

VOCAL CORD DYSFUNCTION COMPLICATING ASTHMA

Michael Levin, MB ChB, FCPaed

Allergy Clinic, Red Cross Children's Hospital and School of Adolescent and Child Health, University of Cape Town

CASE HISTORY

YM, a 9-year-old girl, presented to the Red Cross Children's Hospital in November 2000. She had a tight chest and shortness of breath, which had not responded to nebulisers with bronchodilators at the local day hospital. Her past history included numerous clinic visits, and she had been nebulised at least once a month since an early age. Her mother reported cough, wheezing and episodes of chest tightness beginning shortly after birth. There was no family history of asthma, and no sneezing, itchy nose or eyes, snoring, eye rubbing, allergic mannerisms or skin disease. She was treated with nebulised β_2 -agonists and responded very well. She was discharged the following day on inhaled steroids.

In September 2001 she returned with complaints of cough, fast breathing and fever. Nebulised bronchodilators had been ineffective. Her maintenance treatment was salbutamol syrup and antituberculosis treatment (prescribed by the day hospital for an episode of haemoptysis) but inhaled bronchodilators and steroids had been discontinued by the mother as she felt they did not help. She had severe respiratory distress, grunting, tracheal tug, supraclavicular indrawing and shoulders moving with respiration. Wheezes and crackles were present on auscultation but there was no pulsus paradoxus. Treatment with nebulised β_2 -agonists was initially ineffective, but later she had a very rapid response – both symptomatically and with resolution of abnormal chest signs – and was discharged after 2 days, on inhaled steroids and β_2 -agonists.

On 24 September 2002, she returned to the emergency room and was assessed at 4.15 am by an experienced paediatric registrar, who noted that after 1½ hours of continuous nebulisation, she still had severe respiratory distress, tachypnoea, subcostal recessions, forced expiration and a loud wheeze. Her maintenance treatment was budesonide 400 µg bd and salbutamol 100 µg PRN, both through a spacer given with good technique. She was given IVI dexamethasone, and considered for ICU admission but was admitted to the general ward. At 7.00 am her respiratory rate was 28, there was no respiratory distress and she had a mild wheeze. On discharge, follow-up was arranged for the allergy clinic.

She was a regular attender at the allergy clinic, and received budesonide 400 µg bd, salmeterol 25 µg bd, and PRN salbutamol. She showed excellent compliance and good spacer technique. Skin-prick tests were all negative. In October she was admitted 3 times with severe symptoms of respiratory distress and signs of airway obstruction, which resolved within a few hours of admission. She received intermittent courses of oral steroids. In January 2003 she was admitted 3 times with severe respiratory distress.

On 24 January she had severe symptoms requiring admission. On arrival her respiratory rate was 60/minute. She had flaring of the alae nasi, intercostal recession and a tracheal tug. She had forced expiration and was using abdominal muscles to breathe. She was, however, able to speak to her mother and had good excursion of the chest wall and good air entry bilaterally. She had a slight expiratory wheeze that increased with the squeeze-wheeze technique; physically pushing on the anterior chest wall increased airflow and aided expiration. Her oxygen saturation was 99% on room air, and her peak expiratory flow rate was 250 l/min (predicted normal value 208 l/min). Palpable pulsus paradoxus was present. Chest X-ray showed no significant hyperinflation, no opacification, no pneumothorax or lymphadenopathy. Arterial blood gas (while on oxygen) showed pH of 7.43, pCO₂ of 4.28 kPa and pO₂ of 44 kPa. She received nebulised β_2 stimulants and IVI steroids. After 5 hours of nebulisation with β_2 -agonists with no response, there was a sudden resolution of clinical signs and by morning her respiratory rate was 24, she had no respiratory distress, no wheeze and her peak flow was 260 l/min. She was sent to the allergy clinic where a new diagnosis was entertained.

QUESTIONS

- What is the diagnosis?
- What further history do we need?
- What characteristic signs should we look for on the next admission?
- What are the diagnostic options?
- What treatment is available?

Diagnosis

Vocal cord dysfunction (VCD), also called paradoxical vocal cord motion (PVCM), is a condition that is frequently mistaken for asthma. The cause is adduction and closure of the vocal cords during inhalation resulting in extrathoracic airway obstruction manifesting as wheezing, chest tightness, shortness of breath and cough. Attacks occur predominantly during the day and often begin and resolve abruptly. The symptoms can be very severe and the misdiagnosis of VCD as asthma often leads to inappropriate treatment. Most patients have had treatment with high-dose inhaled and/or systemic corticosteroids, have a history of frequent emergency room visits, hospitalisation and in some cases tracheostomies and intubation.¹

History

The clinical history provides limited opportunity to distinguish between patients with VCD and asthma, because both groups present with symptoms of wheezing, cough and dyspnoea. Patients with VCD characteristically have an abrupt onset and cessation of symptoms, and symptoms occur predominantly during the day. They do not report nocturnal waking due to breathlessness or night coughing. They may be aware of throat tightness or voice changes during an attack.² A history of possible triggers is also no help in distinguishing between the conditions as VCD may be provoked by exercise, respiratory infections, cigarette smoke or other irritant chemicals, emotional upset and

Correspondence: Dr M Levin, Allergy Clinic, Red Cross Children's Hospital, Klipfontein Rd, Rondebosch 7700.
email: mlevin@ich.uct.ac.za

postnasal drip. There is a marked preponderance of female sufferers (41:1 in a large study reported in 1995¹) and most patients are between 20 and 40 years of age. In the paediatric age group, most are teenagers, and 80% are female.³ A history of family discord and sexual abuse should be elicited, as there is a subgroup of patients who have psychogenically triggered VCD.

Examination

Distress and symptoms out of keeping with the peak flow, oxygen saturation and blood gas measurements are typical. Patients with VCD may be able to pant and even hold their breath despite these symptoms, whereas asthmatics will not be able to perform these manoeuvres during an attack. Panting may improve the symptoms. Auscultation is difficult because of transmission of breath sounds, but the wheeze may be heard loudest at the larynx, and may occur during inspiration rather than expiration.⁴ Expiratory wheezing arises from narrowing of the trachea and large bronchi owing to compression of these large airways by increased intrathoracic pressure. This pressure rise results from forced expiration at low lung volumes.⁴ Stridor may occur in addition to wheeze in 18% of patients with VCD.¹ Pulsus paradoxus may occur.⁵

Diagnostic features

Tests for allergy are negative unless the child has concomitant asthma. Chest X-rays and pulmonary function testing reveals normal total lung capacity without evidence of hyperinflation. Peak flows are often well preserved, but if flow is decreased then forced vital capacity (FVC) decreases in tandem with forced expiratory volumes (FEV₁); this is not consistent with classic airflow limitation. A typical blood gas analysis shows normal A-a gradients, and no evidence of hypercapnia or acidosis but may show hypoxaemia. Flow volume loops are the most useful tool in distinguishing between VCD and asthma. During an attack, characteristic changes are inspiratory loop flattening reflecting extrathoracic inspiratory obstruction. In addition abnormalities of the expiratory limb may be seen, such as an abrupt rise and drop in the absence of coughing, or a concave flattening. There is an increased ratio of forced expiratory flow at 50% vital capacity to forced inspiratory flow at 50% vital capacity. In between attacks, 23% will have an abnormal inspiratory flow on flow loops.¹ The gold standard for diagnosis of VCD is direct visualisation of the abnormal vocal cord movement during inspiration by laryngoscopy, preferably via the nasal rather than the oral route. The classic picture is the adduction of the anterior two-thirds of the vocal cords leaving a small diamond-shaped chink posteriorly through which air flows during inspiration. This should ideally be done while symptoms are present, but both adults¹ and children³ with VCD display PVCM during normal quiet breathing. Doctors therefore do not need to wait for symptoms or try to provoke them with methacholine. Other abnormalities seen in 22 children with VCD included arytenoid oedema (77%) and intra-arytenoid abnormalities (86%) suggestive of gastro-oesophageal reflux disease.³

Treatment

Acute management must exclude organic causes such as irritant inhalation, gastro-oesophageal reflux, myasthenia gravis, encephalopathy and brainstem compression. Symptomatic treatment includes inhaled heliox (oxygen/helium mixture, usually 20:80 or 30:70) therapy which reduces airway turbulence, eliminates respiratory noise, and reduces the anxiety that is often a predisposing or exacerbating factor in these cases. Panting provides acute relief by physiologically increas-

ing the glottic aperture. Benzodiazepines and reassurance both reduce anxiety and have been shown to be effective. Nebulised lignocaine has been used in one centre with good symptomatic relief.⁶ Asthma therapy with bronchodilators, oxygen and corticosteroids is ineffective in cases where VCD does not coexist with asthma, and may exacerbate symptoms. However, treatment for bronchospasm should not be withheld from patients with severe respiratory distress and wheezing unless the diagnosis of pure VCD has been definitively proven. Severe cases may require IPPV or CPAP, or intralaryngeal injection of botulinum toxin. A patient with VCD, once intubated, will be noted to be very easy to bag, and the realisation that 'bronchospasm' has disappeared immediately following endotracheal intubation may allow the ICU staff or anaesthetist to make the diagnosis.⁵

Long-term management requires a multidisciplinary approach involving speech therapy, psychiatric support and patient and physician education regarding the condition. A thorough explanation resulting in the diagnosis being received positively by the patient has been shown to strongly affect the resolution of symptoms.⁴ Speech therapy techniques are aimed at focusing attention on expiration and abdominal breathing rather than inspiration and laryngeal breathing, and relaxation of the oropharyngeal, intercostal, neck and shoulder girdle muscles. Psychotherapy allows the patient to explore possible causes or triggers for the disorder and trains the patient in relaxation techniques. Short-term results are favourable, allowing the removal of inappropriate asthma medication, and long-term symptom control is good, particularly in the paediatric age group.⁷

CONCLUSIONS

This girl has features suggestive of vocal cord dysfunction. She has had recurrent wheezing and respiratory distress with an abrupt onset, that has been poorly responsive to nebulised β_2 -agonists and has suddenly resolved while she was in hospital. Although she is unusually young to be diagnosed with VCD, cases in children as young as 4 months have been previously described.⁸ She follows the pattern of having being treated for 'severe asthma' for a long period prior to diagnosis. During her admissions she has demonstrated distress and symptoms while having normal peak flow measurement, with normal oxygen saturations and blood gas measurements. She has not demonstrated inspiratory stridor, and a pulsus paradoxus has been palpable during some of her admissions. Skin-prick tests were negative and chest X-rays have been normal. Her peak expiratory flow rate has been measured at 240 - 260 l/min between attacks, and at 160 - 250 l/min during attacks (predicted normal value 208 l/min). Flow volume loop performed at the allergy clinic after the last admission (with no symptoms present) showed no inspiratory limb flattening, a FVC of 77% of expected, and a FEV₁ of 62% of expected. Peak flow rates were measured at 60% of expected. No laryngoscopy has been performed.

Although she has features of moderate lower airways obstruction on her pulmonary function tests, her clinical signs and response to treatment are compatible with VCD. She was discharged on treatment for her asthma with inhaled steroids and β_2 -agonists, and will be followed up regularly at the allergy clinic. She has been asked to return to Red Cross Hospital when any further attacks occur, so that spirometry and laryngoscopy can be performed to evaluate the contribution of VCD.

DISCUSSION

Wheezing is not always asthma. Mimics of asthma include VCD, bronchiolitis, tuberculosis, Loeffler's syndrome, pneumonia, foreign body aspiration, cystic fibrosis and others. Differentiating between these conditions may be difficult in atypical cases and the characteristics of inspiratory stridor and expiratory wheezing may not be absolute. Although a rare condition, VCD may be a contributing factor in 40% of asthmatics who are not responding to maximal therapy, and may be the sole diagnosis, accounting for all the symptoms in 10% of this group.⁹ In a study of 50 consecutive moderately severe asthmatics presenting with an acute attack, VCD alone was diagnosed in 10%, VCD and asthma in 12%, asthma alone in 68%; 8% had normal spirometry and laryngoscopy, and 1 (2%) had a polyp.¹⁰ Maximally effective asthma treatment should not be withheld from severely symptomatic patients, but those who are difficult to control or present with atypical features should be referred to a specialist centre where alternative diagnoses can be considered or asthma therapy further improved.

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PRODUCT NEWS



The US Food and Drug Administration (FDA) has approved Singulair (montelukast sodium) 4 mg tablets for the prevention and chronic treatment of asthma in children aged 2–5. Singulair, a member of the leukotriene-antagonist class of asthma medicines, is the first asthma controller therapy in more than 15 years to be indicated in the United States for children as young as 2.

This once-daily treatment option, that is not a steroid, represents a breakthrough for parents of asthmatic children who previously had few options available to them. Produced in chewable cherry-flavoured tablet form, these key prescription drugs offer a simple and convenient dosage regimen, as they do not require children to cooperate while medicine is administered through a device.

Currently available in South Africa in 5 mg and 10 mg dosage, Singulair inhibits physiological actions of a group of leukotrienes known as the cysteinyl leukotrienes (CysLTs) which mediate bronchoconstriction, induce leakage of fluids from blood vessels of the airways (oedema), stimulate the secretion of mucus and recruit eosinophils. Singulair helps treat airway inflammation and bronchoconstriction.

More recent studies indicate that physicians' most potent armament in the treatment of asthma, namely corticosteroids, have no effect on the production of leukotrienes which are potent constrictors of the airways.

The latest findings also suggest that inflammation is an essential component of asthma pathophysiology

and while beta 2-antagonists are used for the short-term relief of acute bronchospasm, anti-inflammatory agents are required for the long-term management of chronic inflammation of the disease.

Since its introduction, the growing body of clinical data on Singulair has shown excellent tolerability profiles resulting in increased quality of life for asthma sufferers. In clinical studies, side-effects seen with Singulair in pre-schoolers were generally similar to those seen in patients 6–14 years of age, which, in turn were similar to those seen with placebo.

Singulair, which was approved by the FDA in 1998 as a 5 mg cherry-flavoured chewable tablet for children ages 6–14 and as a 10 mg tablets for adolescents and adults 15 and older.

Singulair can be used alone as chronic therapy (in combination with rescue medicine) or can be added to a patient's existing treatment regimen.

Notes:

- Singulair should not be used for the treatment of acute asthma attacks.
- While the dose of inhaled corticosteroids may be gradually reduced under medical supervision, Singulair should not be abruptly substituted for inhaled or oral steroids.
- Singulair 4 mg has not been approved for age 2–5 years by the M.C.C.

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