

# Third branchial cleft cyst as a cause of hoarseness: a case report

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## Abstract

Third branchial cleft cyst is a rare congenital disease of the neck. It presents as a painless mass that develops rapidly in the neck following an infection. This is the first case report of recurrent laryngeal nerve palsy caused by a third branchial cleft cyst. A 30-year-old woman presented with a 3-month history of hoarseness as her only symptom; she had no pain, fever, dysphagia, dyspnoea, or palpable neck mass. Laryngoscopy revealed that her right vocal cord was paralyzed. Computed tomography and magnetic resonance imaging revealed a cystic mass in the right tracheoesophageal groove that was closely associated with the trachea. Intraoperatively, the cyst was found not to originate from the thyroid or trachea, but it was compressing the right recurrent laryngeal nerve. The hoarseness resolved the day after the cyst was removed.

## Keywords

Third branchial cleft cyst, hoarseness, recurrent laryngeal nerve, palsy, cystic mass, laryngoscopy

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## Introduction

Branchial cleft cysts originate from branchial fissures and can be categorised into four types according to the origin of the branchial fissure.<sup>1</sup> Third branchial cleft cyst is a rare congenital disease of the neck that presents as a painless mass that develops rapidly in the neck following an infection.<sup>2</sup> It is located deep to the thyroid gland, extends along the carotid sheath, and opens through a fistula into the piriform fossa.<sup>3</sup> It usually develops in children and young adults and the optimal

method of treatment is surgical removal.<sup>2</sup> The recurrent laryngeal nerve is located in the narrow space of the tracheoesophageal groove and its compression causes palsy.

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Recurrent laryngeal nerve palsy is usually caused by trauma, infection, or compression by a solid mass. In contrast, compression by a cystic mass is a rare cause of palsy.<sup>4-6</sup> Here, we describe a patient with a cyst that was located in the right tracheoesophageal groove and compressed the recurrent laryngeal nerve, causing hoarseness, which quickly resolved after the removal of the cyst. We also traced the origin of the cyst during surgery.

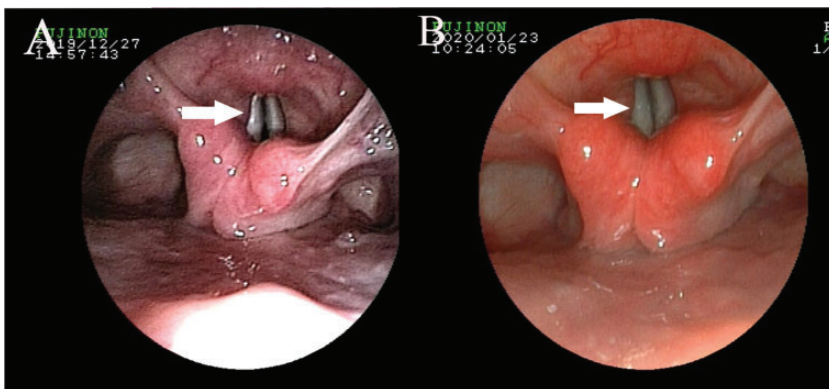
## Case report

A 30-year-old woman presented to the Ear, Nose, and Throat department of our hospital with a 3-month history of hoarseness, but no palpable neck mass, pain, dysphagia, or dyspnoea. She did not report any recent infections, neck trauma, or surgery. Laryngoscopy revealed right vocal cord paralysis (Figure 1). She was admitted to the hospital for further investigation of the hoarseness. An ultrasonographic examination failed to identify a cyst, but computed tomography (CT) and magnetic resonance imaging (MRI) imaging revealed a 1.3-cm cystic mass deep to the thyroid, in the right tracheoesophageal groove, which was closely associated with the trachea (Figure 2). The

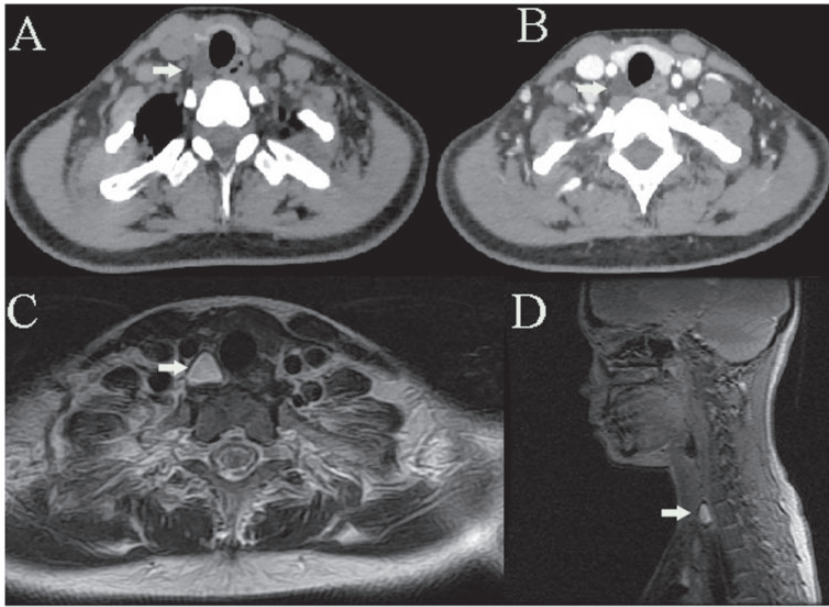
patient's thyroid and parathyroid function were normal. The patient initially refused surgery, but agreed to undergo surgery after 5 days of treatment with dexamethasone (40 mg once daily) and mecobalamin (0.5 mg three times daily) failed to improve her hoarseness. Intraoperatively, we found that her right recurrent laryngeal nerve was tightly adherent to the surface of the cyst, that the cyst did not originate from the thyroid or trachea, and that it was compressing the right recurrent laryngeal nerve (Figure 3). Furthermore, the cyst connected to the piriformis through a fistula. The right recurrent laryngeal nerve was carefully separated from the cyst and the cyst was removed, after which the patient's hoarseness rapidly resolved. Two days after the surgery we performed laryngoscopy and found that the activity of the right vocal cord was normal (Figure 1). Postoperative pathological examination revealed a cystic lesion. The patient has been followed up for a further 3 months and has shown no evidence of recurrence.

## Discussion

Third branchial cleft cyst is a very rare congenital condition. Third and fourth branchial



**Figure 1.** Endoscopic view of the patient's vocal cords before and after surgery. a: Before surgery, the right vocal cord (arrow) is fixed in a lateral central position and the glottis cannot be completely closed when vocalising. b: After surgery, the activity of right vocal cord (arrow) is normal and the glottis can be completely closed when vocalising.



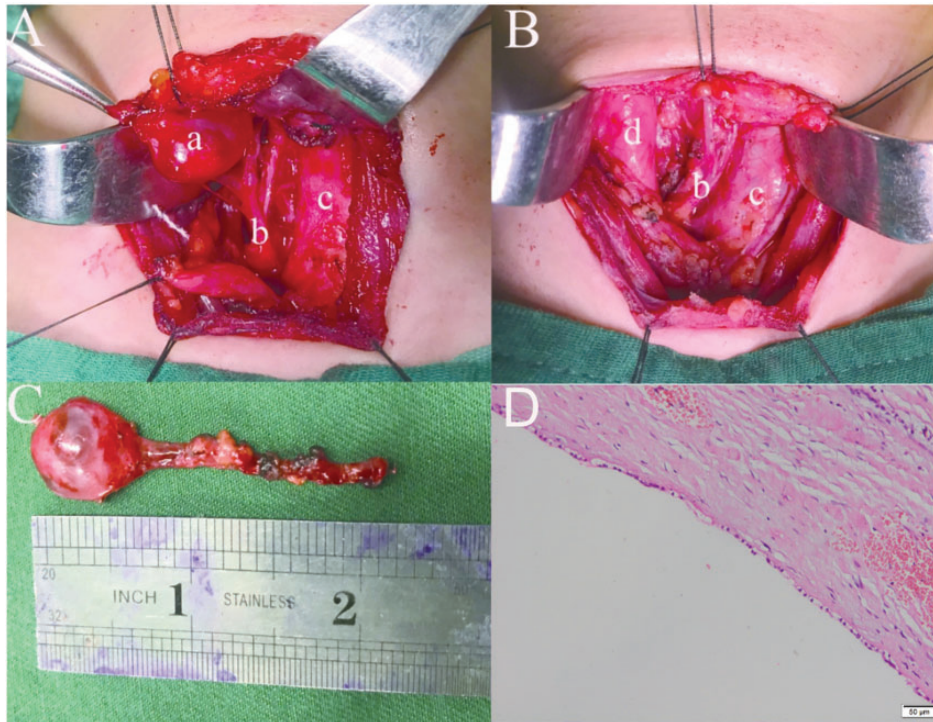
**Figure 2.** Cyst identified in the right tracheoesophageal groove of the patient, using plain and contrast-enhanced computed tomography (CT) and magnetic resonance imaging (MRI). a. A triangle-shaped cyst was identified in the right tracheoesophageal groove of the patient, deep to the right thyroid on plain CT. b. Contrast-enhanced CT showed no enhancement of the cyst. c and d. Transverse and sagittal MRI showed that the cyst was located anterior to the vertebral column.

cleft cysts are rare, accounting for only 3% to 10% of all branchial anomalies, and 89% of the third branchial cleft cysts develop on the left side of the neck.<sup>1</sup> They often present as quickly growing fluctuant masses that develop in the neck after infection. However, in the present patient the cyst developed on the right side of the neck. The diameter of the cyst was only 1.3 cm and it was deep to the thyroid gland, which rendered it impalpable and undetectable using ultrasonography. This cyst, which was unusually located, in the tracheoesophageal groove, was compressing the recurrent laryngeal nerve, causing the only symptom of hoarseness.

There are three types of peripheral nerve injury: nerve apraxia, axon rupture, and nerve rupture. At least 6 weeks are required for the restoration of nerve function after the targeted treatment of peripheral nerve injury, even if this is of the least severe type

(nerve apraxia). In the present case, the patient's right recurrent laryngeal nerve had been compressed by the third cleft cyst for 3 months, but her hoarseness recovered the same day the cyst was surgically resected. This shows that for some long-term peripheral nerve compression injuries, nerve injuries can recover quickly after surgical resection of the impinging mass.<sup>7,8</sup>

To our knowledge, this is the first reported case of hoarseness caused by a third branchial cleft cyst. A review of the literature revealed few cases of third branchial cleft cyst, all of which presented with an obvious mass. The present patient presented with an atypical symptom and her hoarseness quickly resolved after the cyst was removed. Therefore, although this is a rare condition, if third branchial cleft cyst is present, we should consider hoarseness as a possible sequela. The reported case also



**Figure 3.** Intraoperative visualisation and histology of the third branchial cleft cyst. a: The cyst was compressing the right recurrent laryngeal nerve. It did not originate from the trachea. b: Intraoperative view after the removal of the cyst: a, third branchial fissure cyst; b, right recurrent laryngeal nerve; c, trachea, d, right common carotid artery. c: Third branchial fissure cyst, which communicated with the right piriform fossa through a fistula. d: Histopathological examination revealed a cystic lesion. The cyst wall is lined by a monolayer of columnar epithelium.

provides a reference for clinicians treating patients with nerve injuries caused by long-term compression to assist with decision-making regarding the indication for surgery.

In conclusion, hoarseness is usually caused by neck trauma or compression of the recurrent laryngeal nerve by a solid mass; a third branchial cleft cyst aetiology is extremely rare. Third branchial cleft cyst is a rare congenital condition that is typically recognised as a painless mass in the neck, but when the cyst is small or deep it cannot be palpated or identified ultrasonographically, meaning that CT and MRI are required for diagnosis. Prolonged nerve compression does not necessarily cause a complete loss of nerve function.

However, if a tumour is compressing the nerve and causing dysfunction, it should be removed as soon as possible to permit the restoration of nerve function.

#### **Ethics statement**

This study was approved by the Ethics Committee of Chengdu Third People's Hospital, China (number [2021] S-69). The patient provided her written informed consent for the publication of this report.


#### **Declaration of conflicting interest**

The authors declare that there is no conflict of interest.

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