OPEN ACCESS *Case Report*

A case of severe subglottic stenosis masking as bronchial asthma

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Abstract

Tracheal stenosis is an uncommon and dangerous complication after intubation and tracheostomy and its clinical presentation may be misinterpreted as bronchial asthma. A careful vigilant clinical history and examination is required for the diagnosis of such tracheal stenosis. Here, we describe a case of post intubation subglottic tracheal stenosis in a young male who presented with features mimicking bronchial asthma.

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Introduction

Airway stenosis is partial or complete narrowing of the central airway passages. Tracheal stenosis is a dangerous complication resulting from numerous different causes. The disease may be caused by trauma (prolonged tracheostomy or intubation), systemic inflammatory diseases (e.g., Wegener disease, relapsing polychondritis or infectious disease like tuberculosis), malignancy (primary or metastatic). If an underlying etiology is unknown, the condition is termed idiopathic tracheal stenosis.

Subglottic stenosis, a subtype of laryngo-tracheo stenosis, is characterized by fibrosis and narrowing of the subglottic space, which extends from the inferior margin of the vocal cords to the cricoid cartilage. Iatrogenic injury from endotracheal intubation and tracheostomy remains the most common cause [1]. Depending on the site of the lesion and severity of the tracheal narrowing, the stenosis may cause symptoms of persistent cough, dyspnoea on exertion, stridor, wheeze, irritable cough, or recurrent respiratory tract infections. The reported incidence of tracheal stenosis after tracheostomy and prolonged intubation varies between 0.6% to 21% and 6% to 21%, respectively [2]. The simple stenoses includes granulomas, web-like and concentrical scarring stenosis (<1cm) with the absence of tracheomalacia or loss of cartilaginous support. The complex stenosis has long lesion (greater than 1 cm) with tracheomalacia [3].

Here, we describe a case of severe tracheal stenosis, who presented initially with features of bronchial asthma.

Case report

A 22 years old male presented with persistent cough, shortness of breath following thick sputum being stuck in the throat mimicking as bronchial asthma. The patient had severe dyspnoea which was partially relieved after spitting out thick sputum stuck in the throat. But, he had no stridor. The patient was a chronic tobacco chewer with no other addiction. In addition to symptoms like bronchial asthma, his past medical history was not notable for tuberculosis, hypothyroidism, congestive heart failure or coronary artery disease. After deep interrogation patient provided history of admission at another hospital 20 days back for ingestion of unknown poison with intubation for five days. On admission, physical examination revealed a pulse rate of 106 beats / minutes, blood pressure of 132/80 mm Hg, and oxygen saturation of 96% on room air. No gallops, murmurs, or rubs were audible. Routine investigations including complete blood counts, renal and liver function

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tests, and urine examination were within the normal range. Sputum smears for acid-fast bacilli, and smears and cultures for pyogenic organisms and fungi were also negative.

After admission in our centre, the patient was started on inhalation bronchodilator and systemic steroids. But patient did not improve and his CT scan of thorax was planned which was normal. The flow-volume curve was consistent with fixed airway obstruction with a functional vital capacity (FVC) of 2.72 L and 1-second forced expiratory volume (FEV1) of 1.10 L (FEV1/FVC: 40.4%).

Contrast Enhanced Computed Tomography (CECT) examination of the neck was performed which revealed moderate focal subglottic tracheal stenosis 2.0 cm below the vocal cords with a transverse luminal diameter of less than 2.0 mm (Figure-1). The antero-posterior luminal diameter was 9 mm at the level of stenosis. Flexible fibreoptic bronchoscopy revealed normal vocal cords and subglottic tracheal stenosis with luminal opening of 1.5-1.8 mm with a thickened trachea around the small opening. Even, scope of 2.2 mm diameter could not be negotiated through small tracheal opening (Figure-2). Endotracheal biopsy was taken from around the thickened tracheal luminal opening which revealed fragments of stratified squamous epithelium revealing acanthosis, exocytosis and neutrophils showing mild to moderate reactive atypia.

Therapeutic flexible bronchoscopy was performed under local/general anesthesia in the operation theatre. Initially, an electocautery probe was passed through the suction channel of the fibreoptic bronchoscope under 35-40% oxygen supplementation. Linear cuts were given using the "blend" mode on the electrocautery unit which allows tissue cutting and coagulation simultaneously.

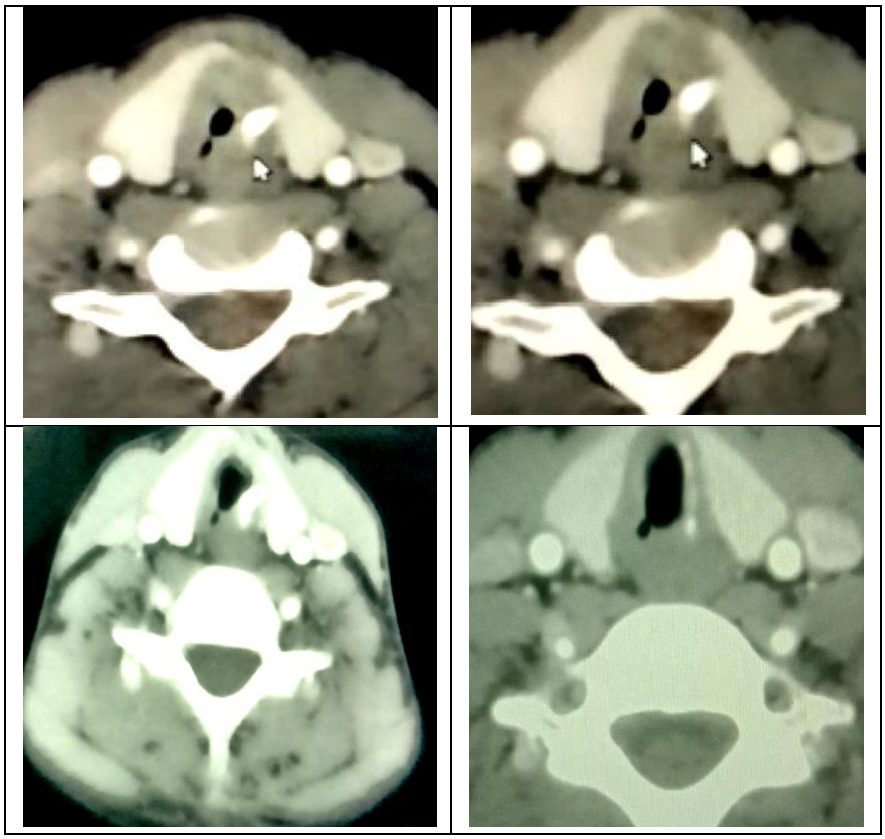

Figure-1: *CECT of neck showing moderate focal subglottic stenosis 2.0 cm below the vocal cords*

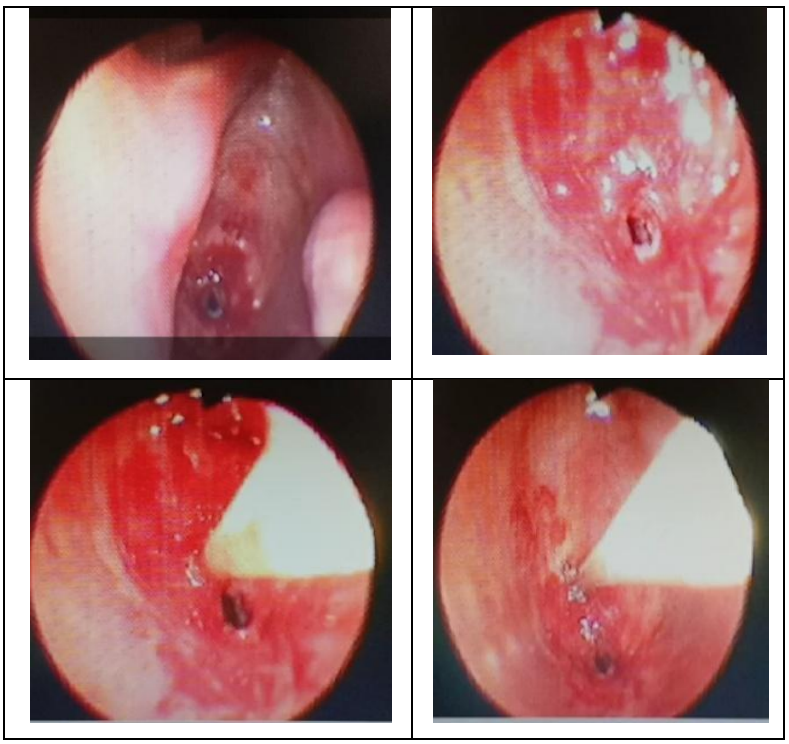

Figure-2: *Subglottic stenosis 2 cm below the vocal cords with narrow tracheal lumen 1.8 mm in size.*

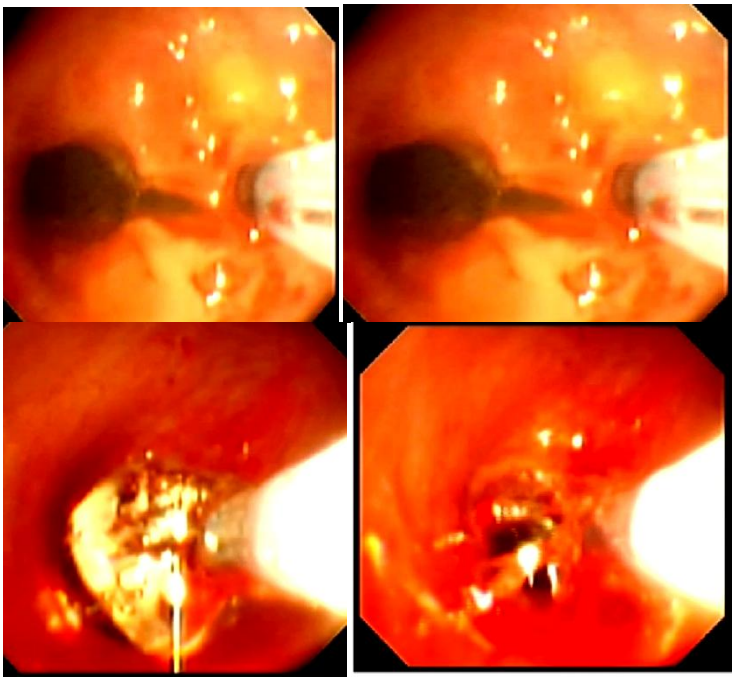

Figure-3: *Incision of stenosis at 3 o'clock position and dilated with Boston balloon*

The electrocautery knife created 1 to 2 mm incisions at targeted points and the balloon dilated the airway. Continuous suction was applied so that the target area remained free of blood and mucus and smoke was evacuated. The linear cuts were made on the walls of the stricture at 12 o'clock, 3 o'clock and 9 o'clock position. During inflation, a balloon inflation device with pressure gauge monitor (Boston Scientific) was used to inflate the balloon (Figure-3). The balloon was initially inflated in the stenosed segment with pressure of 2–3 atm for 15 seconds, and this procedure was repeated thrice. The patient was provided 70% oxygen inhalation before and after the balloon dilatation. Later on, topical spray with mitomycin C was given to prevent re-stenosis. Check bronchoscopy after one week revealed good dilatation of subglottic stenosis.

Discussion

This case report manifests the importance of early diagnosis and management of an uncommon and dangerous complication of intubation, which may be misinterpreted as a case of bronchial asthma. High suspicion, careful physical examination with characteristic spirometric flow volume loops and evaluation by fibreoptic bronchoscopy/3D CT scan of neck enabled early identification of this condition.

Tracheal stenosis is most commonly acquired from prolonged intubations in which the endotracheal cuff pressure exceeded the mean capillary pressure of the tracheal mucosa (> 30 mm Hg). The excessive pressure leads to ischemia, granulation tissue formation, and scarring with lumen stricture [4]. Even when high volume, low pressure cuffed tubes are used, airway stenosis may occur in up to 11% of intubated or tracheostomy patients, even after less than 24 hours of intubation [5,6]. A second common cause of tracheal stenosis is via tracheostomy damage. The injury may involve fractured cartilage from mechanical leverage of the ventilator tubing on the tracheal tube, incorrect sizing of the tracheostomy, fracture during percutaneous tracheostomy tube placement, and excess granulation tissue from infection and abnormal healing [7].

Three-dimensional CT is a useful noninvasive evaluation for tracheo-bronchial stenosis. It allows preoperative determination of balloon size and length, especially when the bronchoscope cannot be passed through the obstruction. It can allow an accurate determination of the degree and length of stenosis and an evaluation of the airway distal to the stenosis and shows the presence of multiple stenoses as well as the relationships with mediastinal structures [8]. Flexible endoscopy is the invasive gold standard procedure for diagnosing endoluminal lesions. But nowadays, the availability of non invasive virtual chest CT (virtual bronchoscopy) is increasing, and it has a diagnostic sensitivity of 94% to 100% for identifying airway stenosis [9,10].

In our case, at the narrowest point of stenosis, there was an approximate cross-sectional obstruction of 90%, which was consistent with a grade 3 obstruction according to the Myer-Cotton classification [11]. Myer-Cotton system primarily addresses circumferential stenosis confined to the subglottic region.

Endoscopic procedures currently used include balloon dilatation, excision of granulation tissue by electrocautery, laser, or sharp incision with balloon dilatation, and topical application of steroids or mitomycin C and silicone or metallic stenting. These treatments are the primary choice for elderly or very ill patients for whom open surgery would be difficult. Brichet, et al has designed a treatment algorithm utilizing a multidisciplinary approach to tracheal stenosis management [12]. Rigid bronchoscopy with neodymium±yttrium aluminium garnet (Nd-YAG) laser resection or stent implantation (removable stent) is proposed as first-line treatment, depending on the type of stenosis (web-like versus complex stenosis). In patients with web-like stenosis, sleeve resection was proposed when laser treatment (up to three sessions) fails. In patients with complex stenosis, operability is assessed 6 months after stent implantation. If the patient is judged operable, the stent is removed and the patient undergoes surgery if the stenosis recurred [12]. Galluccio et al suggest that rigid endoscopy using laser assisted mechanical dilatation (LAMD) and, eventually, stent placement as the treatment of choice for simple stenosis with

96% success rate and referred the patient to surgery in case of failure [3]. In complex stenosis with stenotic lesion >1cm with the scarring contracture of tracheal wall surgery is the first option and endoscopy should be performed in order to obtain the correct information about the tracheal lesion and decide together with the surgeon the best therapeutic option [3].

Complications associated with balloon dilatation are tearing of the bronchial wall due to excessive stretching, resulting in pneumothorax, pneumomediastinum, and subcutaneous emphysema. These complications can be avoided using Nd- YAG laser for cutting open the fibrotic stricture prior to balloon dilatation, as it avoids the need for excessively high pressure for dilating the balloon [13].

Both electrocautery and argon plasma photocoagulation (APC) offer advantage of ease and lower cost as compared with laser therapy [14]. Boxem and colleagues documented that the amount of mucosal damage visualized after electrocautery has good correlation with histologic tissue damage [15]. In our case also web like subglottic stenosis less than 1 cm length was initially subjected to electrocautery incisions at targeted points and the Boston balloon was used to inflate the stenosed segment under controlled pressure. Later on, topical spray with mitomycin C was given to prevent re-stenosis. For web-like stenoses, a recommended mucosal sparring technique with radial incisions followed by airway dilatation using balloon bronchoplasty was described by Mehta [16]. Bronchoscopic tools such as balloon bronchoplasty and electrocautery incisions are safe and rapid treatments that can also be performed during diagnostic bronchoscopy and can limit the need for more invasive surgical procedures [17].

The topical application of mitomycin C following endoscopic electrosurgery can be used for treatment of post intubation tracheal stenosis. Bronchoscopic therapy and topical application of mitomycin C suggest that this intervention works better as a bridge to definitive surgery rather than as a stand-alone therapy [18].

Central airway stenosis is a life-threatening upper airway obstruction and can be mistaken as bronchial asthma. A multidisciplinary approach including electrocautery or laser with balloon dilatation, stent placement or surgery is needed for treatment of tracheo-bronchial stenoses depending on the type and length of stenosis. A careful vigilant clinical examination of patient with history of past intubation or tracheostomy procedure is necessary for diagnosis of tracheal stenosis.

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