

Tracheobronchopathia osteochondroplastica

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Abstract

Tracheobronchopathia osteochondroplastica (TO) is a rare disorder of unknown cause affecting the large airways. It usually manifests in adults, and equally affects both genders. The disease is characterized by the development of multiple osseous and cartilaginous nodules in the submucosa of the trachea and main bronchi. Nodules expansion alters normal airway anatomy, impairs clearance of bronchial secretions and can cause significant obstruction. Patients usually present with cough, hemoptysis, and recurrent respiratory infections. TO is usually not suspected until fiberoptic bronchoscopy is performed; this procedure enables the diagnosis in most cases, since the tracheobronchial tree has a characteristic appearance. Bronchial biopsies disclose the abnormal presence of cartilage and bone tissue in the bronchial submucosa. The disease usually remains stable for years, or progresses very slowly. Only a minority of cases develop significant upper airway obstruction and require invasive procedures to remove or bypass the obstacle on affected airways. To date, there is no specific treatment for the disease. Both the incidence and prevalence of the disorder in the general population are unknown. The incidence of TO in a large series of 16 888 bronchoscopies was 1:1299 bronchoscopies.

Keywords

nodules in the trachea and bronchi, hemoptysis, cough, respiratory infections, cartilage and bone in bronchial submucosa

Disease name and synonyms

- Tracheobronchopathia osteochondroplastica
- Tracheopathia chondroosteoplastica
- Tracheopathia osteoplastica

bronchoscopy and/or chest computed tomography (CT), which are usually performed for other reasons.

Historical overview

First described in the middle of the nineteenth century as "ossific deposits on the larynx, trachea and bronchi", the entity was later named "tracheopathia osteoplastica". Formerly an incidental autopsy finding, the disorder is now discovered more frequently at fiberoptic

Definition

Tracheobronchopathia osteochondroplastica (TO) is a rare disorder of the large airways. It is characterized by the presence of multiple dense osseous and cartilaginous nodules localised in the submucosa of the tracheobronchial wall [1-3]. These nodules protrude into the lumen of the trachea and large bronchi, occasionally leading

to significant airway obstruction [4]. Changes at the mucosal surface and altered clearance of secretions result in recurrent inflammation and infection. The disease is limited to the large airways and does not involve the lung or other organs.

Diagnostic criteria

Fiberoptic bronchoscopy

Fiberoptic bronchoscopy is the best diagnostic procedure to identify TO, since visual appearance of the lesions is usually highly characteristic (see below). Bronchoscopy also allows tissue sampling for histological diagnosis [2].

Histological diagnosis

Bronchial biopsies are usually performed during fiberoptic bronchoscopy, but samples are sometimes difficult to obtain due to hardness of the lesions. The key feature at histology is the presence of cartilaginous and osseous nodules in the bronchial submucosa. Cartilage of TO nodules is distinct from the normal cartilaginous rings. Bone tissue may be calcified and/or contain hematopoietic bone marrow. Squamous metaplasia of the tracheal epithelium is found in half of cases [2].

Chest imaging

The chest X-ray is usually normal. Chest computed tomography discloses dense submucosal nodules protruding into the lumen of the trachea and main bronchi [2,5,6].

Differential diagnosis

Tracheobronchial amyloidosis can present as multifocal submucosal amyloid plaques reducing the lumen of large airways. In contrast to TO, the posterior membranous tracheal wall is usually involved. Amyloid tissue can be detected at histology by its characteristic staining with Congo red dye. TO and amyloidosis may coexist in some cases, and it has been proposed that TO could represent a late stage of tracheobronchial amyloidosis, but this remains speculative.

Other differential diagnoses of TO include calcified lesions secondary to tuberculosis, carcinoma, papilloma, fibroma, endobronchial sarcoidosis, polychondritis and Wegener's granulomatosis of the proximal airways. The characteristic appearance of TO at fiberoptic bronchoscopy and histology allows the correct diagnosis to be made.

Epidemiology

Both the incidence and prevalence of the disorder in the general population are unknown.

The incidence of TO at autopsy was estimated of approximately 3/1000, while data from bronchoscopy were widely varying from 1/125 to 1/6000 [13,14]. The incidence of TO in a large series of 16 888 bronchoscopies was similar to that reported in the literature (1:1299 bronchoscopies) [14]. The long time interval between first symptoms and diagnosis (mean = 4 years) suggests that the disease develops slowly, and may remain unnoticed for long periods of time. TO usually occurs in the adult. No clear link with smoking was established. In one recent series, the mean age at diagnosis was 63 years (range: 25 to 85 years) [2]. TO has been exceptionally reported in a child. Women and men are equally affected. A familial occurrence has been reported in only one instance (in a woman and her daughter) [7].

Clinical description

Symptoms and signs

The majority of patients with TO have non-specific respiratory symptoms such as cough, wheezing, hemoptysis, or recurrent tracheobronchial infections [2,3,6]. Occasionally, the first manifestation of TO may consist of unexpected difficult intubation due to narrowing of the trachea [8]. Physical examination is unremarkable in most cases. Stridor and ronchi may occur when severe airway obstruction is present, and a clinical picture simulating asthma has been described [6].

Fiberoptic bronchoscopy

TO is usually an incidental finding at fiberoptic bronchoscopy, and is only rarely suspected before the procedure. Bronchoscopy discloses multiple hard nodules arising from the submucosa and protruding into the lumen of the tracheobronchial tree [1-3]. Lesions typically spread over the anterior and lateral walls of the airways (but spare the posterior wall of the trachea). Nodules are most abundant in the trachea and main bronchi, and less numerous in the lobar and segmental bronchi. Their size may vary in diameter from 1 to 10 mm. Lesions may become confluent. Large nodules can lead to significant obstruction [2,3]. Involvement of the larynx has been occasionally reported [9].

Chest computed tomography

The dense submucosal nodules are visible on chest computed tomography, especially in the trachea and main bronchi. They are calcified in half of cases. The typical sparing of the posterior wall is usually visible [2].

Lung function tests

Lung function tests are usually normal. An obstructive ventilatory defect may be present, but is usually attributable to coexisting chronic obstructive pulmonary disease. Flattening of inspiratory and/or expiratory flow-volume loops may be present, reflecting the narrowing of the tracheal lumen [2].

Biology

There are no known biological markers of the disease. C-reactive protein and erythrocyte sedimentation rate may be transiently elevated as a result of acute tracheobronchial infection [2]. Calcium metabolism is normal and does not account for the bone deposition in the tracheal submucosa. Hyperphosphoremia and growth hormone hypersecretion have been reported in isolated cases of TO, but this association is probably incidental and no causal relationship has been demonstrated so far.

Disease course

Because submucosal nodules modify airway anatomy, and squamous metaplasia of the epithelium impairs mucociliary clearance [10], recurrent tracheobronchial infections may occur. Obstruction of lobar bronchi by submucosal nodules may lead to recurrent atelectasis or pneumonia [5]. Life-threatening infections have been reported. Overall, the disease is characterized by persisting or recurrent respiratory symptoms [2].

TO nodules seem to remain stable over years, or progress only at a very slow rate. In one cohort of 8 patients who had 2 or more bronchoscopies performed at least 1 year apart, 55% of cases had no detectable disease progression [2]. The remaining 45% of cases had some disease progression, which was, however, minimal in 28% and significant in only 17%. One patient had a severe progression over a period of 9 years, with tracheal obstruction worsening from 30 to 80% (6). Rapid progression has also been reported [4].

Treatment

No specific treatment to inhibit nodule formation in TO is currently available. The vast majority of patients do not develop significant airway narrowing. In a recent series, only 2 out of 41 patients underwent invasive therapeutic interventions to relieve airway obstruction [2]. Laser therapy and endoscopic removal of TO nodules have been reported in isolated cases with some clinical improvement. Tracheostomy has been occasionally necessary to bypass the tracheal obstruction [2].

Since impaired clearance of secretions and airway obstruction could favor the occurrence of infections [10], antibiotic therapy seems advisable for acute bronchitis in TO. Coexisting conditions such as chronic obstructive pulmonary disease or asthma should be treated appropriately.

Etiology

The cause of the disorder is currently unknown. The coexistence of TO and atrophic rhinitis (ozena) has been described in several instances [1]. The bacteria *Klebsiella ozenae* is frequently isolated in both conditions [1,2], further suggesting some link between these disorders [11]. However, no clear relationship has been demonstrated so far. The presence of cough, dyspnea, hemoptysis, or recurrent tracheobronchial infections in a patient with atrophic rhinitis should raise the suspicion of TO. There are anecdotal reports of TO with acromegaly and polymyositis, but these associations are probably incidental. No increased risk of cancer has been reported.

The mechanisms of nodules formation in TO is unknown. Classical theories include ecchondrosis and exostosis arising from the cartilaginous tracheal rings, or metaplasia of the submucosal elastic and connective tissue. Despite a compatible distribution of lesions at histology, no objective data support these hypotheses.

Recent immunohistochemical studies of TO lesions have suggested a role for bone morphogenetic protein 2 (BMP-2), a member of the transforming growth factor beta family which plays important physiological roles in the formation of new bone and cartilage [12]. More studies are needed to explore this issue.

There is no known genetic susceptibility for the development of TO.

References

1. Harma RA, Suurkari S. Tracheopathia chondro-osteoplastica. A clinical study of thirty cases. *Acta Otolaryngol* 1977;84:118-23.
2. Leske V, Lazor R, Coetmeur D, Crestani B, Chatte G, Cordier JF. Tracheobronchopathia Osteochondroplastica: A Study of 41 Patients. *Medicine (Baltimore)* 2001;80:378-90.
3. Vilkmann S, Keistinen T. Tracheobronchopathia osteochondroplastica. Report of a young man with severe disease and retrospective review of 18 cases. *Respiration* 1995;62:151-4.
4. Molloy AR, McMahan JN. Rapid progression of tracheal stenosis associated with tracheopathia osteo-chondroplastica. *Intensive Care Med* 1988;15:60-2.

5. Hodges MK, Israel E. Tracheobronchopathia osteochondroplastica presenting as right middle lobe collapse. Diagnosis by bronchoscopy and computerized tomography. *Chest* 1988;94:842-4.
6. Park SS, Shin DH, Lee DH, Jeon SC, Lee JH, Lee JD. Tracheopathia osteoplastica simulating asthmatic symptoms. Diagnosis by bronchoscopy and computerized tomography. *Respiration* 1995;62:43-5.
7. Prakash UB, McCullough AE, Edell ES, Nienhuis DM. Tracheopathia osteoplastica: familial occurrence. *Mayo Clin Proc* 1989;64:1091-6.
8. Coetmeur D, Bovyn G, Leroux P, Niel-Duriez M. Tracheobronchopathia osteochondroplastica presenting at the time of a difficult intubation. *Respir Med* 1997;91:496-8.
9. Smid L, Lavrencak B, Zargi M. Laryngo-tracheo-bronchopathia chondro-osteoplastica. *J Laryngol Otol* 1992;106:845-8.
10. Chien AY, Donovan DT. Impaired ciliary clearance from tracheopathia osteoplastica of the upper respiratory tract. *Otolaryngol Head Neck Surg* 1997;117:S102-4.
11. Ferguson J, McCaffrey TV, Kern EB, Martin WJ. Effect of *Klebsiella ozaenae* on ciliary activity *in vitro*: implications in the pathogenesis of atrophic rhinitis. *Otolaryngol Head Neck Surg* 1990;102:207-11.
12. Tajima K, Yamakawa M, Katagiri T, Sasaki H. Immunohistochemical detection of bone morphogenetic protein-2 and transforming growth factor beta-1 in tracheopathia osteochondroplastica. *Virchows Arch* 1997;431:359-63.
13. Meyer CN, Dossing M, Broholm H. Tracheobronchopathia osteochondroplastica. *Resp Med* 1997;91: 499–502.
14. Moura E Sa J, Almeida J, Amado J, Fernandes B, Caminha J, Ferraz JM. Tracheobronchopathia osteochondroplastica Experience of a Bronchology Unit. *Rev Port Pneumol* 2003;4:329-40.