



VOCAL CORD PARALYSIS FOLLOWING TRACHEAL INTUBATION: AN UNANTICIPATED POST-OPERATIVE COMPLICATION

Anesthesiology

Dr Harmandeep Kaur

Junior Resident, Department of Anaesthesia, SGRDIMSR, Amritsar, Punjab

Dr Amrinder Singh*

Asst Professor, Department of Anaesthesia, GGSMCH, Faridkot, Punjab *Corresponding Author

ABSTRACT

Background: General anesthesia is a safe, frequent procedure in clinical practice. Although it is very unusual in procedures not related to head and or neck surgery, vocal cord paralysis is a serious and important complication. Incidence has been associated with patient age and comorbidities, as well as the position of the endotracheal tube and cuff. It can become a dangerous scenario because it predisposes aspiration.

Objectives: To present a case and analyze the risk factors associated with increased risk of vocal cord paralysis described in the literature.

Conclusions: Vocal cord paralysis can be a serious complication of general anesthesia because of important voice dysfunction and risk of aspiration. The management is not yet fully established, so prevention and early diagnosis is essential.

KEYWORDS

INTRODUCTION

General anesthesia is considered a safe procedure, with a low rate of morbidity and mortality associated. Within its complications, the presence of hoarseness is usual in the postoperative period. One of the causes, though very unusual, is vocal cord paralysis.¹ It can be suspected from risk factors including the patient's age, previous diseases, as well as the duration of the surgery and the position of the endotracheal tube and its cuff.¹ In the diagnosis, a clinical history characterized by hoarseness is essential.¹ It must be complemented by a videostroboscopic assessment of laryngeal structure and function. Regarding the management, there are no studies that include a large number of these patients, because of the low incidence. Treatment options include voice therapy, medialization injection laryngoplasty with Hyaluronic Acid (Restylane®), and medialization thyroplasty.

The aim of this report is to present a clinical case of vocal cord paralysis secondary to endotracheal intubation for abdominal surgery, as well as a review of the available literature

Clinical case

A 53 year-old diabetic woman (using metformin 500 mg.day⁻¹ po), 176 cm and 82 kg, without known allergies, was admitted to our hospital for elective surgery (laparoscopic hysterectomy). She was classified as ASA II, with previous general anesthesia for other surgeries without incidents. Airway evaluation showed a Mallampati III, thyromental distance a little less than 6 cm and mouth opening greater than 3 cm, with firm teeth in good condition. Laboratory tests and EKG were in normal range. The anesthetic plan was balanced general anesthesia with standard monitoring (EKG lead II, SpO₂, NIBP, nasopharyngeal thermometer, EtCO₂), plus Foley catheter, anti-embolism socks, intermittent pneumatic compression, warming blanket and a non-slip mattress.

Induction was performed intravenously with Fentanyl 300 µg, Lidocaine 80 mg, Propofol 120 mg, Vecuronium 6 mg. She was easily ventilated and intubated on the first attempt with a cuffed Endotracheal Tube (ET) size 7.0, describing a laryngoscopy grade 2B (Cormack-Lehane) with BURP maneuver. Isoflurane was used for maintenance (end-tidal concentration of 1.6–1.8%) and fentanyl/vecuronium boluses. An orogastric tube was also inserted without incident. The patient remained stable during the entire procedure.

Laparoscopic surgery lasted 4 hours and 30 minutes, mainly in the Trendelenburg position, without incidents. The patient was extubated after reversion of muscle relaxation with Neostigmine 2.5 mg and glycopyrrolate 0.4 mg iv, and transferred to the recovery unit, where she stayed for 125 minutes, and was then moved to her room with adequate pain management.

24 hours after the procedure, we received information that the patient had hoarseness, without dysphagia or other alterations.

Otorhinolaryngologic assessment was requested, describing a weak and breathy voice without neck pain. Laryngeal videostroboscopy evidenced left vocal cord immobility in paramedian position, bowed free edge and overhanging ipsilateral arytenoid, determining an incomplete glottic closure. The “jostle sign” was present (the “jostle sign” describes a passive medial movement of the affected vocal cord during adduction due to absence of lateral tension from the denervated musculature, and helps discriminate between a vocal cord paralysis and an arytenoid subluxation). The right vocal cord mobility was preserved in adduction and abduction, and there was no hematoma or trauma sign. Vocal speech therapy was indicated, and outpatient medical evaluation with a laryngeal videostroboscopy 8 days after surgery showed no change. Speech therapy was unsatisfactory, so a percutaneous medialization injection laryngoplasty with Hyaluronic Acid (Restylane®) was performed 23 days post surgery, with favorable evolution for the patient.

DISCUSSION

Endotracheal intubation is a routine, safe procedure worldwide. Nevertheless, it can be a source of morbidity. Airway damage is a widely known complication, mostly involving women and during elective surgery.¹

The larynx is the most common site of airway injury during endotracheal intubation, representing a third of cases, including granuloma, hematoma, vocal cord paralysis, and arytenoid subluxation. Only 20% of the cases are associated with difficult intubations.¹

Hoarseness is a symptom that can appear usually after endotracheal intubation, even in surgery not related with pathologies of head and neck. The reported incidence varies widely, being present in up to 71% of patients undergoing general anesthesia. The average duration of hoarseness is 3–4 days, becoming permanent in 1% of cases. There are a small number of documented cases in the literature where hoarseness is explained by vocal cord paralysis secondary to intubation process, thus being a rare complication. In general, the symptoms are evident within the first 24 hours after intubation; however, diagnosis of vocal cord paralysis is performed on average after two weeks.¹

Vocal cord paralysis is generally unilateral, compromising the left vocal cord in approximately 70% of the cases. This could be explained by endotracheal tube fixation at the right angle of the mouth, with less chance of damage to the recurrent laryngeal nerve on that side.¹ Nasogastric tube positioning could compress the nerve too.

Patients with unilateral vocal cord paralysis clinically manifest changes in voice quality, perceived as dysphonia. Other associated symptoms such as vocal fatigue, decreased range and intensity, can affect communication skills. In addition to changes in voice, vocal cord paralysis produces an inefficient cough mechanism, which can

lead to aspiration with the consequent risk of pneumonia. A group of patients show respiratory failure, stridor and obstructive symptoms. Thus, it can be a severe complication that requires immediate diagnosis and medical care.

The suspected diagnosis begins with the subjective perception of changes in voice from the patient, following a surgery under general anesthesia. Physical examination of patients with unilateral vocal cord paralysis reveals a weak and breathy voice, with loss of projection, vocal fatigue and loss of vocal range especially upper end of register. These features are explained by glottal insufficiency secondary to paresis or paralysis of the vocal cord. In the diagnostic evaluation it is necessary to examine the structure and function of the larynx. Laryngeal videostroboscopy is a useful tool in the diagnosis of voice disorders.²

Patients who develop hoarseness secondary to vocal cord paralysis after endotracheal intubation, can be categorized in two groups: in certain cases, the intubation results in difficulty for anatomical reasons, and in the other, it is not possible to identify an obvious cause.¹

Several factors are associated with the development of this complication. Regarding the factors related to the patient, it is noted that the incidence of these symptoms increases with age. In a multivariate analysis, it was found that the risk increases 3 times in those over 50 years old. Medical records were also relevant. The risk doubled in patients with diabetes mellitus and arterial hypertension.¹

As regards the factors related to the process of intubation and anesthesia, it seems that the incidence increases with the duration of the anesthesia, being particularly riskier if it lasts for more than 6 hours.¹ However, there have been reported cases where surgery was of short duration.

Ellis and Pallister, by dissecting cadavers in 1975, described the path of the recurrent laryngeal nerve, its two branches and the relationship of these when inserting an endotracheal tube and inflating the cuff in the trachea. Their study showed that the recurrent laryngeal nerve divides into two branches before reaching the upper rim of the cricoid cartilage. The posterior branch innervates the posterior cricoarytenoid and interarytenoids muscles, without having contact with the cuff. On the other hand, the anterior branch runs medially to the lamina of the thyroid cartilage, innervating the lateral cricoarytenoid and thyroarytenoid muscles. Because of its anatomical location, it can be compressed between the endotracheal tube and lamina of the thyroid cartilage if the cuff is inflated in the larynx, producing neurapraxia. These authors suggested that this complication could occur if the cuff was positioned at the level, or just below, the vocal cords. Also, if the cuff is not properly deflated before extubation, the anterior branch of the recurrent laryngeal nerve is prone to be damaged. So, another factor to consider is the proper position of the endotracheal tube³ and its size.¹

Because it can be a severe complication, we should be alert for early diagnosis, considering the risk factors mentioned above and the classical symptoms. Although in most cases unilateral vocal cord paralysis secondary to endotracheal intubation has a benign course,¹ there are poor prognostic factors, defined by laryngeal electromyography⁴ as well as the symptoms. Since this disease is uncommon, most studies include patients with unilateral vocal cord paralysis of various etiologies. Treatments described include the usefulness of voice therapy, medialization injection laryngoplasty with different materials and medialization thyroplasty.² However, there are not any available studies to evaluate the results in this particular subgroup. That is the main reason why efforts should be focused on prevention.

A recent meta-analysis concluded that prophylactic use of corticosteroids significantly reduces the prevalence and severity of sore throat, hoarseness, laryngeal edema and reintubation associated to tracheal intubation after surgery under general anesthesia.⁵

CONCLUSIONS

In the described clinical case, it is possible to recognize various risk factors for the development of vocal cord paralysis after endotracheal intubation (age over 50, history of diabetes *mellitus* and duration of the elective surgery). However, during the intubation process, no alteration or difficulty is described. Vocal cord paralysis exclusively

jeopardized the left vocal cord, as is described in most previously reported cases in the literature.

While being a rare complication of general anesthesia, it is necessary to take it into consideration within the diagnostic possibilities faced with the appearance of hoarseness in the postoperative period, in order to provide adequate multidisciplinary treatment. Management, however, must be focused on prevention.

Conflicts of interest

The authors declare no conflicts of interest.

REFERENCES

1. M. Kikura, K. Suzuki, T. Itagaki, et al. Age and comorbidity as risk factors for vocal cord paralysis associated with tracheal intubation. *Br J Anaesth.* 2007;98: 524-30.
2. V.N. Young, L.J. Smith, C. Rosen Voice outcome following acute unilateral vocal fold paralysis. *Ann Otol Rhinol Laryngol.* 2013;122: 197-204.
3. P.D. Ellis, W.K. Pallister. Recurrent laryngeal nerve palsy and endotracheal intubation. *J Laryngol Otol.* 1975;89: 823-6.
4. Pardo-Maza, I. Garcia-Lopez, S. Santiago-Pérez, et al. Laryngeal electromyography for prognosis of vocal fold paralysis. *J Voice.* 2017;31:90-3.
5. W. Zhang, G. Zhao, L. Li, et al. Prophylactic administration of corticosteroids for preventing postoperative complications related to tracheal intubation: a systematic review and meta-analysis of 18 randomized controlled trials. *Clin Drug Investig.* 2016;36: 255-65.