

ORIGINAL ARTICLE

Airway Evaluation by Indirect Laryngoscopy in Patients With Lingual Tonsillar Hypertrophy[☆]

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KEYWORDS

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Rigid laryngoscope;
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Difficult airway;
Tonsil;
Hypertrophy

Abstract

Introduction and objectives: Prevalence of the lingual tonsillar hypertrophy is unknown but it is believed that its presence is associated with the difficult airway. To investigate this, indirect laryngoscopy was performed on patients in the preoperative evaluation and this pathology was diagnosed. The relationship with difficulty of viewing the larynx, intubation and ventilation, under general anaesthesia and using direct laryngoscopy, was then studied.

Methods: We performed the demographic variable checks and tests for predicting difficult intubation (mouth opening, thyromental distance, cervical flexion-extension, neck thickness, and Mallampati test), in the preoperative step on 300 patients who were going to be submitted to general anaesthesia. We then performed indirect laryngoscopy on them using a 70° rigid laryngoscope to ascertain the frequency of appearance of lingual tonsillar hypertrophy. Next, under general anaesthesia, we carried out direct laryngoscopy to verify whether there was difficulty in viewing the larynx and intubation and ventilation. We then investigated the association of demographic predictors of difficult intubation, including indirect laryngoscopy, with the presence of this condition.

Results: Prevalence of lingual tonsillar hypertrophy was 2%. No relationship between the appearance of this entity and the difficulty of viewing the larynx, intubation and ventilation was found. Only indirect laryngoscopy was linked to the appearance of this pathology.

Conclusions: Lingual tonsillar hypertrophy is a relatively frequent disorder, whose presence is not usually associated with difficult airway.

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PALABRAS CLAVE

Laringoscopia indirecta;
Laringoscopio rígido;
Laringoscopia directa;
Vía aérea difícil;
Amígdala;
Hipertrofia

Evaluación de la vía aérea mediante laringoscopia indirecta en pacientes con hipertrofia de la amígdala lingual

Resumen

Introducción y objetivos: Se desconoce la prevalencia de la amígdala lingual hipertrófica, pero se cree que su presencia está asociada con la vía aérea difícil. Para investigarlo se realizó a los pacientes una laringoscopia indirecta en el preoperatorio y se diagnosticó esta enfermedad. Después, bajo anestesia general y laringoscopia directa estudiamos su relación con la dificultad de visión de la laringe, intubación y ventilación.

Métodos: A 300 pacientes que iban a ser sometidos a anestesia general, además de realizarles en el preoperatorio los predictores demográficos y de vía aérea difícil (prueba de Mallampati, apertura bucal, distancia tiromentoniana, flexoextensión cervical y grosor del cuello), se les practicó una laringoscopia indirecta con el laringoscopio rígido de 70° y se comprobó la frecuencia de aparición de la amígdala lingual hipertrófica. Después, bajo anestesia general y laringoscopia directa verificamos si existía dificultad de visión e intubación de la laringe y de ventilación. Exploramos la relación de las 3 variables anteriores con esta enfermedad mediante la prueba de Fisher. También, se investigó la asociación de predictores demográficos y de vía aérea difícil incluyendo la laringoscopia indirecta, con la presencia de esta afección.

Resultados: La prevalencia de amígdala lingual hipertrófica fue del 2%. No se encontró relación entre la aparición de esta entidad y la dificultad de visión de la laringe, intubación y ventilación. Solo la laringoscopia indirecta previno la aparición de esta enfermedad.

Conclusiones: La amígdala lingual hipertrófica es una entidad relativamente frecuente. Su presencia no se asocia habitualmente con la vía aérea difícil.

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Introduction

The lingual tonsils are rounded masses of lymphatic tissue which are normally located on both sides of the glossoepiglottic fold and are part of the tonsillar tissue ring surrounding the entrance of the upper airway.^{1,2} Due to their small size they usually go unnoticed in normal subjects during the exploration of the tongue base and hypopharynx by indirect laryngoscopy (IL) and fibroscopy. However, chronic infection processes can cause them to become hypertrophied and inflamed, and they can reach a large size, fill the vallecula, displace the epiglottis in an anterior direction and narrow the airway retroglottally. Moreover, although it is sometimes an asymptomatic disease, it can intermittently cause foreign body sensation and tightness in the throat, dysphagia, difficulty breathing, coughing, snoring, voice alterations and obstructive sleep apnoea syndrome (OSAS).¹⁻⁴ The history of patients suffering lingual tonsillar hypertrophy can sometimes include previous tonsillectomy and adenoidectomy.^{2,4-8}

The prevalence of lingual tonsillar hypertrophy (LTH) is unknown,^{2,9} but it is believed that its presence is a risk factor in the genesis of unexpected difficult airway,^{2,9} a concept which encompasses difficult visibility of the larynx (DVL), intubation, and ventilation. The concurrence of these 3 variables in the same patient due to this condition can have fatal consequences.⁵

On the other hand, when the patient is intervened due to an otolaryngological disease, the ENT specialist often carries out an IL to explore the upper airway. If LTH is diagnosed at this point and the anaesthesiologist is warned about the finding, he may then implement an adequate anaesthetic induction and intubation strategy.⁸ At other times, patients

have even suffered the breakage of incisors during intubation attempts by direct laryngoscopy (DL), and the origin of the difficulty, which was LHT, has remained undetected.¹⁰ It is usually diagnosed after difficulty or impossibility for intubation using fibroscopy² or magnetic resonance imaging.¹¹

Our primary goal was to employ an IL performed by the anaesthesiologist with a 70° rigid laryngoscope before surgery to verify the frequency of LTH among a group of patients who were scheduled to undergo surgical procedures under general anaesthesia (GA) and DL. Once the disease was diagnosed and GA and DL were carried out, we analysed the association between the presence of LTH and DVL, with difficulty for intubation and ventilation. The secondary objective was to explore the association of demographic and difficult airway predictors (including IL) with the presence of this anomaly.

Methods

Once approved by the Ethics Committee of our hospital, and after obtaining written informed consent, we conducted a prospective, observational study of 300 consecutive patients between September 2009 and November 2010. All of them underwent elective surgery under GA, with endotracheal intubation by DL. We applied the following exclusion criteria: age less than 18 years, inability to sit, coronary disease, ankylosing spondylitis, nasogastric probe carriers, sufferers of infectious diseases such as hepatitis, HIV and TB, recent neck surgery and obstetric and emergency surgery.

On the day scheduled for the intervention, in the surgical area, after consulting the preoperative examination conducted previously in the pre-anaesthesia consultation,

Table 1 Demographic Characteristics and Predictors of Evaluation of a Difficult Airway for Each Patient With a Diagnosis of Lingual Tonsillar Hypertrophy.

| Case | Age (years) | Gender | BMI | Mall | TMD | F-E |
|------|-------------|--------|------|------|-----|-----|
| 1 | 64 | F | 29 | 2 | 6 | L |
| 2 | 28 | F | 30.7 | 1 | 7.5 | N |
| 3 | 69 | F | 26.5 | 2 | 8.5 | N |
| 4 | 39 | F | 26.7 | 2 | 8 | N |
| 5 | 65 | F | 23.1 | 2 | 8 | N |
| 6 | 54 | M | 26.7 | 4 | 8 | N |

| Case | MA | NW | Retr | Snor | DVFM | C-L | DI |
|------|------|----|------|------|------|-----|-----|
| 1 | 3.5 | 37 | No | No | No | III | Yes |
| 2 | 5 | 36 | No | Yes | No | II | No |
| 3 | 4.5 | 37 | No | Yes | Yes | II | No |
| 4 | 3.5 | 38 | No | Yes | No | II | No |
| 5 | 4.5 | 36 | No | Yes | No | III | No |
| 6 | 3.75 | 41 | Yes | No | No | II | No |

BMI: body mass index; C-L: Cormack-Lehane; DI: difficulty for intubation; DVFM: difficulty for ventilation with facial mask; F: female; F-E: cervical flexion-extension; L: limited; M: male; MA: mouth aperture in cm; Mall: Mallampati; N: normal; No: no difficulty; NW: neck width in cm; Retr: retrognathia; Snor: snoring; TMD: thyromental distance in cm; Yes: ventilation improves with the aid of a Guedel airway.

the anaesthesiologist completed a protocol sheet with demographic predictors and airway assessment predictors: Mallampati test, mouth opening, thyromental distance, cervical flexion-extension, and neck thickness. Both types of tests are shown in Tables 1 and 2. The protocol sheet also reflected whether the patient suffered from snoring, retrognathia, and other types of anomalies also considered as predictors of a difficult airway.

It is advisable to perform an IL to study the upper airway in order to diagnose LTH before subjecting the patient to

GA with endotracheal intubation.^{9,12,13} To do this, following the above, patients were moved on a stretcher to the room adjoining the operating theatre where surgery was going to take place. This contained a 70°, 8.5 mm Sopro-Comeg® (Germany), rigid laryngoscope, n.: 162 081 685, mounted on a tower. After preparing the equipment, which also included a DVD recorder to register all the laryngoscopy procedures, patients were seated in a chair with their back to the screen of the monitor and the head in extension and the IL was performed.¹⁴

Table 2 Bivariate Analysis of Demographic Variables, and Variables Affecting DVL and IL With the Presence of LTH.

| | LTH No. = 6 | No LTH No. = 294 | Value of P , χ^2 , Fisher |
|--|---------------|------------------|----------------------------------|
| Gender, M/F | 1/5 | 134/160 | NS |
| Age, (years) | 53.17 (16.38) | 56.28 (18.07) | NS |
| BMI, (kg/m ²) | 27.16 (2.58) | 28.10 (5.38) | NS |
| BMI >30 kg/m ² /BMI <30 kg/m ² | 0/6 | 91/203 | NS |
| Neck width, (cm) | 37.50 (1.87) | 39.01 (4.28) | NS |
| Neck width >43/Neck width <43 | 0/6 | 46/248 | NS |
| TMD, (cm) | 7.66 (0.87) | 7.56 (1.18) | NS |
| TMD<6.5 cm/TMD>6.5 cm | 1/5 | 35/259 | NS |
| Mouth opening, (cm) | 4.20 (0.78) | 4.23 (0.63) | NS |
| Mouth opening <3.5 cm/mouth opening >3.5 cm | 0/6 | 16/278 | NS |
| No foreseeable difficulty Mallampati 1–2/foreseeable difficulty Mallampati 3–4 | 5/1 | 199/95 | NS |
| Normal/decreased cervical mobility | 5/1 | 244/50 | NS |
| Snoring, yes/no | 4/2 | 136/158 | NS |
| Retrognathia, Yes/No | 0/6 | 10/284 | NS |
| Diagnosis of the presence of LTH with IL/no presence of LTH with IL | 5/1 | 3/291 | .000* |

Data are expressed as mean (standard deviation) or as frequency.

BMI: body mass index; DVL: difficulty to view the larynx; F: female; IL: indirect laryngoscopy; LTH: lingual tonsillar hypertrophy; M: male; NS: not significant; TMD: thyromental distance.

* $P<.05$.

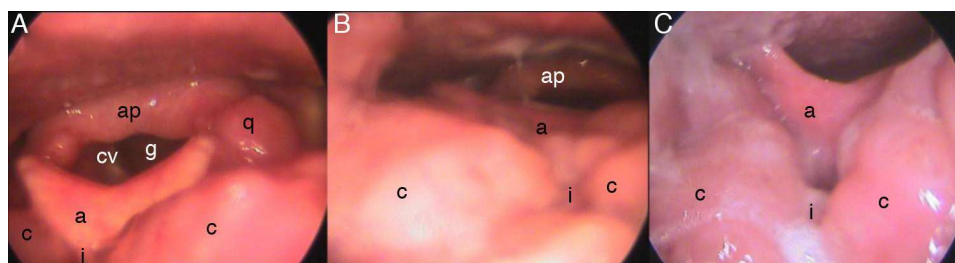


Figure 1 (A–C) Images of the upper airway obtained by IL corresponding to patients 5, 6 and 1. The latter presented difficulty for intubation (Table 1). All 3 presented LTH. In the images, (a) corresponds to the epiglottis, (ap) to the arytenoid, (c) are the lobes of the LTH, (cv) vocal cord, (g) glottis, (i) the isthmus of the LTH and (q) corresponds to a cyst of the vallecula.

Confirmation by an ENT specialist was requested for those patients in whom the anaesthesiologist indicated the presence of LTH after performing IL. The ENT specialist confirmed the diagnosis of the disease through the study of images recorded on the computer during IL. The typical images of LTH usually appeared as an increase in retroglossal tissue shaped as a bilateral and symmetrical mass separated by an isthmus, which occupied the vallecula and invaded the lateral edges of the epiglottis (Fig. 1A–C).² The differential diagnosis was primarily carried out with lingual thyroid, thyroglossal cysts, and lymphoma,^{2,4} in addition to hypertrophy of the tongue base. Each of the patients diagnosed with LTH was assigned a number. Cases of misdiagnosis by the anaesthesiologist during this process were also recorded.

Patients were then moved to the operating room, where the difficult intubation trolley was located, as well as a fiberscope ready for use. Anaesthesia was performed by administration of propofol (2 mg/kg) and we verified whether facial mask ventilation was possible without a Guedel airway (1), with it (2) or impossible (3). If ventilation was feasible, we administered succinylcholine 1 mg/kg. Next, the anaesthesiologist (who was unaware of the finding of LTH by IL) proceeded to evaluate DL, using a Macintosh laryngoscope of an appropriate size, without performing the cricothyroid pressure manoeuvre. The DL view obtained was classified according to the Cormack-Lehane grading scale¹⁵ into: grade I, fully exposed and open laryngeal opening; grade II, the posterior portion of the laryngeal opening could be seen; grade III: only the epiglottis was exposed; and grade IV: no glottic structure was visible, only the soft palate could be seen. Grades I and II were considered as a correct view of the larynx, whilst grades III and IV were considered as DVL. We then proceeded to perform the cricothyroid pressure manoeuvre on these patients (the manoeuvre was recorded). If this achieved visualisation of the glottic orifice, then the patient was intubated. If a good visualisation was not obtained and several intubation manoeuvres were required, the case was considered as difficult intubation, appropriate instruments were employed (Eschmann guide or others) and the episode was recorded as such.

Patients with a diagnosis of LTH included those cases where the anaesthesiologist was able to diagnose it during DL and the presence of LTH was corroborated by direct view of the bilateral masses occupying the vallecula. In addition, we attempted to record LTH images (without adding medication: propofol and succinylcholine). This was done by introducing the fiberscope (previously connected

to a recording system) through the mouth. This operation required the aid of a second anaesthesiologist.

Once the study was complete, we elaborated a table with all the patients diagnosed with LTH which contained: demographic characteristics, predictors of difficult airway, the results of face mask ventilation and DL exploration.

We analysed the association of the onset of LTH and DVL with difficult intubation and difficult ventilation using the χ^2 and Fisher's tests.

We also conducted a bivariate descriptive analysis of demographic and difficult airway variables (including IL), with the presence or absence of LTH to explore their association and estimate their statistical significance.

Data were analysed using the software package SPSS® v.15 for Microsoft Windows®. Quantitative values were expressed as mean (standard deviation) and qualitative variables as frequencies and percentages. We used the Student's *t* test for independent samples with continuous variables and the χ^2 and Fisher's tests with qualitative variables. We tested the normality of continuous variables using the Kolmogorov–Smirnov test. The value of statistical significance was assumed when $P < .05$.

Results

Descriptive Analysis

Out of the 300 patients, 6 suffered LTH (2%). The classification of these patients by surgical specialty was: 3 general surgery, 2 ENT, and 1 traumatology.

Table 1 shows the demographic characteristics, predictors of difficult airway, result of face mask ventilation and results of DL exploration of each of the 6 patients with a diagnosis of LTH.

Only in 2 patients, numbers 2 and 5 in Table 1, did the anaesthesiologist performing DL recognise the presence of LTH.

Cricothyroid pressure during DL was necessary to obtain a better view of the glottis in patients 1 and 5 in Table 1. The first presented difficult intubation and the Cormack-Lehane scale remained at III. In the second, it went from III to II.

One patient presented a history of tonsillectomy and another patient of dysphagia (numbers 2 and 5 in Table 1).

Fig. 1A–C shows 3 LTH images obtained through IL, which present characteristics of bilateral and symmetrical masses separated by an isthmus, occupying the vallecula. Fig. 1B

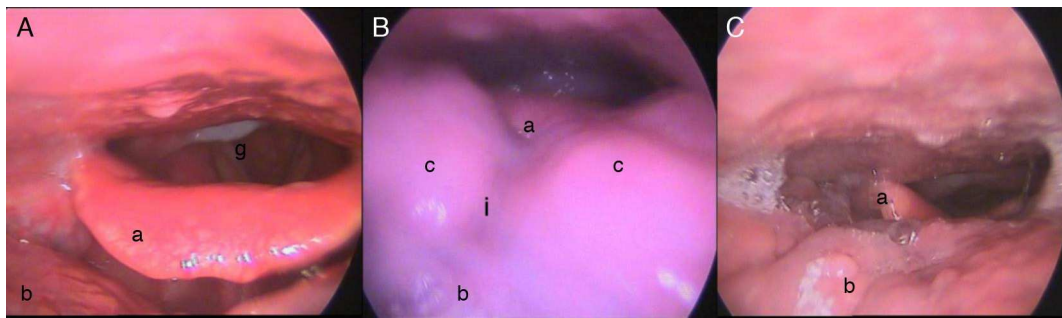


Figure 2 (A) Image of the patient with a normal upper airway obtained using IL. The base of the epiglottis is free, g (glottis). (B) Patient diagnosed with LTH showing the 2 tonsillar lobes (c) separated by an isthmus (i) occupying the base of the epiglottis. (C) Patient with tongue base hypertrophy. In the 3 images (a) corresponds to the epiglottis and (b) to the base of tongue.

and C shows especially clearly how they invade the lateral edges of the epiglottis.

Fig. 2A–C shows the differences between a normal upper airway with free vallecula, an image of LTH occupying the vallecula and an image of the airway with the vallecula occupied by masses without an isthmus, corresponding to tongue base hypertrophy.

Fig. 3A–C is LTH images obtained by IL. Images in Fig. 3A'–C' correspond to the same patients in whom DL images were obtained with the fiberoptic inserted through the mouth. Both the first and the second set show the disease masses invading the edge of the epiglottis.

Predictive Analysis of the Difficulty for Visualisation of the Larynx, of Difficulty for Intubation and Lingual Tonsillar Hypertrophy

We found no significant association between the presence of LTH and DVL ($P=.223$), and difficulty for intubation ($P=.251$) or difficulty for ventilation ($P=.533$).

Table 2 shows the bivariate analysis of demographic variables, predictors of DVL and IL, with a diagnosis of LTH. Only

the IL showed a significant association with the presence of the disease. The results obtained from this exploration presented: 5 cases of LTH diagnosed by anaesthesiologists, 1 case of LTH which went unnoticed and 3 misdiagnoses of LTH with hypertrophy of the tongue base.

Discussion

Cases of LTH associated with DVL, difficulty for intubation^{1,2,5–11,16,17} and sometimes with difficulty for ventilation^{2,6,17} are continuously described in the literature. Although their contribution to difficult airway is unknown, these studies seem to indicate that both entities (difficult airway and LTH) are related. In a recent study,¹⁸ anaesthesiologists performed a preoperative exploration of patients undergoing ENT surgery using a fiberoptic, in order to facilitate the choice of intubation technique. The conclusions proposed conducting this examination in the preoperative schedule of any type of surgery and cited the presence of LTH as an example of risk of failure in the treatment of the airway which would benefit from this test. Nevertheless, it is known that, both in children¹⁹ and in adults,³ LTH is one of the findings correlated with gastroesophageal reflux during endoscopic evaluation of the upper airway by ENT specialists. This would mean that it is not an uncommon entity and, therefore, its presence would not necessarily always imply a difficult airway. Our study confirms this assumption, as we found no relationship between the presence of LTH and DVL, difficult intubation and difficult ventilation with a face mask.

The medical histories of the 2 patients undergoing surgery for ENT diseases presented findings of LTH during exploration of the airway carried out by ENT specialists through IL, but this was not included in the pre-anaesthetic report. One of them presented DVL and difficulty for intubation. Similar situations can take place in patients undergoing surgery due to ENT diseases who have been previously diagnosed with LTH, who at the time of treating the upper airway are diagnosed with unexpected difficult airway. Thus, the key study by Ovassapian et al.² does not specify whether any of the 33 patients undergoing various surgical procedures, all with failed tracheal intubation by DL and presence of LTH, underwent surgery due to ENT causes and, in that case, whether a previous exploration of the upper airway had been conducted by these surgeons. Therefore, we believe that in

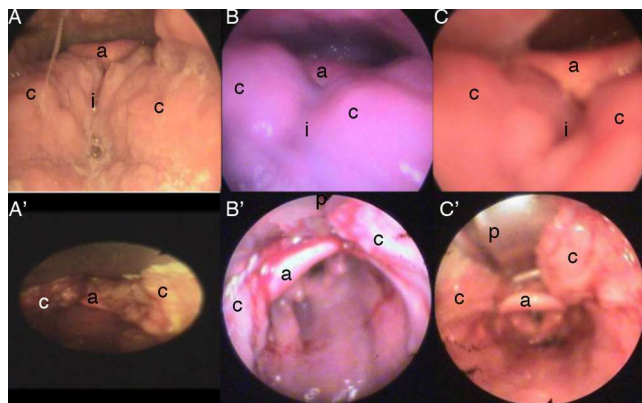


Figure 3 (A and A') Images of LTH corresponding to patient 2 (Table 1), the first obtained through IL and the second with the fiberoptic. (B and B') Images obtained as the above and corresponding to patient 3 (Table 1). (C and C') Images corresponding to patient 4 (Table 1). In all of them (a) corresponds to the epiglottis, (c) to the lobes of the LTH, (i) to the isthmus and (p) to the blade of the Macintosh laryngoscope.

patients undergoing surgery due to ENT diseases, the anaesthesiologist must verify the result of the airway examination by this service. Moreover, if the ENT specialist diagnoses a case of LTH in a patient scheduled for GA, the Anaesthesiology Service should be informed when the preoperative schedule is requested.

The base of the tongue, epiglottis, and glottis (Fig. 2A) are noted during IL with a rigid laryngoscope in patients without disease of the upper airway. However, in patients with LTH, the base of the tongue at its junction with the epiglottis is not free, but instead is occupied by a mass which is almost always bilobed and separated by an isthmus (Fig. 2B). In the case of an increase in the tongue base, its union with the epiglottis is covered by a mass without an isthmus (Fig. 2C). In our study, this was the main cause of confusion with LTH during IL.

When patients have previously undergone IL and are diagnosed with LTH (Fig. 3A–C), if they subsequently undergo DL under GA, this disease also usually appears as bilateral masses (Fig. 3A'–C') occupying the vallecula (which supports the tip of the laryngoscope). Moreover, apparently this entity should be visualised and recognised by the anaesthesiologist, but this does not occur (if the anaesthesiologist is not advised about the presence of LTH). In our analysis, only 2 of the 6 LTH cases were recognised by the anaesthesiologist when performing DL. In the cited study,² not only were no patients diagnosed with LTH during the repeated DL manoeuvres that ended in failure, but this was not observed either at the time of intubation with the fiberscope during the anaesthetic procedure. The disease was only discovered during the pharyngoscopic exploration conducted with the fiberscope, once the patient had recovered from the intervention.

Being an ENT disease, the predictors of airway assessment, as well as the indices with the best predictive results for DVL, such as those by Arne et al.²⁰ (which include, among others: Mallampati test, TMD, cervical mobility, and mouth opening), decrease their sensitivity and specificity. This could be applied to LTH, as it is an ENT condition. Table 2 shows that the only predictor showing a significant association with the presence of LTH was IL. The diagnosis of LTH by IL allowed us to not modify the intubation schedule unless a difficult airway was anticipated, and forewarned us in case this eventuality appeared.

As a limitation to the study, we believe that larger studies are required to support our results. As a limitation to the use of IL in patients diagnosed with LTH, we can say that, in addition to the need for learning this technique, its diagnosis by an anaesthesiologist requires prior knowledge of the characteristic images of the disease, and this requires training by an ENT specialist, which extends the learning period.

Conclusions

We believe that: (a) LTH is a relatively common condition; (b) IL with a 70° rigid laryngoscope was the only predictor which warned of the presence of the entity; and (c) recognition of the presence of this disease during DL under GA is not commonplace.

Conflict of Interests

The authors have no conflict of interests to declare.

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References

1. Agnoletti V, Piraccini E, Corso R, Avino F, Scaioli I, Maitan S, et al. Failure of double-lumen tube positioning in a patient with lingual tonsil hypertrophy. *J Cardiothorac Vasc Anesth*. 2011;25:20–1.
2. Ovassapian A, Glassenberg R, Randel GI, Klock A, Mesnick PS, Klapka JM. The unexpected difficult airway and lingual tonsil hyperplasia: a case series and a review of the literature. *Anesthesiology*. 2002;97:124–32.
3. Quesada JL, Lorente J, Homs I, López D, Quesada P. Globo faríngeo y reflujo faringo-laríngeo. *Acta Otorrinolaringol Esp*. 2003;54:495–8.
4. Yamakawa PE, Andrade EH, Watanabe-Silva CH, Dos Santos Neto LL. Lingual tonsil pseudolymphoma and obstructive sleep apnea. *Braz J Otorhinolaryngol*. 2009;75:469.
5. Jones DH, Cohle SD. Unanticipated difficult airway secondary to lingual tonsillar hyperplasia. *Anesth Analg*. 1993;77:1285–8.
6. Henderson K, Abernathy S, Bays T. Lingual tonsillar hypertrophy: the anesthesiologist's view. *Anesth Analg*. 1994;79:814–5.
7. Ojeda A, López AM, Borrat X, Valero R. Failed tracheal intubation with the LMA-CTrach in two patients with lingual tonsil hyperplasia. *Anesth Analg*. 2008;107:601–2.
8. Nakazawa K, Ikeda D, Ishikawa S, Makita K. A case of difficult airway due to lingual tonsillar hypertrophy in a patient with Down's syndrome. *Anesth Analg*. 2003;97:704–5.
9. Saturno Marcos M, Escribano Jiménez M, Rodríguez-Navarro MA, Marante Fuertes N. Vía aérea difícil no prevista: amígdala lingual hipertrófica. *Rev Esp Anestesiol Reanim*. 2009;56:574–5.
10. Goldman AJ, Rosenblatt WH. Use of the fiberoptic intubating LMA-CTrach in two patients with difficult airways. *Anaesthesia*. 2006;61:601–3.
11. Greenland KB, Cumpston PH, Huang J. Magnetic resonance scanning of the upper airway following difficult intubation reveals an unexpected lingual tonsil. *Anaesth Intensive Care*. 2009;37:301–4.
12. Sánchez Morillo J, Solaz Roldán C, Mompó Romero L, Soliveres Ripoll J. Utilización de la laringoscopia indirecta con laringoscopia rígido en la preanestesia de 2 pacientes con Mallampati 4 para estudiar la vía aérea y decidir la técnica de intubación. *Rev Esp Anestesiol Reanim*. 2009;56:126–7.
13. Sánchez Morillo J, Solaz Roldán C, Richard Aznar M, Mompó Romero L, Barber Ballester G, Santamaría Vázquez J. Utilización del laringoscopia rígido y el nasofibroscopio flexible en la valoración de la vía aérea difícil: descripción de 3 casos. *Rev Esp Anestesiol Reanim*. 2010;57:91–4.
14. Remacle M, Lawson G, Giovanni A. Exploration du larynx. In: Choppin D, editor. *Encycl Méd Chir. Oto-rhino-laryngologie*. Paris: Elsevier Masson SAS; 2005. p. 20-635-A.
15. Hsiung MW, Pai L, Kang BH, Wang BL, Wong CS, Wang HW. Clinical predictors of difficult laryngeal exposure. *Laryngoscope*. 2004;114:358–63.
16. Peral Sánchez D, Higuera J, Sánchez A, Barberá M. Amígdala lingual hipertrófica en relación con un caso de intubación difícil. *Rev Esp Anestesiol Reanim*. 2006;53:134.

17. Biro P, Shahinian H. Management of difficult intubation caused by lingual tonsillar hyperplasia. *Anesth Analg*. 1994; 79:389.
18. Rosenblatt W, Ianus AI, Sukhupragarn W, Fickenscher A, Sasaki C. Preoperative endoscopic airway examination (PEAE) provides superior airway information and may reduce the use of unnecessary awake intubation. *Anesth Analg*. 2011;112: 602–7.
19. May JG, Shah P, Lemonnier L, Bhatti G, Kosica J, Coticchia JM. Systematic review of endoscopic airway findings in children with gastroesophageal reflux disease [abstract]. *Ann Otol Rhinol Laryngol*. 2011;120:116–22.
20. Arné J, Descoins P, Fusciardi J, Ingrand P, Ferrier B, Boudigues D, et al. Preoperative assessment for difficult intubation in general and ENT surgery: Predictive value of a clinical multivariate risk index. *Br J Anaesth*. 1998;80:140–6.