Inducible laryngeal obstruction (ILO) is a reversible narrowing of the laryngeal opening (Fig 1) in response to external triggers, which results in breathing difficulty. It includes the classical presentation of paradoxical vocal cord motion (PVCM), which was previously known as vocal cord dysfunction. This article discusses the symptoms, diagnosis and management of ILO and explains how patients are cared for at the Manchester Airways Service. The service was established in 2016 and initially consisted of a consultant respiratory physician, a consultant speech and language therapist (SLT) and a respiratory nurse. The team has expanded into a larger multidisciplinary team (MDT) that includes the first airways specialist nurse in the country, and input from physiotherapy and clinical psychology to provide specialist holistic care for patients with suspected ILO.

**Key points**

- Inducible laryngeal obstruction is a condition that causes attacks in which the laryngeal opening narrows
- Triggers include exercise, irritants and emotional stress; diagnosis uses laryngoscopy, sometimes alongside triggers
- The condition is often misdiagnosed as asthma and the two conditions frequently co-exist
- Specialist nurses and clinicians need knowledge of both conditions to ensure accurate diagnosis and management
- The Manchester Airways Service is one of four such specialist services in the UK

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### Abstract

In inducible laryngeal obstruction, external triggers cause attacks in which the laryngeal opening narrows. Its symptoms are like those of asthma, commonly resulting in misdiagnosis, and the two conditions often co-exist: differential diagnosis is therefore crucial. Inducible laryngeal obstruction is diagnosed using laryngoscopy, with provocation of symptoms if necessary. The multidisciplinary team must work collaboratively to treat all aspects of the condition and any comorbidities, and the specialist nurse role is vital in helping patients manage and control symptoms.

### Citation


Diagnosing and managing patients with inducible laryngeal obstruction

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Inducible laryngeal obstruction (ILO) is a reversible narrowing of the laryngeal opening (Fig 1) in response to external triggers, which results in breathing difficulty. It includes the classical presentation of paradoxical vocal cord motion (PVCM), which was previously known as vocal cord dysfunction. This article discusses the symptoms, diagnosis and management of ILO and explains how patients are cared for at the Manchester Airways Service. The service was established in 2016 and initially consisted of a consultant respiratory physician, a consultant speech and language therapist (SLT) and a respiratory nurse. The team has expanded into a larger multidisciplinary team (MDT) that includes the first airways specialist nurse in the country, and input from physiotherapy and clinical psychology to provide specialist holistic care for patients with suspected ILO.

### Inducible laryngeal obstruction

The larynx is situated at the top of the windpipe and contains three parts:

- **The supraglottis** (including the epiglottis);
- **The glottis** (including the vocal cords);
- **The subglottis** (lower region of the larynx).

The vocal cords are folds of tissue in the larynx that protect the airway when swallowing; they usually open during breathing, close during swallowing and vibrate when speaking or singing. The posterior glottic chink is the opening between the cords and the size of the glottic chink is important in respiration and phonation.

The human larynx has several highly complex functions: it must close to protect the airway from life-threatening aspiration, but must open fully during exercise to optimise airflow and thus exercise performance (Halvorsen et al, 2017).

The degree of laryngeal obstruction can vary from mild to severe and includes near-complete closure in some cases (Maat et al, 2009). However, there is currently no gold-standard validated scoring system that differentiates normal from abnormal responses. The pathophysiology of ILO is unknown, and no organic cause has yet been found. Identification of triggers for each individual is, therefore, paramount for assessment, diagnosis, treatment and prevention.

### Epidemiology

No key epidemiological data is available about ILO, such as its prevalence,
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incidence, age and sex distribution; however, Newman et al (1995) found that, of 95 patients hospitalised with a diagnosis of ILO, 84% were female and the average age was 39; 56% of the patients also had asthma. All had laryngoscopic evidence of PVCM, with inspiratory and/or early expiratory vocal cord adduction. Halvorsen et al (2017) also highlighted that the majority of ILO patients are female and there is a broad age range. Other evidence suggests that ILO is especially common in people with certain airway diseases, such as asthma (Lillie and Fowler, 2013). Lee et al’s (2018) study of 69 patients that found 42% had objective evidence of both ILO and asthma, further highlighting the need for joint assessment and treatment by a service with expertise in both. There also appear to be psychological factors: Gregson et al (2011) reported symptoms of significant anxiety in 45% of patients and symptoms of depression in 30% of patients with a respiratory disease.

Diagnosis and management

The most common inducers of laryngeal obstruction are exercise, irritants and emotional stress. An inducer in this context is defined by its ability to trigger sufficient narrowing of the laryngeal space to cause breathing difficulties, along with confirmed laryngoscopic appearances compatible with ILO (Halvorsen et al, 2017).

Triggers for ILO attacks include:
- Inhaling irritants such as perfumes or aerosols;
- Having a cold or viral infection;
- Temperature changes;
- Eating triggers, for example, crumbly, dry or cold foods;
- Using a powder-based inhaler;
- Mechanical triggers, such as laughing, coughing or talking;
- Strong emotions or stress;
- Daily activities such as exercising;
- Triggers that are not readily identified (Lillie and Fowler, 2013).

The gold-standard diagnostic assessment for ILO is provocation laryngoscopy (Haines et al, 2010). Laryngoscopies can demonstrate narrowing of the supraglottic and/or glottic areas of the larynx during the inspiratory and/or expiratory phase of the respiratory cycle. These are all types of ILO, however, inspiratory glottic ILO is the most common (Lee et al, 2018). Symptoms can occur quickly, therefore, irritants that have previously provoked symptoms can be used to trigger them during the laryngoscopy.

To ensure accurate diagnosis and treatment, an assessment of the upper airways is crucial. This is due to the wide variety of conditions that may co-exist and be responsible for persistent ongoing or additional symptoms, including rhinitis, nasal polyps, reflux, heightened laryngeal sensitivity, breathing pattern disorder and asthma. The MDT must, therefore, work collaboratively to treat all aspects of the ILO and any comorbidities.

Physiotherapists play an important role in breathlessness management for patients with ILO. The various dimensions of dysfunctional breathing may be of greater or lesser importance in the treatment of different cases and breathing-training protocols need to address an individual’s specific type of breathing dysfunction, for example hyperventilation, breathing pattern disorder or anxiety and fearful cognitions related to dyspnoea and the ability to control breathing (Rosalba, 2017).

Depression and anxiety are a significant comorbid factor for ILO (Gregson et al, 2011) and are associated with worse health status and breathlessness in respiratory conditions (Lunn et al, 2017), so clinical psychologists are vital within the team. They work with the respiratory team to support the more complex respiratory patients, providing clinical input both directly and indirectly. They also provide consultation and advice on psychological issues linked to patient care, through individual case discussions, joint patient appointments and wider staff training (Stern et al, 2015).

ILO causes a variety of respiratory symptoms that can mimic asthma (Lee et al, 2018; Fretzayas, 2017; Halvorsen et al, 2017). Consultants who oversee treatment and diagnosis must distinguish between the two conditions. Before a diagnosis of ILO has been established, most patients have been treated solely for asthma and have often been given regular high-dose steroid treatment (Fretzayas, 2017). Consequently, some have been misdiagnosed with asthma for long periods and have had treatment inappropriately escalated with poor results (Truong and Truong, 2011).

Diagnosis at the Manchester Airways Service

Patients are referred to our service by GPs and hospital-based professionals both regionally and nationally. It is one of four such services in the UK and works alongside the severe asthma service at Manchester University Hospitals NHS Foundation Trust, because joint care is often required. When patients are referred to our service, we import any previous relevant investigation results to ensure we have as much information as possible and no tests are repeated unnecessarily. In a patient’s first appointment, a full clinical history is taken and initial investigations are completed. The MDT provides a full in-depth respiratory assessment then collates the information, contributing to a holistic plan of care. The patient then has a provocation laryngoscopy; for example, if exercise triggers their symptoms, we use equipment such as a static bike or stepper to enable visualisation of symptoms in a clinically relevant context.

Identifying ILO in clinical practice

Signs and symptoms of ILO include:
- Shortness of breath;
- Noisy breathing from the throat;
- Cough;
- Upper-chest tightness;
- Voice changes/complete loss of voice;
- Heightened laryngeal sensitivity;
- Globus (sensation of a lump in the throat);
- Choking or swallowing problems.

Within clinical practice, health professionals may be caring for patients who present with one or more of these symptoms. ILO cannot be diagnosed without expert knowledge and objective evidence, so patients presenting with suggestive upper-airway symptoms must be referred for a specialised assessment to establish diagnosis. During an acute ILO attack, patients can feel as though they are being choked; this can be very frightening, both for them and for people around them, including health professionals who do not...
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know how to manage the condition (Ng, 2017). Patients with a previous confirmed diagnosis of ILO should only be assessed by specially trained staff who have previously witnessed attacks and cared for patients with ILO. These are also the only team members who should provide advice for future management of the condition. Successful management depends both on correct diagnosis of ILO and any associated comorbidities (Kenn and Balkisson, 2011) because laryngeal dysfunction-specific therapies, such as speech and language therapy, may not provide optimal symptom relief if an ongoing comorbidity is causing symptoms (Lillie and Fowler, 2013).

ILO is non-life-threatening: in the most extreme cases, patients can lose consciousness for a few seconds, which can be worrying for both the patient and any witnesses. When diagnosis is confirmed by a specialist centre, patients can be given advice on how to manage attacks, for example by using an emergency-breathing technique; this is usually taught by a specialised SLT at their initial therapy session. The patient takes a long, gentle breath in through the nose to open the larynx; then, with pursed lips, they take two relaxed breaths out and relax their shoulders to help open the airways and keep them patent. Speech and language therapy has long been considered the mainstay of ILO treatment (Kenn and Balkisson, 2011) and is associated with an improvement in symptoms and laryngoscopic appearance (Fowler et al, 2015).

If it is not evident that a patient’s attacks are solely related to ILO, a nurse should perform basic observations – such as measuring blood pressure, respiratory rate, heart rate, temperature and oxygen levels – and seek urgent medical advice if unsure. If attacks are suspected to be caused by asthma, differential diagnosis must be considered as ILO is most often presumed to be severe asthma. ILO symptoms usually present within seconds and do not respond to inhaled therapy, and the breathing characteristics usually demonstrate a prolonged inspiratory phase of breathlessness with cough, throat disturbances and possible voice disturbances. In contrast, asthma and lower-airway dysfunction usually present with a more gradual onset of symptoms, usually respond to inhaled therapy, and the breathing characteristics often include an expiratory wheeze and lower-cheest breathlessness (Hull et al, 2016). Conditions other than asthma may also be mistaken for ILO: dysfunctional breathing, chronic rhinosinusitis, gastro-oesophageal reflux disease and chronic cough have been associated with its development (Gurevich-Uvena et al, 2010). This can also lead to co-existing conditions being left untreated, which, in turn, may contribute to ongoing symptoms.

The role of the specialist nurse

Following initial referral, the specialist nurse undertakes a comprehensive assessment of each patient, including obtaining a full medical history and carrying out clinical tests, to gain an in-depth understanding of their current condition. Tests include chest auscultation, lung function testing and fractional exhaled nitric oxide measurement. Patients are also asked to complete a vocal cord dysfunction questionnaire, a screening tool used to ascertaining their awareness and acknowledgement of their symptoms to ascertain which affect them the most (Fowler et al, 2015).

In my role as airways specialist nurse, I independently review patients and liaise with members of the MDT as necessary. I review patients who have ILO and comorbidities such as asthma, allergic rhinitis or gastro-oesophageal reflux disease, providing medication management and advice as a non-medical prescriber. A major part of my role is education for non-specialist staff and patients. My extensive experience of working in a severe asthma service has proven invaluable in caring for patients with ILO and helping ensure they receive the correct diagnosis. Patients in severe asthma services are often referred to our service for assessment if their symptoms have not adequately improved following an increase in asthma treatment, or if they have symptoms suggestive of co-existing ILO. Because the two conditions can co-exist, the involvement of a specialist nurse with knowledge of both is key to ensuring accurate differential diagnosis and the correct treatment (Virchow, 2016).

Conclusion

ILO can mimic asthma symptoms and co-exist with common conditions such as asthma, reflux and nasal disease, so differential diagnosis is crucial to ensure the correct treatment and management. The gold standard of diagnosis for ILO is laryngoscopy, with provocation if necessary. The specialist nurse role is a fundamental part of the MDT, helping ensure accurate diagnosis and helping patients manage ILO and any co-existing conditions.

References


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