

The Obstructed Paediatric Airway – Recognition and Assessment

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Introduction

This chapter will discuss the importance of recognising the severity of upper airway obstruction in the child and methods of assessment.

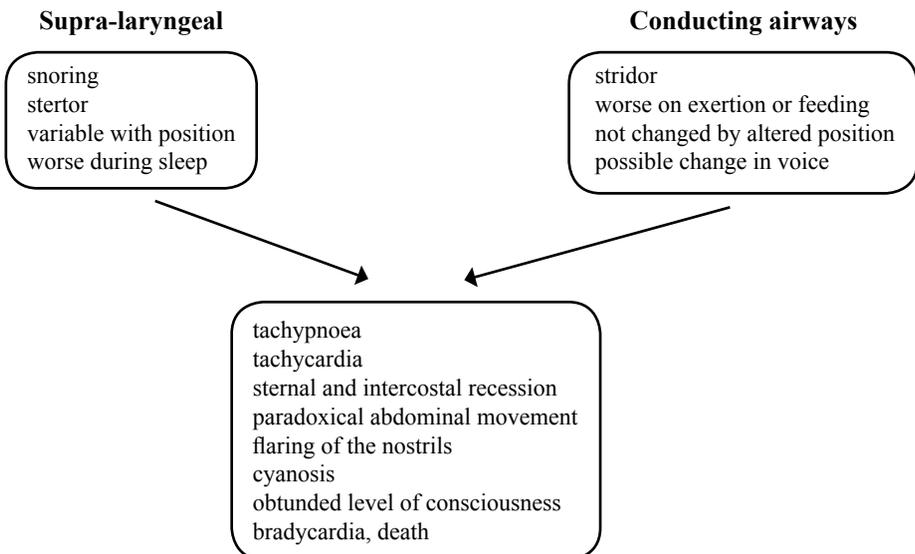
The neonatal larynx differs from the adult in that the supraglottis is elongated and soft, so that the introitus to the airway is much more tubular. Poiseuille's Law states that the rate of airflow through a tube is proportional to the fourth power of the radius, so that even a small reduction in the lumen of the airway will result in a very large decrease in the airflow. Conversely, if the size of the airway can be increased by even a modest amount, then the airflow will be significantly increased.

Assessment

The first step is to determine if possible whether the obstruction is above the level of the vocal cords, ie supraglottic, or in the lower conducting airways.

It is essential to undress the child so that at least the chest can be observed, and a good light will allow assessment of cyanosis.

The relevant features can be listed thus:



progressive, death will ensue without timely intervention. The purpose of assessment is to determine how far down the path the child has gone and whether he is continuing to get worse. Appropriate intervention will be determined by proper recognition of the problem.

For example, a rising respiratory rate and more recession are indicators of deterioration. A reduction in the level of stridor may mean that the child is getting exhausted and that there is less airflow, and this may be accompanied by a reducing level of consciousness.

Examination

It is essential to observe and record the following features:-

- Audible stridor or stertor
- Use of accessory muscles
- Colour – pale, flushed, cyanosed
- Oximetry
- Pulse monitor
- Dribbling – may indicate ingested FB or acute painful inflammation
- Restless or sleeping – but beware the exhausted child
- pCO₂

Investigations

It is always advisable to monitor oxygen saturation with pulse oximetry, but remember that any fall in pO₂ is a late phenomenon. A rising pCO₂ is a more reliable indicator of reduced ventilation and can be recorded by capillary sampling or expired CO₂ levels (capnography).

Oximetry also allows continuous recording of the pulse rate, and is a useful guide. If a foreign body is suspected, radiology is essential, though most FBs are radiolucent. There may be evidence of air trapping or collapse within the lung fields.

There are various supportive measures that can be undertaken in airway impairment

- Oxygen – but its use may mask hypoventilation and hypercapnoea
- Dexamethasone or hydrocortisone IV – may reduce acute inflammation
- Nebulised 1:1000 epinephrine, 2ml in 2ml normal saline – will reduce acute oedema of the airway
- (Heliox – 20% O₂ 80% He – not often used or available but may buy time if all else fails. The helium is less dense than air and so more easily passes the obstruction.)

Airway endoscopy

Although an experienced clinician will usually know by this stage what the diagnosis is likely to be, no-one is infallible, so approach endoscopy with a receptive mind.

Fibre-optic airway endoscopy (do not call it “nasendoscopy”, which implies examination of the nose) can be carried out without anaesthesia in babies. Older children may prefer a little topical anaesthetic. A good view can be obtained of the oropharynx and supraglottis, but an adequate view below the cords is unlikely.

Rigid airway endoscopy provides the definitive examination of the airway and also allows a therapeutic role if a remediable condition is found.

The indications for rigid endoscopy are:

- Known or suspected foreign body in the airway
- Worsening stridor or obstruction
- Hoarse voice
- Significant airway obstruction
- Associated features
 - dysphagia
 - aspiration
 - failure to thrive
 - cyanotic attacks
 - radiological abnormality
- Diagnostic uncertainty

Rigid endoscopy is performed under general anaesthesia and requires close cooperation between anaesthetist and surgeon. The larynx is first examined closely under suspension laryngoscopy and the use of a 4mm telescope and television screen makes examination easier. The distal airway can then be examined by passing the telescope between the cords and into the trachea and bronchi.

Alternatively, a ventilating bronchoscope (Storz) with a viewing telescope can be used to examine the whole airway.

Diagnostic endoscopy may not always resolve the problem but will dictate the next step – intubation, definitive surgery or tracheostomy.

Finally, **when should a tracheostomy be considered?**

- Electively, prior to other surgery where there may be airway difficulties
- Electively, for protection of the tracheo-bronchial tree
- Electively, for long term positive pressure ventilation
- Urgently, for the relief of upper airway obstruction when other more conservative measures have failed
- As an emergency (*Amer.* = *emergent*, though *emergent* means something which is *emerging*) when things have gone wrong.

Further readings

1. Bull, PD Evaluation of the pediatric airway by rigid endoscopy. In: Cotton RT, Myer III CM, eds. Practical Pediatric Otolaryngology. Lippincott-Raven, 1999, 477-489.
2. Diagnosis of recurrent intermittent airway obstruction (“recurrent croup”) in children Tonia L Farmer, Daniel L Wohl. The Annals of Otology, Rhinology & Laryngology St. Louis: Jul 2001. Vol.110, Iss. 7; Part 1. pg. 600, 6 pgs.
3. Friedman EM, Vastola AP, McGill TJ et al. Chronic pediatric stridor: etiology and outcome. *Laryngoscope* 1990; 100:277-280.
4. Pryor MP. Noisy breathing in children: history and presentation hold many clues to the cause. *Postgrad Med* 1997; 101(2):103-112.