

CASE REPORT

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A complication of double-lumen endotracheal tubes resulting in delayed laryngeal injury and dyspnea: a case report and literature analysis

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Abstract

Background Double-lumen endotracheal tubes (DLTs) is often used in lung surgery and is more likely to cause throat injury than single-lumen endotracheal tubes. However, it is rare to have an occult giant laryngeal cyst and upper airway obstruction after DLTs, causing severe complications such as dyspnea. This serious complication endangers the patient's life and safety.

Case presentation A 55-year-old woman underwent surgical resection of a lung tumor under DLTs. Approximately 3 months after surgery, she went to the hospital for treatment due to hoarseness and dyspnea after a change in body position. Laryngoscopy revealed that the upper airway was obstructed due to a large cyst in the throat, which required surgical resection. Although the crisis was resolved by surgical resection, this serious complication of endotracheal intubation, which could have endangered the patient's life, was indeed worrisome.

Conclusions The DLTs is thick, and the positioning of the intubation technology is high, which increases the likelihood of a throat injury. Thus, it is necessary to actively prevent its occurrence during operation. Hoarseness after operation needs early examination to detect and treat the injury early and avoid such serious complications.

Keywords Double-lumen endotracheal tubes, Delayed laryngeal injury, Dyspnea, Case report

Introduction

Double-lumen endotracheal tubes (DLTs) is a commonly used procedure in lung surgery; however, the thicker DLTs makes intubation more difficult, resulting in a greater probability of laryngeal injury in patients [1]. Posttracheal intubation vocal cord cysts are rare complications of laryngeal injury caused by tracheal intubation

[2]; these lesions are often detected within a short period after the operation and can be improved by medication [3].

In July 2023, the radical resection of lung tumor was completed in our hospital under DLTs. Approximately 3 months after the operation, a large cyst of the larynx in a patient who complained of hoarseness was found by laryngoscopy in our hospital. The patient presented with dyspnea due to postural changes. The symptoms of the patient were not significantly improved after 1 week of drug treatment, so surgical resection of the giant laryngeal cyst was selected. Airway obstruction caused by the giant throat cyst after DLTs can endanger the patient's

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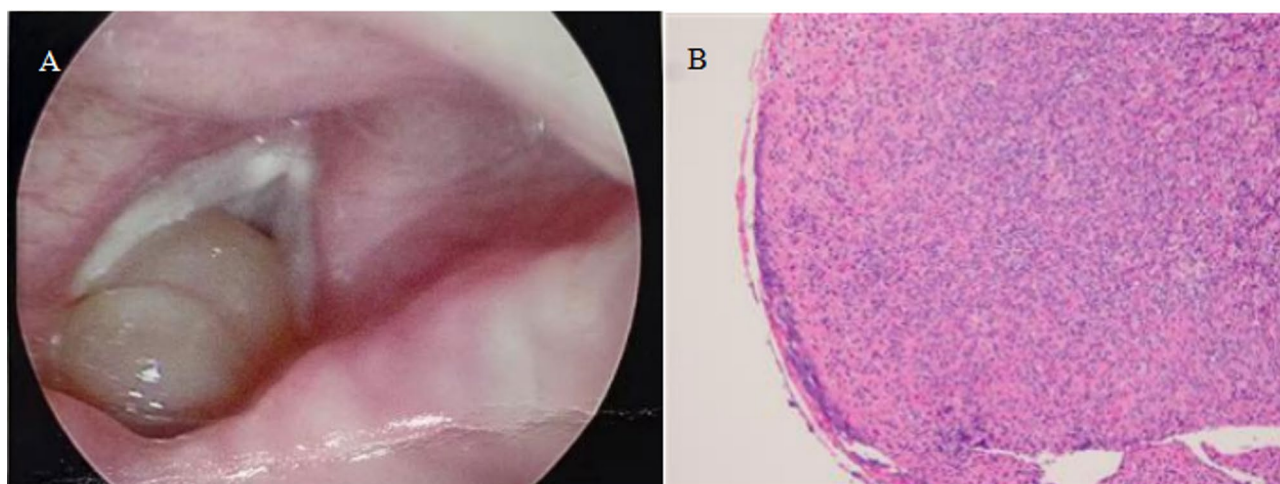


Fig. 1 **A:** Laryngoscopy revealed that the cyst was located in the arytenoid region of the subglottic area and measured approximately 10 mm * 10 mm in size. **B:** Pathology showed that there was no lining epithelium on the surface of the vocal fold mass, and acute and chronic inflammatory cell infiltration, granulation tissue formation, and hemosiderin deposition were observed

life. Therefore, we present a case of this rare complication as a reminder that throat injury caused by DLTs is not always detected immediately after surgery and that it may not be detected until immediately after surgery.

Case report

On July 6, 2023, a 55-year-old female patient needed surgical treatment for lung cancer. During the operation, a 35-size DLTs (Covidien Shiley Endobronchial Tube) was selected for one-lung ventilation. The anesthesia record of the patient was consulted, and a resident with 3 years of work experience was guided by a senior physician. After anesthesia induction, the operator used the video laryngoscope in his left hand to expose the glottis. After the glottis was fully exposed, the operator held the DLTs in his right hand and guided its front end into the glottis. The stylet was removed when the end of the DLTs entered the glottis. The DLTs was rotated approximately 90° into the trachea lumen until slight resistance was encountered. After the completion of the DLTs, fiberoptic positioning showed that the position of the DLTs was accurate and that the position of the DLTs was not adjusted repeatedly. The DLTs was successfully inserted only once. Unfortunately, we did not measure the cuff pressure after the procedure was completed. During the operation, the right lateral position was selected, and the total duration of DLTs was 172 min. According to the follow-up records of the anesthesiologists, the patient's throat pain score was 0 within 24 h after surgery, and there was no obvious hoarseness. A review of the doctor's ward rounds and nursing records indicated that the results were the same as those of the anesthesiologist's follow-up. The patient was discharged three days after surgery.

However, on October 9, 2023, he went to the hospital due to hoarseness, where a laryngoscopy revealed a large cyst in his throat (Fig 1A). After further investigation of the medical history, the patient complained of dyspnea in the left lateral position, which needed to be relieved by changing the position. At the same time, the patient had not undergone other general anesthesia surgery or throat surgery during this period. Antacid therapy was given; however, the patient's hoarseness was not significantly relieved, so surgical removal of the cyst was chosen. During the operation, a cystic mass of about 10 mm*10 mm was found on the right vocal cord. Pathology showed that there was no lining epithelium on the surface of the vocal fold mass, and acute and chronic inflammatory cell infiltration, granulation tissue formation, and hemosiderin deposition were observed (Fig 1B).

Discussion

We describe a case of hoarseness that did not appear immediately after surgery but did appear 3 months later and a severe complication of a large laryngopharyngeal cyst that resulted in airway obstruction after laryngoscopy.

Laryngeal damage is a common complication of tracheal intubation, but among such injuries, vocal cord cysts are rare [2]. The occurrence of laryngeal injury is associated with a variety of factors, including the intubation conditions [4], thickness [5–7] and material of the tracheal tube [8], duration of indwelling of the tracheal tube [9, 10], sex [10], and history of gastroesophageal reflux disease [11]. The dual-lumen tracheal tube is specialized for performing one-lung ventilation during perioperative thoracic surgeries, and its distinct structure (thicker outer diameter, long and curved) and high degree of technical difficulty in completing DLTs lead to

a higher incidence of pharyngeal ventilation than that with single-lumen tracheal tubes [10, 12, 13]. This patient is female and represents a high-risk population [10]. A DLTs with a thick outer diameter was inserted [5–7]. The indwelling endotracheal tube time was 172 min, and a time of more than 120 min further increased the incidence of glottic cyst [2].

Studies have found that heating the DLTs can also reduce the throat pain caused by the DLTs and even improve the throat complications of endotracheal intubation in patients with a high risk of smoking and COVID-19 [14–16].

Sequelae of laryngeal injury caused by tracheal intubation, such as sore throat and hoarseness, have the highest incidence on the first postoperative day [17], and therefore, most current scholars have studied the outcome of postoperative hoarseness within 1 week. According to the English literature retrieved thus far, Friedrich and other scholars have studied voice changes over a relatively long postoperative follow-up period of 4–9 days [18]. Yamanaka et al. reported longer follow-up periods, with the greatest duration being 21 days [17]. However, both studies included patients who developed hoarseness on the first postoperative day and continued to be followed. The reported duration of follow-up for pharyngeal complications after DLTs is relatively short (approximately 1–3 days) [14–16]; in contrast, the hoarseness that appeared in our case at approximately 3 months after the operation was not a case in which the hoarseness appeared on the first day of the postoperative period and persisted, and no similar reports or studies have been published.

Vocal cysts are secondary pharyngeal injuries caused by tracheal intubation [2], and such damage usually resolves within 1 week postoperatively [3] and, in some cases, up to 2–3 months later [19]. In new postoperative cases that do not improve by 48 h after surgery, Martin B and other scholars recommend laryngoscopy, which allows early treatment to avoid serious complications [2], and head and neck surgery experience in the United States similarly suggests that new voice changes occurring between 2 weeks and 2 months after surgery should be examined via laryngoscopy as soon as possible, regardless of the duration of the surgery [20]. In the case reported in this article, the patient did not complain of significant sore throat or hoarseness within 24 h after surgery but developed hoarseness approximately 3 months after surgery, which exceeded the time of occurrence in the American Head and Neck Surgery expert consensus.

In this case, the patient had dyspnea with upper airway obstruction due to obstruction of the vocal ostium by a large vocal cord cyst, resulting in airflow obstruction and presenting as dyspnea on inspiration. Particularly in the left lateral position, the cyst sagged to the right under

gravity, which aggravated the vocal fold obstruction and led to worsened dyspnea. In right lateral recumbency, the cyst prolapsed under gravity toward the left side, reducing the vocal fold obstruction and dyspnea. Therefore, the patient's dyspnea was more pronounced in the left lateral position and was relieved when the patient turned to the right lateral position. Such a large vocal cyst can cause dyspnea in the obstructive inspiratory phase of a patient, which may endanger the patient's life at any time and is a delayed but serious complication.

Conclusion

In this case, we discuss a laryngeal cyst that was identified approximately 3 months after DLTs and resulted in a complication that made the patient's dyspnea more severe after upper airway obstruction. The DLTs is thick, and the positioning of the intubation technology is high, which easily leads to throat injury. It is necessary to actively prevent its occurrence during operation. Hoarseness after operation needs early examination to detect and treat it early and avoid serious complications.

Abbreviations

DLTs	Double-lumen endotracheal tubes
COVID-19	Corona virus disease 2019

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Not applicable.

Author contributions

Yunxia Fang collected the data of the patient. Qinye Shi contributed to writing the manuscript. Jianhong Xu contributed to performing of anesthesia and revising the manuscript.

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Data availability

All data related to this case report are contained within the manuscript.

Declarations

Ethics approval and consent to participate

The study has been approved by the Ethics Committee of the Fourth Affiliated Hospital Zhejiang University School of Medicine (approval number: K2024169).

Consent for publication

Written informed consent for publication of the clinical details and clinical images was obtained from the patient.

Competing interests

The authors declare no competing interests.

Clinical trial number

Not applicable.

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References

1. Knoll H, Ziegeler S, Schreiber JU, Buchinger H, Bialas P, Semyonov K, Graeter T, Mencke T. Airway injuries after one-lung ventilation: a comparison between

- double-lumen tube and endobronchial blocker: a randomized, prospective, controlled trial. *Anesthesiology*. 2006;105:471–7.
2. Brodsky MB, Akst LM, Jedlanek E, Pandian V, Blackford B, Price C, Cole G, Mendez-Tellez PA, Hillel AT, Best SR, Levy MJ. Laryngeal injury and upper airway symptoms after endotracheal intubation during surgery: A systematic review and Meta-analysis. *Anesth Analg*. 2021;132:1023–32.
 3. Geraci G, Cupido F, Lo Nigro C, Sciuto A, Sciumè C, Modica G. Postoperative laryngeal symptoms in a general surgery setting. Clinical study. *Ann Ital Chir*. 2013;84:377–83.
 4. Mencke T, Echternach M, Kleinschmidt S, Lux P, Barth V, Plinkert PK, Fuchs-Buder T. Laryngeal morbidity and quality of tracheal intubation: a randomized controlled trial. *Anesthesiology*. 2003;98:1049–56.
 5. Jaensson M, Olowsson LL, Nilsson U. Endotracheal tube size and sore throat following surgery: a randomized-controlled study. *Acta Anaesthesiol Scand*. 2010;54:147–53.
 6. Hu B, Bao R, Wang X, Liu S, Tao T, Xie Q, Yu X, Li J, Bo L, Deng X. The size of endotracheal tube and sore throat after surgery: a systematic review and meta-analysis. *PLoS ONE*. 2013;8:e74467.
 7. Xu YJ, Wang SL, Ren Y, Zhu Y, Tan ZM. A smaller endotracheal tube combined with intravenous Lidocaine decreases post-operative sore throat - a randomized controlled trial. *Acta Anaesthesiol Scand*. 2012;56:1314–20.
 8. Jeon J, Lee K, Ahn G, Lee J, Hwang W. Comparison of postoperative sore throat and hoarseness between two types of double-lumen endobronchial tubes: a randomized controlled trial. *J Cardiothorac Vasc Anesth*. 2015;29:121–5.
 9. Dunham CM, LaMonica C. Prolonged tracheal intubation in the trauma patient. *J Trauma*. 1984;24:120–4.
 10. El-Boghdady K, Bailey CR, Wiles MD. Postoperative sore throat: a systematic review. *Anaesthesia*. 2016;71:706–17.
 11. Smit CF, Mathus-Vliegen LM, Devriese PP, Schouwenburg PF, Kupperman D. Diagnosis and consequences of gastropharyngeal reflux. *Clin Otolaryngol Allied Sci*. 2000;25:440–55.
 12. Clayton-Smith A, Bennett K, Alston RP, Adams G, Brown G, Hawthorne T, Hu M, Sinclair A, Tan J. A comparison of the efficacy and adverse effects of Double-Lumen endobronchial tubes and bronchial blockers in thoracic surgery: A systematic review and Meta-analysis of randomized controlled trials. *J Cardiothorac Vasc Anesth*. 2015;29:955–66.
 13. Park JW, Jo JH, Park JH, Bae YK, Park SJ, Cho SW, Han SH, Kim JH. Comparison of conventional and fiberoptic-guided advance of left-sided double-lumen tube during endobronchial intubation: A randomised controlled trial. *Eur J Anaesthesiol*. 2020;37:466–73.
 14. Seo JH, Cho CW, Hong DM, Jeon Y, Bahk JH. The effects of thermal softening of double-lumen endobronchial tubes on postoperative sore throat, hoarseness and vocal cord injuries: a prospective double-blind randomized trial. *Br J Anaesth*. 2016;116:282–8.
 15. Bi X, Wen J, Chen Q, Zhang X. Effects of thermal softening of Double-Lumen endobronchial tubes on the prevention of postoperative sore throat in smokers: A randomized controlled trial. *J Cardiothorac Vasc Anesth*. 2022;36:3109–13.
 16. Yan W, Cai J, Zhu C, Chen Y, Fang J, Xu H, Zheng X, Zhou Y, Xie Y, Zhang M, Shu S. Effect of thermal softening of double-lumen endobronchial tubes on postoperative sore throat in patients with prior SARS-CoV-2 infection: a randomized controlled trial. *BMC Anesthesiol*. 2023;23:403.
 17. Yamanaka H, Hayashi Y, Watanabe Y, Uematu H, Mashimo T. Prolonged hoarseness and arytenoid cartilage dislocation after tracheal intubation. *Br J Anaesth*. 2009;103:452–5.
 18. Friedrich T. [Recurrent laryngeal nerve paralysis as an intubation injury?]. *Chirurg*. 2002;73:740–1.
 19. Sadoughi B, Fried MP, Sulica L, Blitzler A. Hoarseness evaluation: a transatlantic survey of laryngeal experts. *Laryngoscope*. 2014;124:221–6.
 20. Stachler RJ, Francis DO, Schwartz SR, Damask CC, Digoy GP, Krouse HJ, McCoy SJ, Ouellette DR, Patel RR, Reavis C, Smith LJ, Smith M, Strode SW, Woo P, Nnacheta LC. Clinical practice guideline: hoarseness (Dysphonia) (Update). *Otolaryngol Head Neck Surg*. 2018;158:S1–42.

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