Life-threatening idiopathic subglottic stenosis misdiagnosed as asthma

Niloofar Sherazi Dreyer, Kristine Grubbe Gregersen and Kristian Hveysel Bork
Department of Otorhinolaryngology, Head and Neck Surgery, Copenhagen, Denmark

ABSTRACT
Background: Subglottic stenosis (SGS) is the obstruction of the central airway in the region bounded superiorly by a plane below the glottis and inferiorly by the first two tracheal rings. Causes of subglottic stenosis can be congenital, acquired, or idiopathic. We present a case of possible post infectious subglottic stenosis. Case report: A 26-year-old woman was admitted to the hospital due to worsening of dyspnea for 3 years. She was initially diagnosed with asthma, but asthma medication did not have an effect. She had an endoscopic bronchoscopy that revealed a subglottic stenosis and a few hours after the bronchoscopy the patient developed stridor and was hurried to surgery. Conclusions: Subglottic stenosis is a rare condition and is possible misdiagnosed as asthma or chronic obstructive pulmonary disease (COPD). Early and correct diagnosis is essential to reduce morbidity and mortality. Diagnosis of SGS is endoscopic laryngoscopy/bronchoscopy or CT scan.

Introduction
Subglottic stenosis is the obstruction of the central airway in the region below the glottis and bounded inferiorly by second tracheal ring. Causes of subglottic stenosis can be congenital, acquired, or idiopathic. The most common causes are trauma following intubation (prolonged/repetitive intubation or excessive endotracheal tube cuff pressure) and tracheostomy. Acquired causes may be external and internal traumas. External are typically trauma to the neck/larynx and internal traumas can include (intubation or tracheotomy) as mentioned earlier. Other acquired causes include infections as bacterial tracheitis, tuberculosis, gastroesophageal reflux disorder (GERD), systemic diseases (amyloidosis, sarcoidosis, polyarteritis, granulomatosis with polyangiitis), radiation therapy, inhalational injury, tracheal malignancy, and foreign body aspiration [1].

Idiopathic subglottic stenosis is a rare disease of unknown etiology with a reported incidence of 1 in 400 000 patients [1]. It mostly affects females age ranging from 30 to 60 and frequently presents with other conditions hypertension and obesity. Patients generally present symptoms such as dyspnea/stridor on exertion, dysphonia and cough. Over time the symptoms may also present at rest. Interestingly most of the symptoms are reported when the disease has progressed and the stenosis is over 50% of airway lumen [2]. Undiagnosed the progression of the disease can shut off the airways urgently and lead to death.

The symptoms mimic the ones of pulmonary diseases as asthma and chronic obstructive pulmonary disease and is consequently often misdiagnosed [3]. But often stridor becomes a predominant symptom over time. A correct diagnosis is important and can prevent further progression and decrease in quality of life.

The gold standard of diagnosis of SGS is endoscopic laryngoscopy/bronchoscopy and radiologic imaging with high resolution computed tomography (HRCT) should be performed to plan surgery which is the treatment of choice.

Histopathology often displays dense fibrosis with keloid and fibroblasts. Dilatation of minor salivary glands and ducts can also be found. Granulation formation and squamous metaplasia of the epithelium may also occur.

The aim of this activity is, based on this case report, to enlighten the importance of symptoms not to be overlooked and misdiagnosed as asthma. Furthermore, we present management of subglottic stenosis.

CONTACT Niloofar Sherazi Dreyer nilou.sherazi@gmail.com
© 2022 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.
**Case report**

A 26-year-old female was admitted to the hospital due to worsening of dyspnea through several weeks. The dyspnea presented at rest and worsened during mild exercise as walking on stairs or power walking. She explained the examiner that the dyspnea originally started 3 years earlier and months after having symptoms mimicking pseudocroup. Her general practitioner had diagnosed her with asthma (spirometry showed FEV1 = 70% of the expected) however the asthma medication did not have any effect. She had never smoked nor been exposed to passive smoke and did not have any B-symptoms, such as fever, night sweat or unintentionally weight loss. She did not have history of any recurrent pneumonia.

Her blood pressure was within normal range and heart rate was 74 bpm, blood saturation 99%, ECG and stethoscopy were all normal. Blood laboratory findings were within normal limits. X-ray of the chest showed normal heart, no pleural fluid nor infiltrates in the lungs. The conclusion was that there was no suspicion of lung embolism or other acute cardiac-or respiratory conditions so she was referred to the lung pulmonary outpatient clinic for further examinations.

A HRCT did not show air trapping or infiltrates and no signs of tracheomalacia, however the lumen in larynx collapsed at expiration, and she had inspiratory stridor. Mannitol challenge test was performed and the result was negative. Continuous laryngoscopy exercise test (CLE test) was normal and did not raise any suspicion of exercise-induced laryngeal obstruction (EILO), however HRCT showed signs of possible tumor/collapse of larynx lumen and led to a bronchoscopy and the patient was sent to further investigation.

A bronchoscopy was performed and showed subglottic stenosis with 75% closure of the lumen (See Figure 1). A couple of hours following the bronchoscopy, she acutely presented with severe inspiratory stridor and received adrenalin and intravenous solumedrol and was urged to surgery. No signs of tracheomalacia was seen during bronchoscopy and surgery. The length of the stenosis measured 5-8 mm. The procedure started by placing a laryngoscope at larynx and initially it was not possible to pass a tube size 4 why an immediate cut with a cold knife had to be performed to create passage.

Radial incisions were performed anteromedially at two sites followed by dilatation with an open balloon-type, 16 mm, 6 atm pressure (Trachealator, Medinotec DISA, Mowbray, South Africa), for 2 min, while ventilating with 100% O2 catheter superiorly to the balloon. The balloon dilatation was repeated once. (See Figure 2 for post surgical result).

Ultimately, KENALOG 1 ml, a corticosteroid was injected superiorly at the site of stenosis. A biopsy was obtained and showed no signs of malignancy-only dilated capillaries, lymphocytes and plasma cells. There was no sign of inflammation.

On follow up 3 weeks later she felt improvement in her condition and delivered a peak flow of 430 l/min
against the previous 210 l/min. She had no signs of infection or stridor and her voice was clear.

4 months later she still did not show any signs of relapse, her voice was normal, laryngoscopy showed no signs of re-stenosis.

8 months following her initial surgery she experienced mild dyspnea, laryngoscopy showed a slight re-stenosis anteriorly, which did not demand any surgery.

Discussion

Diagnosing subglottic stenosis is a clinical challenge. This case demonstrates the importance of correct and early diagnosis. The patient had been diagnosed with asthma however asthma medication did not have any effect. She had numerous visits to the hospital and over the years a great number of examinations were performed. The patient suffered from symptoms that worsened over the years and during respiratory tract infections. Her quality of life declined as she was not able to exercise due to severe dyspnea/stridor and she experienced tremendous weight gain and fatigue. She developed potential life-threatening stridor after bronchoscopy, which could have been fatal if not treated urgently and accurately.

The lack of effect of asthma medication should have raised suspicion of upper respiratory condition. It is suggested that as many as one-third of patients are misdiagnosed with asthma or COPD [1]. Other differential diagnosis should include obstruction due to malignancy and vocal cord paralysis/paresis or foreign body aspiration.

A thorough history and physical examination is of great importance and serologic testing should be performed.

Flexible nasoendoscopy is readily available and allows rapid evaluation of the upper airway; whether there is vocal cord paresis/paralysis, obstruction or malignancy. Subglottic stenosis can be seen in the well-cooperating or local anaesthetized patient. If the patient cannot cooperate to endoscopy a bronchoscopy in mild sedation or general anesthesia is a good alternative.

Endoscopic laryngoscopy/bronchoscopy as well as HRCT of the larynx and airways play a significant role in diagnosing subglottic stenosis and are useful to plan management strategies. They can assess the stenosis and its characteristics such as extent and location and can help exclude external compressing factors such as goiters/tumors. They should be performed in all patients with no effect of asthma medications.

Spirometry is non-invasive and can be used, where nasoendoscopy or bronchoscopy is not accessible. Spirometry/pulmonary function testing is noninvasive and may help distinguish between the two conditions: asthma will show an obstructive or normal pattern on spirometry, while SGS will show blunted inspiratory and expiratory peaks. Pulmonary function tests can also be used to postoperatively measure the outcome of surgery, monitor the treatment efficacy and allows to follow patients over time and offer an intervention before the condition turns critical [4,5].

Treatment strategies vary greatly and depend on the degree of the stenosis. The treatment of choice is surgery and first line treatment is surgical. We recommend surgery and dilation of the stenotic airway with cold knife followed by balloon dilatations and corticosteroid injection in the operative site, as it tends to have the lowest recurrence rate and longer time interval between procedures [6,7].

Several adjuvant medications are used, sometimes in combination with surgery, for patients with idiopathic subglottic stenosis to minimize symptoms and prolong time between surgeries. However there is no evidence to support using adjuvant medications have an effect on time to recurrence and no data to support effect of medical therapy alone [8].

Other treatment options include laser therapy (CO2 or Nd:YAG). The different surgical approaches can be used in combinations and supplemented with mitomycin C and/or corticosteroids. In severe or recurrent cases open surgery with laryngotracheal reconstruction surgery is required. In urgent cases tracheostomy may be the modality of choice.

The rate of disease recurrence is significantly higher for endoscopic treatment than that for open approach but still endoscopic approach is to prefer due to their minimally invasive nature and low complications rate [6,7].

Follow up is necessary due to the high frequency in relapse. At follow up the patient should be examined with flexible nasal endoscopy.

Conclusions

Our case highlights the fact that early recognition of symptoms and diagnosis is of utmost importance due to the progressive and hence potential life-threatening nature of subglottic stenosis. Subglottic stenosis is a rare but important differential diagnosis in patients with dyspnea that do not respond to asthma.
medication. Subglottic stenosis has a negative impact on quality of life and fast treatment initiation reduces morbidity and mortality. Laryngoscopy/bronchoscopy (and HRCT) are essential in diagnosing and managing subglottic stenosis. The treatment of choice is surgical.

Informed consent

The authors have obtained a consent from patient to the inclusion of material pertaining to the patient.

Author contribution

Niloofer Sherazi Dreyer: writing the paper; Kristine Grubbe Gregersen: writing the paper; Kristian Bork: writing the paper

Disclosure statement

There are no conflicts of interest.

Literature

[1] Aravena C, Almeida FA, Mukhopadhyay S, et al. Idiopathic subglottic stenosis: a review. J Thorac Dis. 2020; 12(3):1100–1111.
[2] Brandenburg JH. Idiopathic subglottic stenosis. Trans Am Acad Ophthalmol Otolaryngol. 1972; 76(5):1402–1406.
[3] Pomerantz B, Pomerantz M, Finn A. Idiopathic subglottic stenosis in a young female patient. BMJ Case Rep. 2021;14(5):e241525.
[4] T Tie K, Buckmire RA, Shah RN. The role of spirometry and dyspnea index in the management of subglottic stenosis. Laryngoscope. 2020;130(12): 2760–2766.
[5] Carpenter DJ, Ferrante S, Bakos SR, et al. Utility of routine spirometry measures for surveillance of idiopathic subglottic stenosis. JAMA Otolaryngol Head Neck Surg. 2019;145(1):21–26.
[6] Maurizi G, Vanni C, Rendina EA, et al. Surgery for laryngotracheal stenosis: improved results. J Thorac Cardiovasc Surg. 2021;161(3):845–852.
[7] Lavrysen E, Hens G, Delaere P, et al. Endoscopic treatment of idiopathic subglottic stenosis: a systematic review. Front Surg. 2020;6:75.
[8] Hoffman MR, Patro A, Huang LC, et al. Impact of adjuvant medical therapies on surgical outcomes in idiopathic subglottic stenosis. Laryngoscope. 2021; 131(12):E2880–E2886.