

# Voice professionals and associated anaesthetic risk: a proposal to a perioperative airway-protective care bundle

## Abstract

**Background:** Voice professionals subjected to surgical procedures or anaesthesia are particularly susceptible, considering the multi-factor potential for damaging the vocal system. Such injuries are the most common reasons for anaesthetic morbidity and have even more serious repercussions for singers. Surgery in the abdominal region is singularly important, considering the vital role that abdominal support plays for respiratory dynamics and vocalisation. Perioperative management and planning and strict anaesthetic practices are fundamental for minimising this risk and promoting an optimum clinical outcome. The lack of guidelines adapted to this context justifies the need to gather together and review all existing evidence, which this case study aims to do.

**Case presentation:** The clinical case concerns a 46-year-old female, a light opera singer, admitted for laparoscopic cholecystectomy. It describes the ample pre-anaesthetic assessment and education and lists the protective technical and pharmacological choices adopted during the surgery. The subsequent follow-up serves as the starting point for reflecting on the results obtained, preparing a suggested sequential approach for each perioperative stage.

**Conclusion:** Even though vocal damage depends on the surgical and anaesthetic approach during the operation, anaesthesia for voice professionals requires rigorous planning beforehand, often being more complex than the surgical procedure. A multifaceted intervention including counselling, less invasive anaesthetic practices and systematic follow-up promote the key strategy – overall protection.

**Keywords:** voice, singer, anaesthesia, standard of care

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**Abbreviations:** OTI, orotracheal intubation; OTT, orotracheal tube; LMA, laryngeal mask; ASA, American Society of Anesthesiologists; EV, endovenous; VAS, visual analogue scale; NIBP, non-invasive blood pressure; ECG, electrocardiogram; SpO<sub>2</sub>, blood oxygen saturation; BIS, bispectral index system; TOF, train-of-four (TOF Watch)

## Introduction

The voice is a distinctive element, which can be identified with individuals, especially when it is a work tool and a means of livelihood. Being a cause for redoubled care among voice professionals, the need for surgical intervention and anaesthetic procedures are events that can result in significant distress.<sup>1</sup>

The occurrence of complications related to the vocal system continues to be among the reasons for higher anaesthetic morbidity and can affect 40% of patients.<sup>2</sup>

Vocalisation is the result not just of the glottal component of the respiratory system, but also of the coordination of the supraglottic tract, glottis, lungs, abdomen and muscular-skeletal system, the reason why surgical intervention and anaesthesia can affect it so unequivocally.

The most frequent anaesthetic vocal complications depend on the OTI, particularly haematoma and thickening of vocal chord mucus.<sup>2</sup>

The incidence of hoarseness, vocal fatigue, globus pharyngis and odynophagia (painful swallowing) is generally self-limited to the first 24 hours after surgery. However, the risk of permanent damage exists, with clearly evident serious repercussions for singers.

As for the aetiology, the use of OTT can directly cause trauma – during the intubation, due to movements during the surgery or during the extubation. Characteristics such as calibre, pressure and volume appear to be preponderant for post-anaesthetic vocal changes, although muscular relaxation, the anaesthetic depth or factors specific to individual patients (e.g. active smoker, obesity) can influence this risk.<sup>3,4</sup>

Anaesthesia for voice professionals is a challenge for anaesthesiologists, requiring excellent anaesthetic technique as well as perioperative management and planning.

Keeping in mind the complexity of the scenario, the anaesthesiologist must gather information to enable suitable counselling and techniques, minimising risks and maximising safety and outcomes. However, there are few guidelines for standardised anaesthetic practices, and the current evidence is based on joint opinions issued by specialists.<sup>5</sup>

In the clinical case being studied, it is important to note that the surgery was related to the abdomen, a structure that plays an essential role in the performance and cinematic aspects of classical singers and

post-operative abdominal pain proves decisive for vocal respiratory support.<sup>3</sup>

This article aims to review the best anaesthetic approach for voice professionals, based on a practical case.

## Case presentation

Female, 46years, admitted for a laparoscopic cholecystectomy due to a vesicular polyp. In professional terms, it is important to note her career as a nationally and internationally renowned light opera singer. This was a patient without a relevant pathological history, without regular pharmacological remedies at home and who did not have any known medication allergies. She did not have any prior history of surgery or of anaesthesia. She denied having any toxic habits. She had a compact build, corresponding to a BMI of 20. All of the findings of the objective exam were benign.

No criteria were noted to envisage difficulties in approaching via the air passage, classifiable as Mallampati Class II, for a thyromental distance of more than 6cm and an interincisive distance of more than 3cm. The assessment of the complementary diagnostic exams required by the surgical team, pursuant to institutional protocol, did not reveal changes to normal parameters. All the findings allowed her to be classified as ASA I, according to the Physical State Classification of the American Society of Anesthesiologists.

In the context of the pre-anaesthetic consultation, special importance was paid to the description of the anaesthetic technique, the alternatives available to approaching via the air passage and potential risks inherent to them, so as to take all possible steps necessary for informed and clear consent. On her own initiative the patient also underwent clinical observation by an ENT specialist, seeking clarifications and a complementary assessment of the vocal system.

On the morning of the procedure the patient reiterated additional concerns about the fact that this was the first surgery she was ever undergoing and the unpredictability of the complications associated with handling air passages, due to which we repeated the information provided to her and reminded her of available options. The final anaesthetic suggestion was that of balanced general anaesthesia using orotracheal intubation.

This was followed by anxiolysis with 2mg of midazolam *ev* at the time of entering the operating theatre, after starting standard monitoring and recording the vital signs. Therapeutic steps were started with a proton pump inhibitor – esomeprazol, 40mg *ev*.

The patient was monitored in terms of TANI, ECG, SpO<sub>2</sub>, BIS and TOF, with a close watch kept on the last two.

The patient was actively kept warm with a heated blanket from the time of entering the operating theatre, the pressure points identified and duly protected.

The anaesthetic induction was realised with fentanyl (2mcg/kg), propofol (2mg/kg) and curarisation with rocuronium (0.6mg/kg), with the subsequent confirmation of complete neuromuscular block. Prophylaxis for nausea and vomiting was started during the induction, with 4mg of dexamethasone, complemented by 4mg ondansetron at the end of the procedure.

The patient was intubed orotracheally by an experienced anaesthesiologist, by means of a direct laryngoscopy, using a

conventional number 3 blade and a number 6 tube. The respective cuff was inflated and the tube fixed at 21cm at the level of the labial commissure, with clinical and capnographic confirmation of its positioning. Care was taken with the precise assessment of the inflation pressure of the cuff with a pressure gauge, set at 20cm H<sub>2</sub>O.

The anaesthesia was maintained by means of sevoflurane, and a mixture of air/oxygen (FiO<sub>2</sub> 40%), under ventilation with a controlled volume for 400mL, with a respiratory frequency of 12cpm, PEEP of 5mmHg and peak pressure stability (< at 30mmHg). A deep neuromuscular block was sought, again administering 10mg of rocuronium 30minutes after the induction, according to the *train-of-four* stimulus response.

During the procedure 500ml of balanced crystalloid solution (Ringer's Lactate solution) was perfused, without there having been significant blood loss.

The entire surgery lasted 50minutes and the pneumoperitoneum was maintained with stable insufflation pressure, lower than 15mmHg. There were no complications during the procedure. Analgesia was started during the operation using an endovenous dose of 1gm of paracetamol and 2gm of metamizole.

It was decided to opt for extubation under deep anaesthesia, with early disinflation of the cuff and reversal of the neuromuscular blocker with a specific antagonist – sugammadex – using a dose of 200mg endovenous. The patient was later maintained under clinical observation at a post-anaesthetic care unit. At this unit she was treated with droperidol (0.625mg) and pethidine (20mg) *ev* since she was feeling nauseous and had been assessed at suffering pain equivalent to a VAS score=4. Both the measures were effective. 120minutes later, she reached 10 points on the Aldrete score and was moved to nursing care.

The patient was released from the clinic and allowed to go home after 24hours, with painkillers *per os* and proton pump inhibitor therapeutic treatment. The patient was reassessed at an anaesthesiology consultation 1month after the procedure. She said there was no dysphonia, odynophagia, hoarseness or other immediate or delayed post-operative symptoms. Given the lack of symptoms or immediate or subsequent vocal limitations, the patient dispensed with additional assessments by an ENT specialist or speech therapist.

She rested for a period of 3weeks, with occasional vocal resonance exercises. She later gradually resumed her professional activities, was back to normal after a month, and did not discern any change in the intensity, range and maximum time of phonation.

## Discussion and conclusion

The occurrence of complications, such as local structural changes of the vocal tract – viscosity, oedema, stiffness, and vibration properties-or sup-optimal muscular support, is directly related to traumatic manipulation of the air passage or to pharmacological effects from anaesthetics and neuromuscular relaxants.<sup>3</sup>

However, the preparation must be done well before the approach through the air passage on the operating table and a phase-based view of the practical guidelines to be implemented is followed. Thus, in the pre-operative phase: patients must be informed of the expected recovery period after the surgery and what symptoms to watch out for and when to seek assistance for them. Although uncertain scheduling did not allow this in the case under study, prophylactic steps should

be planned to counter gastroesophageal reflux, to be maintained after the procedure.

The presentation of the different types of anaesthesia and approaches via the air passage is essential, always emphasising local anaesthesia, whenever viable.

Even though the choice of oro- or nasotracheal intubation is intuitively less controversial, the LMA has long been popular as a protective strategy in this context. However, this practice has not been substantiated by literature, since it can also result in equally harmful outcomes such as dislocation of the arytenoid cartilages and lesions to cranial nerves.<sup>2</sup>

During the operation, a philosophy aimed at overall protection is suggested in the aforesaid situation, converging with the most effective practices: use of a small size endotracheal tube (6 for women, 7 for men); intubation under direct laryngoscopy and with a minimum insufflation of the cuff (20-25 cmH<sub>2</sub>O); neuromuscular relaxation and suitable anaesthetic depth; eviction of the dilatatory action of the nitric oxide; extubation under deep anaesthesia, allowing tube movement and a possible intermediary transition to the supraglottic tract. From the pharmacological point of view, the dose of the corticoid (dexamethasone, 8 mg) can be maximised during induction, due to its anti-inflammatory and anti-oedema effects. The use of antacids during induction and investing in prophylaxis against nausea and vomiting are fundamental.<sup>3,5</sup>

This context shows the importance of systematic post-anaesthetic follow-up with patients, useful to document the state of the voice, assessing temporary post-operative changes in timbre, range and phonation time.

A multidisciplinary approach must be encouraged, requesting additional care from ENT specialists or speech therapists in situations of dysphonia or persistent hoarseness.

Due to the associated emotional toll, patients try to resume vocal exercises as soon as possible during the post-operative period. While

a week's gap can be enough in the case of surgery that has entailed minimal air passage manipulation, cervical, abdominal and thoracic surgery necessitate rest that can extend over several months.<sup>1</sup> Bringing this moment forward can precipitate harmful vocal practices and poorly adapted postures, in an attempt to compensate for weaknesses still present in the vocal system and muscular-skeletal support.<sup>3</sup>

Even though this case had a low level of surgical complexity it shows how a multifaceted and consecutive intervention in the educational, emotional and technical aspects and doctor-patient interaction can promote better clinical results.

The least invasive practice and that in which the anaesthesiologist is most skilled must always be chosen, because more than the sophistication of the techniques used it is care with elementary measures that is undoubtedly the key to success.

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## Conflicts of interest

The authors declare that they do not have any conflict of interest.

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