussion

The essential requirements for precision microlaryngeal surgery and optimal preservation of function include a clear and still surgical field, absence of patient movement, and allocation of sufficient time to carefully complete the procedure in an unhurried manner. The patient's airway must be protected from blood, debris, and irrigation fluid and ventilation must be adequately controlled.¹⁷ In our study the mean age of the patients is 61.3 years which means that these are people in active working age. This kind of operation gives them chance to keep their ability to speak and work normally. On

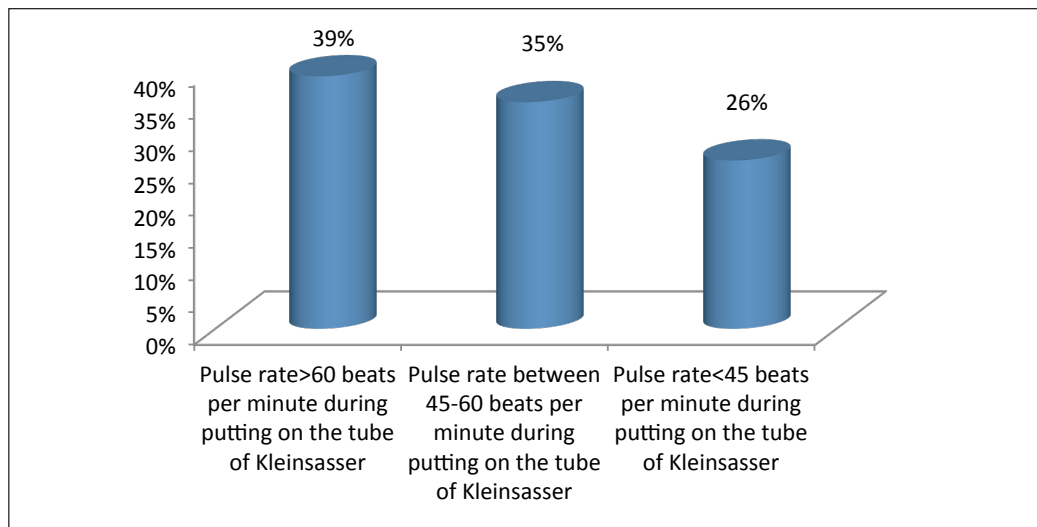


Fig.4. Bradycardia after putting on the tube of Kleinsasser

the other hand in this age group the risk of accompanying cardiovascular and respiratory disease is higher. In this case the risk of hemodynamic complications will be higher. Most of the patients are males 72%. This may be connected with higher incidence of accompanying risk factors like smoking in male group, which is common for Bulgarian population.^{18,19} Chronic cigarette smoking and alcohol use can cause induction of the cytochrome P450 multi-enzyme system, leading to increased perioperative requirements for opioids and neuromuscular blockers and generation of higher levels of potentially toxic metabolites of volatile halogenated anesthetic agents.²⁰ Patients with chronic alcohol consumption require preoperative evaluation of liver function and coagulation status. The anesthesia risk assessment shows that most of the patients are in ASA III class 58%. This means higher risk of accompanying cardiovascular disease and higher risk of hemodynamic complications. The rate of difficult endotracheal intubation may reach almost 16% among patients presenting for ear, nose, or throat cancer surgery, which is on average six times higher than among the general surgical patient population.²¹ Standard anesthesia airway assessment tests fail to account for aspiration risk and lower airway problems. Postirradiation changes in the neck and decreased mandibular protrusion are important factors predicting the risk of impossible mask ventilation, difficult mask ventilation, and difficult intubation in patients at risk for these conditions.²² Pharyngeal restriction can be further accentuated by a large tongue or intraoral masses that can be exophytic and mobile. Drooling, dysphagia, and ex-

piratory snoring are the signs of marked pharyngeal restriction, but inspiratory stridor at rest represents the most worrisome sign, suggesting a reduction in airway diameter at the supraglottic or glottic level of at least 50%.^{23,24} Difficulties during endotracheal intubation in our study are due to higher percent of laryngeal obstruction, 27% are with 3rd degree of obstruction, according to modified Cotton-Myer scale, and pharyngeal restriction because of the intraoral masses. We had technical problems performing endotracheal intubation. We used endotracheal tubes №6.0 or №6.5, smaller size than normal, because of the exophytic masses and the obstruction of the oral cavity. Twenty six percent (26%) of the patients had pulse rate <45 beats per minute during putting on the tube of Kleinsasser. This is very dangerous reflex reaction of the heart, which we believe is caused by parasympathetic nervous system, because in some of the cases the pulse rate is corrected after administration of atropine. In other cases when the bradycardia is very severe administration of atropine cannot help so the tube of Kleinsasser must be removed, because there is a risk of cardiac arrest. After removing the tube and administration of atropine the pulse rate is normalized.²⁵⁻²⁸

Conclusion

Anesthesia for microlaryngeal surgery has always been demanding, as often pathology interferes with the anesthesiologist's field of work. Endotracheal intubation can be very challenging especially if patients are at high level of anesthesia risk with multiple cardiovascular risk factors.

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