Tracheal Diverticulum

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Summary: **Tracheal diverticulum is a rarely encountered entity, usually discovered incidentally as an outpouching at the right side on radiography or computed tomography (CT). We present the case of a male patient with a tracheal diverticulum detected during a work-up for hemoptysis. His thoracic CT scan showed a sac formation on the right dorsolateral wall of the trachea. Flexible bronchoscopy showed a collapsed entrance to the diverticulum, which could be opened by flexible forceps. The mucosal lining of the diverticulum seemed normal, without retained secretions or blood. Although with limited clinical consequences, tracheal diverticulum must be kept in mind as a reservoir for secretions that may cause infection, and also hemoptysis if infected.**

Key Words: bronchoscopy, tracheal diverticulum, hemoptysis

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CASE REPORT

A 74-year-old, life-long nonsmoker, male presented with hemoptysis. He had an earlier history of diabetes, hypertension, and coronary heart disease. He had undergone coronary bypass surgery 20 years earlier and had percutaneous coronary angioplasty with stent implantation 4 years ago. Shortly after warfarin was started 9 months before, because of unstable angina, he complained of episodic hemoptysis, without weight loss, fever, dyspnea, or dysphagia. The only pathologic finding on his physical examination was arrhythmia. The investigations, including renal function, liver function tests, full blood count, erythrocyte sedimentation rate, and arterial blood gases were all within normal limits. International normalized ratio was 1.37. Auricular fibrillation, right bundle branch, and left anterior hemi-block were detected on the electrocardiogram. A thoracic CT scan showed discrete fibrotic and ground glass opacities in lingula and segment 8 on the left, and a saccular formation on the right dorsolateral wall of the trachea, at the level of the first thoracic vertebra, measuring 15×11 mm, which communicated with the trachea through a 6-mm wide opening (Fig. 1A).

Flexible bronchoscopy, performed for hemoptysis showed a small collapsed orifice on the proximal right dorsolateral trachea, which could be opened by separating the folds with the flexible forceps (Fig. 1B). Within the diverticulum, the mucosa seemed normal without retained secretion or blood. The rest of the tracheobronchial mucosa showed a pattern of chronic bronchitis and blood vessel congestion from known heart failure, and no active bleeding. Bronchial washings were negative for pathologic bacteria and malignant cells.

Gastroesophagoscopy was performed in the same session and a nonobstructive esophageal tumor at 30 cm from the teeth was detected. Examination of the frozen section showed a squamous carcinoma. The patient was then referred to the oncology department for further investigation. Anticoagulation withdrawal was recommended.

DISCUSSION

Tracheal diverticulum is a relatively rare entity, usually an incidental finding, characterized by single or multiple evaginations of the tracheal wall.[1] By a strict definition, a diverticulum would have a communication with the airways, which can be sometimes very small.[2] It is classified as congenital from incomplete supernumerary branches during development and thus showing all the layers of the tracheal wall, or more commonly as acquired, thought to be caused by mucosal herniation through a weakened point of the wall from increased intraluminal pressure. It has also been proposed that acquired diverticulum could be caused by cystic distention and enlarging of mucous gland ducts.[3] A fourth possible explanation is related to remnants of the connection between the esophagus and the trachea during embryogenesis.

Although usually asymptomatic, occasionally patients develop airway compression symptoms, recurrent infections, or chronic cough,[2] and it is difficult to ascertain whether the latter is a cause or an effect. During exploration, we did not find any sign that the diverticulum was the

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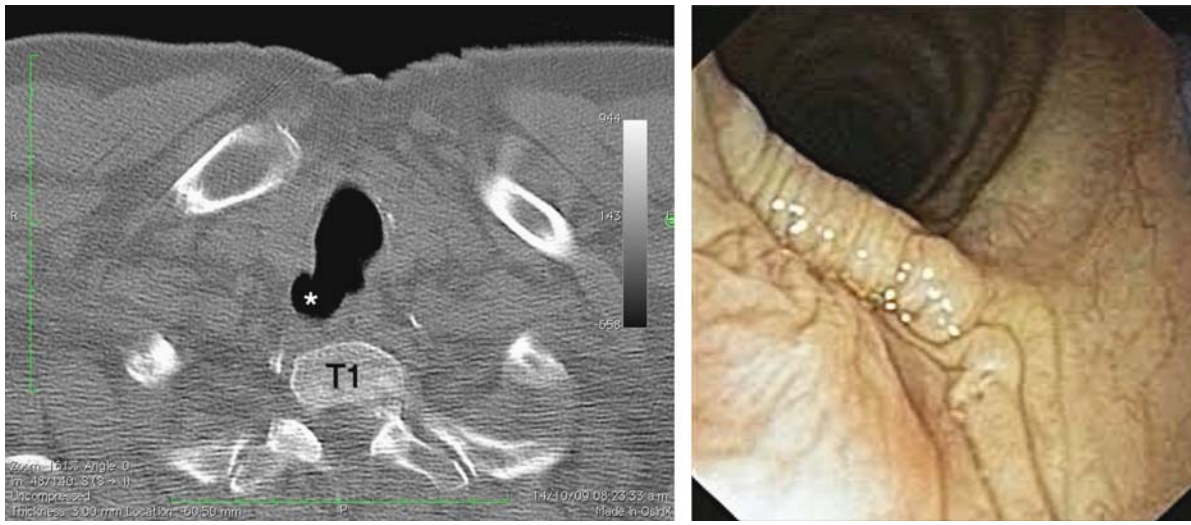

FIGURE 1. Left: Computed tomography scan at first thoracic vertebra level (T1) showing the tracheal diverticulum (*) as a pouch at the right posterolateral wall. Right: Broncoscopy image showing the collapsed diverticulum's openning.

source of hemoptysis in our patient; instead, the findings suggested chronic bronchitis and associated anticoagulant therapy as the cause.

In the available series, tracheal diverticula tend to have an ovoid pedunculated shape with a vertical long axis, and most communications are small enough to be undetected even during bronchoscopy.[1,3] It seems that the best modality for diagnosis is a thin-slice CT of the trachea and a 3-dimensional reconstruction showing the communication between the cyst and the airways.[2] The low yield of this finding reported in the series by Goo et al[1] was explained because most of the images were obtained by thick-section CT and 3-dimensional reconstruction was done only in a few cases. In 98% of the patients, diverticula are found in the right posterolateral aspect of the trachea, at a level between T1 and T3 vertebra,[1] which is probably the point of least resistance at the limit of the intrathoracic and extrathoracic trachea.

It has been reported that tracheal diverticula shrank during inspiration and expanded during expiration;[1] this, however, was not our finding. As in the case reported by Saito et al,[4] our patient's diverticulum expanded during inspiration

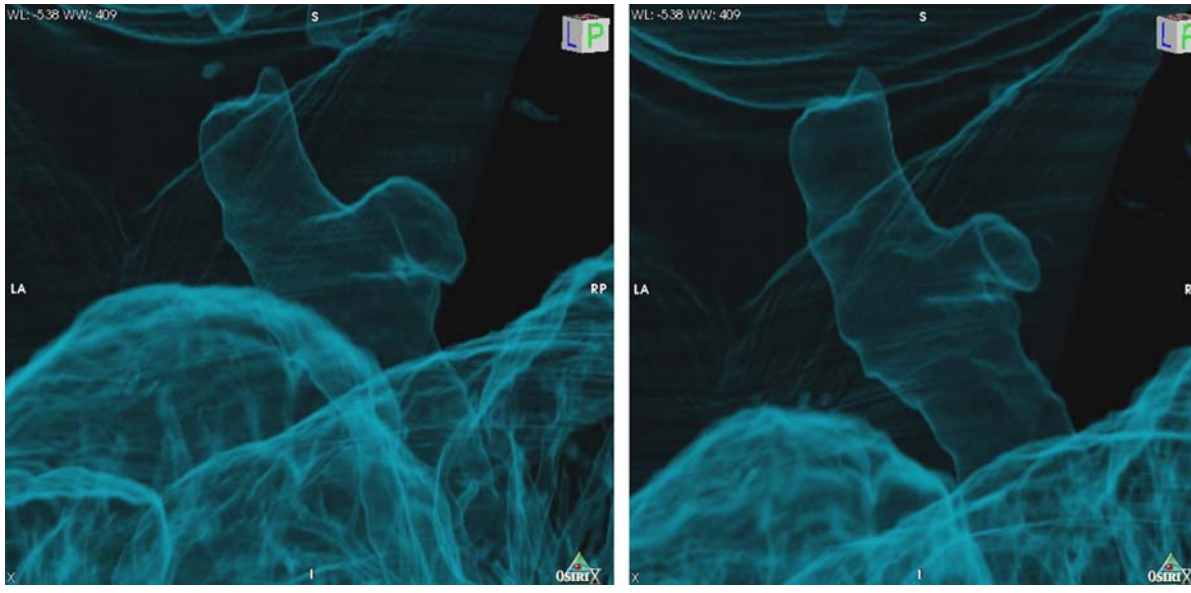

FIGURE 2. Three-dimensional reconstructions of tracheal diverticulum from left posterolateral view at inspiration (*left*) and expiration (*right*). Processed with Osirix v. 3.6.1.

and shrank at expiration (Fig. 2). Probably because of a predominantly intrathoracic localization, the negative intrapulmonary pressure during inspiration is transmitted to the walls of the diverticulum and enlarges its size. It is possible that this behavior also depends on the diameter and the shape of its opening to the airway.

Earlier reports suggest that tracheal diverticula could be a sign of chronic obstructive pulmonary disease (COPD).[3] Accordingly, Goo et al[1] found that radiologic signs of emphysema on a CT scan were significantly more prevalent in this group. However, Mineshita et al[5] did not find any clinical or radiologic finding suggesting COPD in their cases incidentally found in healthy Japanese men. By agreeing with both investigators, it is reasonable to propose that COPD in patients with tracheal diverticula could be not necessarily be the cause, but these could become larger and symptomatic with time because of increased intraluminal pressure from chronic cough. Despite the fact that the patient was diagnosed to have esophageal cancer, we cannot define a direct relationship between the both entities.

Differential diagnosis includes laryngocele, pharyngocele, Zenker's diverticulum, apical hernia of the lung, and apical bullae and pneumomediastinum.[1,5] Features on CT scan, barium radiographs, and endoscopy can help distinguish between these.

Treatment is usually not necessary for tracheal diverticulum, but selected symptomatic cases could require surgery.

In conclusion, although it is asymptomatic in most of the cases, tracheal diverticulum must be kept in mind as a reservoir for secretions that may cause infection, and also hemoptysis in infected cases.

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