

# Postoperative laryngeal symptoms in a general surgery setting.

## Clinical study



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### Postoperative laryngeal symptoms in a general surgery setting. Clinical Study

**INTRODUCTION:** *Vocal cord injuries (VI), postoperative hoarseness (PH), dysphonia (DN), dysphagia (DG) and sore throat (ST) are common complications after general anesthesia; there is actually a lack of consensus to support the proper timing for post-operative laryngoscopy that is reliable to support the diagnosis of laryngeal or vocal fold lesions after surgery and there are no valid studies about the entity of laryngeal trauma in oro-tracheal intubation. Aim of our study is to evaluate the statistical relation between anatomic, anesthesiological and surgical variables in the case of PH, DG or impaired voice register.*

**MATERIALS AND METHODS:** *50 patients (30 thyroidectomies, 8 videolaparoscopic cholecistectomies, 2 right emicolectomies, 2 left emicolectomies, 1 gastrectomy, 1 hemorrhoidectomy, 1 nephrectomy, 1 diagnostic videothoracoscopy, 1 superior right lung lobectomy, 1 appendectomy, 1 incisional hernia repair, 1 low anterior rectal resection, 1 radical hysterectomy) underwent clinical evaluation and direct laryngoscopy before surgery, within 6 hours, after 72 hours and after 30 days, to evaluate motility and breathing space, phonatory motility, true and false vocal folds and arytenoids oedema. We evaluated also mean age ( $56.6 \pm 3.6$  years), male:female ratio (1:1.5), cigarette smoke (20%), atopic comorbidity (17/50 = 34%), Mallampati class (32% 1, 38% 2, 26% 3, 2% 4), mean duration of intubation (159 minutes, range 50 – 405 minutes), Cormack-Lehane score (34% 1, 22% 2, 22% 3, 2% 4), difficult intubation in 9 cases (18%). No complication during the laryngoscopy were registered. We investigated the statistic relationship between pre and intra-operative variables and laryngeal symptoms and lesions.*

**RESULTS:** *In our experience, statistically significant relations were found in prevalence of vocal folds oedema in smokers ( $p < 0.005$ ), self limiting DG and DN in younger patients ( $p < 0.005$ ) and in thyroidectomy ( $p < 0.01$ ), DG after thyroidectomy ( $p < 0.01$ ). The short preoperative use of steroids and antihistaminic to prevent allergic reactions appears not related to reduction or prevention of DN, DG, PH and ST. No statistical relation in incidence of postoperative complications was found for the prolonged intubation, gastro-esophageal reflux, BURP manoeuvre (backward upward right sided pressure) and Mallampati and Cormack-Lehane class more than 2, maintenance with sevoflurane 2% and use of stilet.*

**CONCLUSIONS:** *Direct laryngoscopy is essential for the detection of arytenoid lesions after orotracheal intubation for general anesthesia. In our opinion, a part of temporary post-operative DN or PH is due to monolateral or bilateral arytenoids oedema, secondary to prolonged or difficult orotracheal intubation, valuable with laryngoscopy 72 hours after surgery. Is necessary to adjunct these complications in the surgical informed consensus scheme.*

**KEY WORDS:** Arytenoid, Complications, Laryngoscopy, Oro-tracheal intubation, Surgery, Vocal fold.

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### Introduction

Laryngeal symptoms after general anesthesia are a challenge to both anesthesiologists and otolaryngologists, because too many patients with postoperative hoarseness

may not have vocal cord paralysis and there is considerable variation in the reported frequency of recurrent laryngeal nerve (RLN) palsy rates after thyroid surgery due to the different methods of diagnosing RLN palsy (indirect laryngoscopy versus fiber-optic nasolaryngoscopy (FNL) versus videostroboscopy), each of which have significant different sensitivities and specificities; also, it is impossible to speculate a post-surgical cordal paralysis or trauma in non thyroid surgery.

However, few data are available to differentiate whether these complications result from injury to the recurrent nerve or to the laryngeal complex from anaesthesiologic manoeuvres.

Aim of our study is to demonstrate that a relevant part of postoperative laryngeal symptoms are related to laryngeal and vocal folds trauma secondary to anaesthesiologic procedures (orotracheal intubation or extubation) and morphologic features.

## Materials and methods

We included 50 consecutive adult non-pregnant patients with ASA (American Society of Anaesthesiologist) physical status classification from I to III, who received direct laryngoscopy with fiberoptic laryngeal portable endoscope (LUT, Germany, Operative length: 300 mm, diameter: 3.2 mm, deflexion: up 160°, down 160°) before elective surgery (requiring general anaesthesia and tracheal intubation), within 6 hours, after 72 hours and after 30 days, to evaluate motility and breathing space, phonatory motility, true and false vocal folds oedema and arytenoids oedema.

All patients were scored separately by 2 evaluators (F.C. and C.L.N.), one ear-nose-throat (ENT) specialist and one thoracic surgeon; laryngeal complications were

defined as newly discovered findings at the vocal folds after surgery compared with the preoperative status, and specific attention was placed on oedema, granulations, haematomas, dislocation of the arytenoid cartilage, and fibrinous laryngitis or thickening of the vocal folds.

Surgery were 30 thyroidectomies, 8 videolaparoscopic cholecistectomies, 2 right emicolectomies, 2 left emicolectomies, 1 gastrectomy, 1 hemorrhoidectomy, 1 nefrectomy, diagnostic videothoracoscopy, 1 superior right lung lobectomy, 1 appendectomy, 1 incisional hernia repair, 1 low anterior rectal resection, 1 radical hysterectomy. No patients had previously undergone a surgical procedure with laryngeal nerve at risk.

We evaluated mean age ( $56.6 \pm 3.6$  years), male:female ratio (1:1.5), cigarette smoke (no smokers 80% versus smokers > 20 cigarettes / day 20%), atopic comorbidity with preoperative dose of steroids combined and antihistaminic agents (17 patients = 34%), Mallampati score, defined as the visibility of the base of uvula, faucial pillars (the arches in front of and behind the tonsils) and soft palate (class 1: 16 patients = 32%; class 2: 19 patients = 38%; class 3: 13 patients = 26%; class 4: 1 patient = 2%)<sup>1</sup>, Cormack-Lehane score, used to describe laryngeal view during direct laryngoscopy (class 1: 17 patients = 34%; class 2: 21 patients = 42%; class 3: 11 patients = 22%; class 4: 1 patient = 2%)<sup>2</sup>, duration of intubation (mean 159 minutes and 34 seconds, range 50 – 405 minutes), difficult intubation (9 cases = 18%, 4 (8%) with 3 attempts and 5 (10%) with 2 attempts; stylet use in 34 intubation attempts (68%), BURP (“back upper right pressure”) manoeuvre (12/50 = 24%), use of Fast Track mask (1 cases of mask number 5 = 2%), monopulmonary ventilation (2 cases with Robert-Shaw tube 39 Ch = 4%), use of nasogastric tube (10 = 20%) or orogastric tube (7 = 14%) and use of anaesthetic gas (Sevoflurane 2%) for maintenance anaesthesiology plan (32/50 patients = 64%) (Table I).

No ENT pathology were reported at pre-operative direct laryngoscopy in all 50 patients.

For comparison between groups, the  $\chi^2$  test and Kendall  $\tau$ -b rank correlation were used. Statistical significance was defined with a 95% confidence interval ( $p < 0.05$ ) (Table II).

## Results

At clinical evaluation, 44/50 (80%) within 2-6 hours after surgery, 36/50 (72%) after 72 hours and 1 patient (2%) after 30 days reported hoarseness (PH, defined as “rough and husky voice”); 27/50 (54%) within 2-6 hours after surgery, 16/50 (32%) after 72 hours and 3 patients (6%) after 30 days reported sore throat (ST, defined as “pain in the throat” or “bolus sense”); 24/50 (48%) within 2-6 hours after surgery, 11/50 (22%) after 72 hours and no patients after 30 days reported dysphagia (DG, defined as “difficult swallowing”); 7/50 (14%) within 2-

TABLE I - Characteristics of the patients

Number of the patients	50
Mean age (years)	$56.6 \pm 3.6$
Male:female ratio	1:1.5
Cigarettes smoke > 20 / day	Smokers 20% versus no smokers 80%
Atopic comorbidity	17 patients (34%)
Mallampati score	class 1: 16 patients = 32% class 2: 19 patients = 38% class 3: 13 patients = 26% class 4: 1 patient = 2%
Cormack-Lehane score	class 1: 17 patients = 34% class 2: 21 patients = 42% class 3: 11 patients = 22% class 4: 1 patient = 2%
Mean duration of intubation	159 minutes and 34 seconds (range 50 – 405 minutes)
Difficult intubation	9 cases = 18%
BURP manoeuvre	12 / 50 = 24%

TABLE II - Postoperative evaluation of demographic variables, signs and symptoms

	2-6 hours	72 hours	30 days		2-6 hours	72 hours	30 days
<i>Age &lt; 50 years</i>				<i>Stilet use</i>			
Dysphagia	p < 0.005	ns	ns	Dysphagia	ns	ns	ns
Dyspnea	p < 0.005	ns	ns	Dyspnea	ns	ns	ns
Hoarseness	p < 0.05	ns	ns	Hoarseness	ns	ns	ns
Sore throat	ns	ns	ns	Sore throat	ns	ns	ns
Vocal folds edema	ns	ns	ns	Vocal folds edema	ns	ns	ns
Arytenoids edema	ns	ns	ns	Arytenoids edema	ns	ns	ns
<i>Smoking</i>				<i>Mallampati III</i>			
Dysphagia	p < 0.005	ns	ns	Dysphagia	ns	p < 0.05	ns
Dyspnea	p < 0.005	ns	ns	Dyspnea	ns	p < 0.05	ns
Hoarseness	ns	ns	ns	Hoarseness	ns	ns	ns
Sore throat	ns	ns	ns	Sore throat	ns	ns	ns
Vocal folds edema	p < 0.05	ns	ns	Vocal folds edema	ns	p < 0.001	ns
Arytenoids edema	ns	ns	p < 0.05	Arytenoids edema	p < 0.001	p < 0.05	ns
<i>Thyroidectomy</i>				<i>Cormack III</i>			
Dysphagia	p < 0.01	ns	ns	Dysphagia	p < 0.001	ns	ns
Dyspnea	ns	ns	ns	Dyspnea	ns	ns	ns
Hoarseness	ns	ns	ns	Hoarseness	ns	p < 0.001	ns
Sore throat	ns	ns	ns	Sore throat	p < 0.001	p < 0.001	p < 0.001
Vocal folds edema	ns	ns	ns	Vocal folds edema	p < 0.001	p < 0.001	p < 0.001
Arytenoids edema	ns	ns	ns	Arytenoids edema	p < 0.001	ns	ns
<i>Duration &gt; 120 minutes</i>				<i>Tracheal tube ≥ 7.5</i>			
Dysphagia	p < 0.005	ns	ns	Dysphagia	ns	ns	ns
Dyspnea	ns	ns	ns	Dyspnea	p < 0.005	ns	ns
Hoarseness	ns	ns	ns	Hoarseness	ns	p < 0.001	ns
Sore throat	ns	p < 0.05	ns	Sore throat	p < 0.001	ns	ns
Vocal folds edema	ns	ns	ns	Vocal folds edema	ns	ns	ns
Arytenoids edema	p < 0.05	p < 0.001	p < 0.05	Arytenoids edema	ns	ns	ns
<i>Allergy</i>				<i>Difficult intubation (≥ 2 attempts before intubation)</i>			
Dysphagia	ns	ns	ns	Dysphagia	p < 0.001	p < 0.001	ns
Dyspnea	ns	ns	ns	Dyspnea	p < 0.005	ns	ns
Hoarseness	p < 0.001	ns	ns	Hoarseness	ns	ns	ns
Sore throat	ns	ns	ns	Sore throat	p < 0.001	p < 0.001	p < 0.05
Vocal folds edema	p < 0.001	p < 0.001	ns	Vocal folds edema	p < 0.001	p < 0.001	ns
Arytenoids edema	p < 0.005	p < 0.001	ns	Arytenoids edema	p < 0.01	p < 0.001	p < 0.001
<i>BURP</i>							
Dysphagia	ns	p < 0.005	ns				
Dyspnea	p < 0.001	p < 0.001	ns				
Hoarseness	ns	ns	ns				
Sore throat	ns	ns	ns				
Vocal folds edema	ns	ns	ns				
Arytenoids edema	ns	ns	p < 0.05				

6 hours after surgery, 2/50 (4%) after 72 hours and 1 patient (2%) after 30 days reported dysphonia (DN, defined as “impairment of the voice”).

At direct laryngoscopy, we found 34/50 (68%) case of edema of the false vocal folds within 2-6 hours after surgery, 23/50 (46%) after 72 hours and no hyperemia or edema after 30 days of surgery.

ENT evaluation revealed also 42/50 cases of edema and

hyperemia of arytenoid cartilages and 25/50 (50%) cases of edema of inter-arytenoid space within 2-6 hours after surgery, 35/50 cases of edema and hyperemia of arytenoid cartilages (70%) after 72 hours and 13/50 (36%) cases of edema of inter-arytenoid space; 30 days after surgical procedure we reported 4/50 (8%) cases of persistent edema and hyperemia of arytenoid cartilages but no inter-arytenoid space lesions (Table II).

TABLE III - Postoperative laryngeal manifestations of endotracheal intubation <sup>5</sup>

Laryngeal findings	Symptoms	Etiology
Vocal fold edema/redness Arytenoid edema/redness	Throat clearing, hoarseness No symptoms, throat clearing Globus pharyngus	Intubation, tube factors (size, material, cuff)
Vocal fold hematoma, laceration	Aphonia, severe dysphonia	Traumatic intubation/extubation
Arytenoid subluxation/ dislocation Avulsion of vocal process of arytenoids	Breathiness, aspiration, dysphonia	Traumatic intubation/extubation
Vocal fold dryness Alterations in rheologic properties of vocal fold cover	Xerophonia (dry voice) Vocal fatigue Increase in phonatory effort	Anesthetic gas Drying medication Dehydration
Vocal fold paralysis	Breathiness Aspiration	Hyperextension of neck Hyperinflation of cuff Insertion of subclavian line

No complication during direct laryngoscopy were registered.

We specifically matched the results of laryngoscopy (pre-operative and controls 2-6 hours, 24 hours and one month after surgery) and clinical symptoms (dysphonia, disphagia, hoarseness and sore throat 2-6 hours, 24 hours and one month after surgery) with anatomic (age, sex, Mallampati class, Cormack class) and operative (duration of intubation, diameter of oro-tracheal tube, difficult oro-tracheal intubation, use of stilet) variables and we searched for the statistical difference between these groups.

Our statistical study demonstrates that subjects younger than 50 years had an higher prevalence of DG and DN, without laryngoscopic correspondence. In smokers, early DG and DN were more frequent, edema of the vocal cords was greater within 6 hours as permanence more than 30 days of edema of the arytenoids. DG was more frequent in thyroidectomy; incidence of early DG was higher if the duration of the intervention was greater than 120 minutes, ST persisted for more than 72 hours (self-limited to 30 days), with a corresponding edema of the arytenoids, which is always present if the intervention has lasted more than 120 minutes, associated with ST self-limited to 72 hours of surgery; in addition, DG, PH and ST were all self-limited to 72 hours after surgery, without medical therapy. Atopic subjects reported a higher incidence of PH and early edema of the vocal folds, also under prophylactic therapy with corticosteroids and antihistaminergic agents. DG and DN, although self-limiting to one month, were significantly more frequent when BURP was performed (mechanic trauma). There was no statistical difference in incidence of symptoms in use of stilet and sevoflurane 2% in maintenance. In Mallampati I, early PH was more frequent, as well as DG and DN at 72 hours (theoretical greater easy intubation with use of endotracheal tubes of large diame-

ter), with a corresponding and lasting edema of the vocal cords and arytenoids. Edema of vocal folds was more frequent and PH was the symptom more frequent and persistent in Cormack III. DN and ST were more frequent in large diameter orotracheal tube, without laryngoscopic correspondence. DG and ST were more frequent in difficult intubation, persistent more than 30 days and has a correspondence in vocal folds and arytenoids edema and nor Mallampati neither Cormack are able to predict difficult intubation.

## Discussion

The larynx is a muscle-cartilaginous structure in which a delicate and intrinsic muscle structure interconnects with cartilages to promote the opening of the vocal folds during breathing and the closing of the folds during phonation and swallowing preventing food from entering airway.

The innervation of the intrinsic muscles of the larynx is made up inferior laryngeal nerves and recurrent laryngeal nerves, which were branches of the vagus nerve. Only the cricothyroid muscle receives innervation from the superior laryngeal nerve.

The vocal folds have very few lymphatic vessels, meaning that an edema on the inside will take long to be reabsorbed, thereby resulting, many times, in secondary lesions, such as vocal polyps.

The arytenoid cartilage is a pyramid-shaped composed of hyaline and elastic cartilages and consists of an apex, base, and 2 processes. The vocal process articulates with the vocal ligament, and the muscular process is the insertion point for the muscles that move the arytenoid. The base rests on the cricoid cartilage, and the apex articulates with the aryepiglottic fold and the corniculate cartilage (Santorini cartilage). Most cricoarytenoid motion

is that of rocking and, to a lesser extent, gliding. The cricoarytenoid joint is a synovial joint enclosed by a joint capsule. The capsule receives posterior support from the posterior cricoarytenoid ligament.

The cricoarytenoid joint controls adduction and abduction of the true vocal folds, which facilitates the main laryngeal functions of airway protection, respiration, and phonation<sup>3</sup>.

DN or change in voice quality following surgery (14.4% - 50% of patients that underwent tracheal intubation) is very often overlooked by the anesthesiologist and the treating physician. In view of its transient nature, no investigation for the causes of DN is warranted despite the frequency of this condition.

However, it should be noted that postoperative hoarseness does not necessarily imply damage of the recurrent laryngeal nerve, because injury of the vocal fold during orotracheal intubation, with subsequent oedema, is a fairly frequent cause of PH: in these cases, differential diagnosis will be made by laryngoscopy<sup>4</sup>, but is always late and the etiology invariably is often multivariable and necessitates a team approach for proper diagnosis<sup>4,5</sup>.

When phonatory symptoms are present, it is important to note that they are self limited and subside within 24 to 48 hours. When they become persistent for more than 72 hours, the anaesthesiologist should suspect injury to the vocal folds.

The leading cause of the problem is injury to the recurrent nerve: studies performed on large groups of patients show a prevalence for permanent palsy of the recurrent nerve ranging from 0 % after primary surgery to 20% after revision surgery, but orotracheal intubation can lead to PH as well. Moreover, the incidence of laryngeal injuries caused by intubation is considered to be about 6% to 70% after surgical procedures not adjacent to the larynx<sup>6</sup>.

It was speculated that poor muscle relaxation at the moment of tracheal intubation might have caused many of the observed laryngeal injuries; however, the large individual variation in neuromuscular depression with varying onset times might result in poor muscle relaxation at the time of intubation even when neuromuscular blocking drugs are used<sup>7</sup>.

In our study, arytenoid and false vocal folds edema was a critical clinical signs under any conditions, but the severity of edema was variable and this condition has therefore been very difficult to quantificate<sup>8</sup>.

Moreover, postoperative PH (defined as an acoustic quality different than the previous voice quality of the patient) and ST (defined as a continuous throat pain) are the possible result of at least some degree of laryngeal injury and risk factors for postoperative hoarseness and vocal folds injury have been identified such as technical (endotracheal tube size, type of tube, cuff design, cuff pressure, use of introducer, use of nasogastric tube, type and duration of surgery and intubating conditions) and demographic factors (sex, weight, history of smoking and gastroesophageal reflux) and duration of surgery<sup>7</sup>.

Fiberoptic laryngeal endoscopy (FLE) enabled us to study the laryngeal biomechanics of the speaking voice, i.e. the behaviour of laryngeal structures in relation to time and how they interact with vocal fold injury<sup>5</sup> (Table III). The degree of laryngeal trauma, visualized at FLE, following endotracheal manipulation may extend from simple edema or redness of the vocal folds, hematoma of the vocal folds, to dislocation of the arytenoid cartilages<sup>9</sup>. Other findings may include vocal fold laceration, avulsion of the vocal process of the arytenoids, and granulation tissue.

Aggressive intubation with a large endotracheal tube or when the endotracheal tube is inserted while the vocal folds are still in the median position, may injure both the vocal folds and the cricoarytenoid joints. Similarly, removal of the endotracheal tube while the cough is still inflated may dislodge the arytenoids and result in an incompetent glottis. On the other hand, vocal fold paralysis invariably is secondary either to hyperinflation of the endotracheal tube cough, aggressive extension of the neck or simply the insertion of a subclavian central line on the right side. The injury is usually self limiting and does not extend beyond neuropraxia. Laryngeal electromyography can differentiate cricoarytenoid joint dislocation or fixation from vocal fold paralysis<sup>5</sup>.

Another important factor to consider in the examination of the larynx is the extent of mucus, its consistency and behavior with vocal fold oscillation. A change in the consistency of the mucus reflects either an element of dehydration that is systemic and secondary to medications such as atropine or to the local drying effect of anesthetic agents<sup>5</sup>.

Moreover, data from a double-blind controlled clinical trial in 90 patients who received general anesthesia for ear, nose and throat surgery outpatient, demonstrated that desflurane inhalation through a laryngeal mask had a higher incidence of cough than patients who inhaled sevoflurane, probably for a chemical or mechanical effect in the larynx and in the distal portion of respiratory tree<sup>10</sup>.

The use of lubricants on the tube did not lower the incidence of sore throat, instead is associated with an its higher incidence; also, coughing during anaesthesia and the presence of oropharyngeal or intragastric tubes lead to an higher incidence of sore throat.

Surprisingly, but in according to our results, traumatic intubation is not associated with higher incidence of sore throat<sup>11</sup>.

In case of one-lung ventilation in lung resective surgery, a recent study demonstrated that PH and vocal fold lesions occurs more significantly more frequently in double-lumen group of patients compared with group in which endobronchial blocker (such as the Arndt blocker) was used (44% vs 17%, respectively) and cumulative number of days with hoarseness and sore throat were significantly increased in the double-lumen group compared with the blocker group (no PH or ST were reported on the fourth day after surgery)<sup>12</sup>.

A prospective randomized double-blind study performed to compare the effectiveness of prophylactic dexamethasone and postintubation dexamethasone in reducing the incidence and severity of ST, demonstrated that intravenous injection of 10 mg of dexamethasone is more effective in reducing only the severity of ST and not its incidence compared with the administration after tracheal intubation<sup>13</sup>.

## Conclusions

General anesthesia may affect the fine motor control and sensorium of the laryngeal neuromuscular activity, resulting in an increase in the perturbation parameters with consequent dysphonia.

Although there is the risk of damaging the nerve during thyroidectomy, it should be mentioned that the larynx should can be injured during intubation or extubation as well, as demonstrated from analogue lesions in literature<sup>6</sup> and in our study: in fact, as our study demonstrates, an important role is played by direct mechanic trauma to arytenoid cartilage and vocal folds, due to intubation or extubation trauma in difficult oro-tracheal intubations, not prevented by profilactic steroid drugs and related to reversible post-operative DN, ST, PH and, sometimes, DG.

In conclusion, in our opinion it is recommended to inform patients about the risk of benign and potentially reversible and self-limiting postoperative hoarseness and sore throat, even in non-thyroid surgery, with particular relevance to smoking, age < 50 years, duration of surgery > 120 minutes, BURP maneuver and Mallampati class II, that are, from our study, the main contributing factors for the occurrence of post operative DN, DG, ST and PH.

## Riassunto

**INTRODUZIONE:** Le lesioni delle corde vocali (VI), la raucedine (PH), la disfonia (DN), la disfagia (DG) e la faringodinia (ST) sono comuni complicanze dopo anestesia generale con intubazione orotracheale; ad oggi non c'è consenso per il timing della valutazione laringoscopica post-operatoria per confermare la diagnosi post-operatoria di lesione delle corde vocali e non esistono studi scientificamente validi sull'entità del trauma oro-tracheale dopo intubazione. Scopo del nostro studio è valutare la relazione statistica tra variabili anatomiche, anestesologiche e chirurgiche in caso PH, DG o alterazioni post-operatorie del tono della voce.

**MATERIALI E METODI:** 50 pazienti (30 tiroidectomia, 8 colecistectomie videolaparoscopiche, 2 emicolectomie destre, 2 emicolectomie sinistre, 1 gastrectomia totale, 1 emorroidectomia, 1 nefrectomia, 1 toracosopia diagnostica, 1 lobectomia polmonare superiore destra, 1 appen-

dicectomia, 1 cura radicale di laparocoele, 1 resezione anteriore del retto, 1 isterectomia radicale) sono state sottoposte a valutazione clinica e laringoscopia prima dell'intervento chirurgico, dopo 6 ore, dopo 72 ore and a 30 giorni, per valutare la motilità cordale e lo spazio respiratorio, le corde vocali vere e false e le cartilagini aritenoidi. Abbiamo anche valutato età media ( $56.6 \pm 3.6$  anni), il rapporto M:F (1:1.5), il fumo di sigarette (20%), l'atopia (17/50 = 34%), la classe Mallampati (32% 1, 38% 2, 26% 3, 2% 4), la durata media dell'intubazione (159 minuti, range 50 – 405), lo score di Cormack-Lehane (34% 1, 22% 2, 22% 3, 2% 4) e la intubazione difficoltosa (9 casi = 18%).

Non abbiamo registrato complicanze durante la laringoscopia. Abbiamo infine studiato la relazione statistica, ove presente, tra le variabili per ed intraoperatorie, i sintomi laringei e le lesioni evidenziate alla laringoscopia.

**RISULTATI:** nella nostra esperienza, una relazione statistica significativa è stata trovata per l'edema delle corde vocali nei fumatori ( $p < 0.005$ ), per DG e DN autolimitantesi nei pazienti più giovani ( $p < 0.005$ ) e nelle tiroidectomie ( $p < 0.01$ ) e per DG persistente dopo tiroidectomia ( $p < 0.01$ ). L'uso preoperatorio di steroidi e di agenti antistaminici per prevenire reazioni allergiche non è apparso correlato alla riduzione o alla prevenzione di DN, DG, PH e ST. Non è stata evidenziata alcuna correlazione statistica tra la insorgenza di complicanze post-operatorie e la intubazione prolungata, il reflusso gastroesofageo, il ricorso alla manovra di BURP (backward upward right sided pressure) le classi Mallampati e Cormack-Lehane superiori a 2, il mantenimento del piano anestesologico con sevoflurano 2% e l'uso di tubi armati mandarinati.

**CONCLUSIONI:** la laringoscopia diretta è essenziale per l'individuazione di lesioni delle cartilagini aritenoidi dopo intubazione orotracheale per anestesia generale.

Secondo i nostri risultati, una percentuale delle DN e PH postoperatorie temporanee è dovuta all'edema aritenoidico mono o bilaterale, secondario a prolungata o difficoltosa intubazione orotracheale, valutabile, con sicurezza, a 72 ore dopo la chirurgia. È quindi necessario elencare queste possibili complicanze al consenso informato, anche quando non si tratti di chirurgia della tiroide.

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