A right paratracheal air cyst in the thoracic inlet is a rare lesion. It generally originates from respiratory or gastrointestinal system disorders such as laryngocele, pharyngocele, Zenker’s diverticule, tracheal diverticulum, apical hernia, lymphoepithelial cyst, or bronchogenic cyst. We present three cases of right paratracheal air cysts related to the trachea which were confirmed as tracheal diverticulum via three-dimensional reconstruction computed tomography and virtual bronchoscopic evaluation. These methods provide better demonstration of the lesions. These lesions may be congenital or acquired. Acquired form is more common. Tracheal diverticulum is generally overlooked, neither reported on chest computed tomography nor recognized unless it is complicated. We, therefore, aim to draw attention to this entity. In additional, a discussion of the evolution, importance, and complications of, as well as treatments for tracheal diverticulum is made in light of the currently available literature.

**Key Words:** Trachea; diverticulum; congenital; imaging, three-dimensional
finding accompanied by radiological reconstruction images and virtual bronchoscopic evaluation, and to review the literature on tracheal diverticulum.

**CASE REPORTS**

**CASE 1**
A 77-year-old woman presented with dyspnea and cough for one year. She was non-smoker and had been treated for lung tuberculosis 50 years previously. Clinical respiratory examination revealed inspiratory crackles at the lower of the left lung and upper of the right lung fields. Oxygen saturation was 75% without oxygen therapy. The chest CT showed two thin-walled air cysts in the right posterolateral and near side of the trachea and diffuse bronchiectasis. Fiberoptic bronchoscopy (FOB) was not applied due to respiratory failure. A three-dimensional reconstruction CT showed very small direct connections between the trachea and the paratracheal air cysts (Figures 1, 2). Also, virtual bronchoscopy demonstrated the mouth of a diverticulum (Figure 3).

**CASE 2**
A 34-year-old woman was referred for dyspnea and cough by the department of Neurology. Her symptoms had persisted for 7 years and had been progressive for a month. She had had hyperthyroidism for 7 years and had been investigated for ocular myasthenia gravis in the Neurology department. She had smoked 10 pack-years of cigarette. Expiration time was prolonged on respiratory examination. Pulmonary function tests revealed a normal pattern. The chest CT showed a thin-walled air cyst in the right posterolateral and near side of the trachea. The patient refused FOB. Three-dimensional reconstruction CT showed a very small direct connection between the trachea and the paratracheal air cyst (Figures 4, 5). Virtual bronchoscopy was
applied; but did not reveal the mouth of the diverticulum possibly due to secretion. An intradiverticular view was obtained via virtual bronchoscopy (Figure 6).

CASE 3

A 54-year old male, ex-smoker, with a history of larynx carcinoma for 7 months consulted our department due to having dyspnea for a week. He had received both chemotherapy and radiotherapy for larynx carcinoma. His chest CT demonstrated air filled lesions originating from the trachea in the right paratracheal region and at the level of the thoracic inlet (Figures 7, 8). A connection with the tracheal lumen was also visible. No wall thickening or calcifications were found. In addition to these findings, multiple mediastinal lymph nodes and bilaterally pulmonary acinar nodules were detected on the CT. FOB could not be implemented due to a laryngeal lesion. Virtual bronchoscopy was applied; but, did not reveal the mouth of the diverticulum possibly due to a membrane. An intradiverticular view was obtained via virtual bronchoscopy (Figure 9).

An informed consent form was obtained from each patient.
DISCUSSION

Paratracheal air filled lesions originate from respiratory or gastrointestinal system disorders such as laryngocele, pharyngocele, Zenker’s diverticule, tracheal diverticulum, apical hernia, lymphoepithelial cyst, or bronchogenic cyst.1-5 Tracheal diverticulum is rarely described at chest CT and its frequency occurs at about 0.75-1%. It can be either congenital or acquired. The majority of these lesions are asymptomatic, being discovered as incidental findings on radiological imaging.1-3,6

The congenital form is smaller, located nearly 4-5 cm below the vocal cords, and is generally multiple. It is a small-mouthed opening of the tracheal mucosa with a predilection for males. The histological structure of this diverticulum resembles that of the trachea. It is hypothesized that it is developed as a result of a defect in endodermal differentiation during development of the tracheal pars membranacea or cartilage during embryonic life and is thought to be a supernumerary branch of the trachea.7 The presence of cartilaginous rings in the wall of the diverticula strongly suggest the congenital form. It is not normally detected in infancy unless it is suggested by recurrent episodes of tracheobronchial infection or in association with other malformations.2 An association between tracheal diverticulum and cystic adenomatoid malformation has been reported as a unique case report.8

The acquired form is sometimes referred to by the term tracheocele. It may arise from increased intraluminal pressure during repeated respiratory infection or chronic cough at any level of the trachea. As a result of this, it emerges at weak areas of the tracheal wall resulting in mucosal herniation. Additionally, esophageal or tracheal surgery, tracheostomy closure and orotracheal intubation are other etiologic factors.1,2,9-13 They usually appear as a wide-mouthed pouch, with 98% of lesions located on the right posterior-lateral side of the trachea and one or more of them having a connection with the trachea. The histological structure of this diverticulum wall consists only of respiratory epithelium.1,2 The esophagus and aortic arch protect the left side of the airway for development of diverticula.1 The connection between the tracheal lumen and diverticulum may be shown by bronchoscopy or chest CT, which exploit thin sections or reconstructed images.1,3,14,15 Furthermore, chest CT evaluates the peri-diverticular tissues, its exact location, size and wall thickness, and determines the nature of the tracheal diverticulum due to the presence of or absence of cartilaginous rings in the diverticulum wall.1,6,16

Most cases are asymptomatic, but when symptoms are present they are usually nonspecific. Dyspnea, stridor, dysphonia, hemoptysis, pneumomediastinum, and chronic chest infections may be
observed probably due to the tracheal diverticulum’s propensity for acting as a reservoir for secretions. In addition, cases may be investigated for dysphagia, cervical swelling, or pharyngeal disorders.  

There is no consensus on the treatment of tracheal diverticulum. In general, conservative measures, such as antibiotics, mucolytic agents, and chest physiotherapy are recommended. When the diseases is symptomatic and medical therapy is insufficient, this disorder must be treated surgically. A variety of surgical methods have been reported, ranging from resection of the lesion via open neck or thoracic surgery to endoscopic repair, such as electrocauterization or application of fibrin glue by means of catheter. Surgery and endoscopic treatment is accepted as safe, less invasive, conservative, and reproducible.

It was thought that our first and third cases had tracheal diverticulum due to chronic lung disorder, and that the second case had tracheal diverticulum due to chronic cough. All our cases of diverticulum were connected to tracheal lumen. However, the presence of connections between the diverticulum and tracheal wall was not pathologically demonstrated in our cases, but rather demonstrated in 3-dimensional reconstruction chest CT, and in the case of the first case patient, the mouth of the diverticulum was revealed by virtual bronchoscopy. No symptoms were established related to the tracheal diverticula’s and no treatment was administered by us to any of the patients. Resection of these tracheal diverticula was also not considered as a treatment option for the patients.

In conclusion, acquired tracheal diverticulum is rare entity which may be confused with several lesions. It is generally overlooked, not reported on chest CT, nor recognized unless it is complicated. Therefore, it should be kept in mind as a possible etiology for chronic cough, recurrent lung infection, hemoptysis, dysphagia and pneumomediastinum. In this article, the evolution, importance, complications and treatments of tracheal diverticulum were discussed in light of the current literature.

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REFERENCES


