

Acute upper airways obstruction in children

Croup will be encountered by all GPs and is generally easy to treat. However, careful assessment is essential to exclude sinister causes of obstruction and prevent progression of a 'typical' case to a life threatening situation.

GARY GEELHOED

MB BS, FRACP

Dr Geelhoed is Director of Emergency Services, Princess Margaret Hospital for Children, Perth, WA.

Croup is a common illness of childhood, having a peak incidence of 60 per 1000 child-years in those aged between 1 and 2 years. It is by far the most common cause of acute upper airways obstruction likely to present to a general practitioner or an emergency department.

The diagnosis and management of a typical case of croup can be handled by a general practitioner. It is important, however, to establish that more sinister causes of obstruction are not masquerading as croup and that the 'typical' case does not go on to become life threatening.

Presentation

The typical presentation of croup occurs in a preschool child with a history of recent upper respiratory tract infection. Often the patient has a mild to moderate fever and is snuffly. Parents report that the child had been coughing in a non-specific manner and then started a barking or seal-like cough, a hoarse voice and, if the obstruction is

severe enough, stridor. This type of presentation can occasionally also be seen in older children and in teenagers. Inspiratory stridor is thought to indicate obstruction at the laryngeal level or above, whereas expiratory or biphasic stridor indicates problems in or around the trachea.

Distress caused by respiratory obstruction tends to be most marked in younger children because of the small size of their larynx and the presence of a relatively loose submucous layer, predisposing to dramatic swelling. In addition, the subglottic area is tightly encircled by the cricoid cartilage – this is the narrowest point of the airway in children under 8 years of age, and any swelling in this area caused by inflammation or excessive mucus results in significant airway impingement. It is estimated that a small reduction in the radius of the airway can produce a 16-fold increase in airway resistance. The younger the child, the less the respiratory muscle reserves and the greater the need to watch carefully.

IN SUMMARY

- Acute upper respiratory obstruction in children is common and is usually caused by croup.
- Almost all children who present with croup will benefit from a one-off dose of oral corticosteroids.
- Adrenaline is useful for more severe cases of croup. However, its effects are short lived and it does not change the natural history of croup.
- The possibility of other problems should always be kept in mind, and will often be uncovered by a complete history and examination.
- Other causes should be considered in any child who has severe symptoms, does not respond early to treatment, or has a prolonged course.

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Table. Causes of acute upper airways obstruction in children

Very common

Croup (viral)

Common

Croup (recurrent or spasmodic)

Uncommon

Laryngeal foreign body

Rare

Epiglottitis

Bacterial tracheitis

Trauma

Infectious mononucleosis

Angioneurotic oedema

Retropharyngeal abscess

Inhalation of hot gases

Diphtheria



COURTESY OF PROFESSOR CRAIG MELLIS, WESTMEAD, NSW.

Figure. Acute airways obstruction. Features of viral infection (e.g. fever, nasal discharge) are consistent with croup. However, drooling or hyperextension may suggest other underlying causes. This 3-year-old boy is in the early stages of acute epiglottitis.

Assessment

The diagnosis of croup is generally straightforward, but it should always be remembered that a rare case may progress to life threatening obstruction. Taking a relevant history and keeping all of the possible causes in mind will allow for earlier identification of the cause, especially when a 'typical' case of croup is severe, does not respond to treatment, or is prolonged. Causes of acute upper airways obstruction are listed in the Table.

History

It is important to know whether the child has had croup in the past and specifically if he or she has had mild stridor between acute attacks. This is important because any child who has a pre-existing narrowing of the airway is much more likely to proceed to a dangerous obstruction when an acute obstruction is superimposed on it. It is worthwhile asking whether the child has been intubated in the past (especially if he or she is under 2 years of age), and specifically about

prolonged intubation after birth (for example, if the child was born preterm).

Enquire about possible trauma, toxic ingestions, dysphagia and drooling. In the smaller child, ascertain whether there are any problems with feeding or swallowing difficulties, and if the child has been cyanosed. Any suggestion of more long term obstruction in a younger child could suggest an underlying congenital airway or vascular anomaly – examples include tracheomalacia, congenital subglottic stenosis, congenital bilateral cord, paralysis, laryngeal web or vascular ring compression of the trachea.

An immunisation history should be obtained because of the possibility of diphtheria (very rare), and to check whether the child has been vaccinated against *Haemophilus influenzae* type b if there is any hint of epiglottitis. Classic croup and epiglottitis are generally difficult to confuse because the latter usually presents as a pale, toxic drooling child with a short history who does not cough much, but the distinction may be more

difficult early on.

Ask about possible foreign bodies because these can produce an obstruction of the upper airways and be mistaken for croup. Parents will usually (but not always) volunteer a history of an acute obstruction or a sudden coughing fit, but in some cases the information will not be known to them. The possibility of a foreign body should be kept in mind in children who do not respond to treatment or who have a prolonged course.

Examination

When examining the child, look to confirm the presence of viral symptoms, such as fever and nasal discharge. The child's preferred position may also give clues to the severity of the obstruction and alternative diagnoses. Hyperextension or other abnormal positioning of the neck may suggest a retropharyngeal abscess. Drooling may suggest epiglottitis (Figure), peritonsil abscess or a foreign body in the airway or oesophagus. Associated wheezing may be important – occasionally asthma will be present but wheeze may also be due to a foreign body in the airway or oesophagus, a mediastinal mass or congenital reasons such as a vascular ring, subglottic haemangioma or tracheal stenosis.

A definitive diagnosis may be obtained by viewing the upper airway directly, but this should only be done by an experienced paediatric anaesthetist, intensivist or emergency physician. If the diagnosis is uncertain, a general practitioner's role should be to support the child until more definitive care can be initiated.

Investigations

Most children with typical croup do not require any specific investigations. In difficult diagnostic cases, a lateral soft tissue x-ray of the neck may be helpful. However, if the obstruction is more than mild to moderate then the possible benefits should be weighed against the risks of moving or disturbing the child – expert

advice should be sought. A compromised but functioning airway should never be made worse by upsetting the child.

Current approaches to management

The introduction of corticosteroids to treat croup has been a major change in management. It is interesting to look back only 10 years to see how controversial – and, in some quarters, unpopular – the use of corticosteroids was in treating croup. It is worth noting the following results from the Princess Margaret Hospital for Children in Perth to see what the practice of treating all cases with a one-off dose of oral dexamethasone (0.15 mg/kg) has achieved:

- On average, 1800 children present to the hospital with croup each year. In the past, a general rule of thumb was to admit children with stridor at rest to hospital for observation while allowing those with only occasional stridor and a barking cough to be managed at home. Approximately 80% of patients were sent home with no treatment, and 15% of those would return due to parental concern at apparent deterioration. Since introducing the corticosteroid treatment, the return rate has fallen to around 1%.
- Of approximately 360 children admitted each year for observation, an average of 10% used to be transferred to the intensive care unit. Since introducing corticosteroid treatment, this has become relatively rare: bed days for croup in the intensive care unit have dropped from consistently over 130 days/year to less than 10 days/year.
- Prior to introducing corticosteroid treatment, between 10 and 15 children each year were intubated due to severe obstruction. However, only a few children with croup have been intubated in the past 10 years.
- Since the universal use of corticosteroids was introduced, the

average length of hospital stay for patients with croup has fallen from 2.1 to 0.7 days.

Note that other factors always need to be considered when making the decision to admit a child. These include distance from medical care, the availability of transport, the child's past history with regard to severe airway obstruction, parental concern and attitude.

Treatment in general practice Corticosteroids

Although it is recommended that all children who present to emergency departments with croup be given corticosteroid treatment, it could be argued that the average case presenting to a general practitioner is not as severe and therefore may be treated differently. Given that the natural history for most children with

untreated croup is to recover, it has been suggested that not all children should be given a corticosteroid. However, the following points should be kept in mind for those presenting with very mild croup:

- any child who has had severe croup in the past is more likely to do so again and therefore probably should be treated
- any child who is located far from medical expertise should be treated (e.g. those living in country areas remote from care).

It is also worthwhile remembering that the length of time that children suffer symptoms of croup – even if mild – is approximately halved when they are given corticosteroid, and therefore one could argue for treatment on this basis alone. It is worth pointing out, however, that corticosteroids have absolutely no

Using oral corticosteroids to treat croup

Most children with croup are not distressed and have a barking cough with little or no stridor, but most will benefit from a one-off small dose of oral corticosteroid (see section headed 'Treatment in general practice'). If the child has more pronounced stridor at rest but has little soft tissue retraction and seems unconcerned, then treatment with corticosteroid is probably all that is needed.

Oral or inhaled?

Oral corticosteroids that are suitable for the vast majority of cases have been found to work within an hour and act as fast as inhaled corticosteroids. Moreover, studies have demonstrated that oral corticosteroids are more effective than inhaled budesonide. Given this and the fact that budesonide and the equipment used to nebulise it is approximately 100 times more expensive than oral corticosteroids, there is little indication for budesonide. A number of trials have shown that combining budesonide with oral corticosteroids adds no benefit.

Which drug?

The drugs of choice are dexamethasone (Dexamethasone), in a one-off dose of 0.15 mg/kg given orally, or an equivalent dose of prednisolone (Predmix Oral Liquid, Redipred Oral Liquid, Panafcortelone, Solone), 0.75 mg/kg. In the community setting, it is often more convenient to use prednisolone, rounded off to a simple 1 mg/kg, because it is more readily available. Children generally will tolerate a liquid preparation better than a tablet.

How many doses?

Most children with croup will require only one dose of treatment. However, if symptoms of croup persist (as opposed to the symptoms of a viral infection), a further dose may be given 24 hours later.

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effect on the underlying viral illness that precipitated the obstruction. A child will continue to have a fever, nasal discharge and nonspecific cough for some time as the 'cold' runs its course. A guide to using corticosteroids to treat croup in general practice is given in the box on page 45.

Older children can present with recurrent croup and no viral prodrome. They and their families tend to be atopic and suffer from asthma more than the general population. They should be treated in the same manner as patients with viral croup, but they may benefit from having oral corticosteroids on hand at home.

Other therapies

There is no place for antibiotics in a typical case of croup. The efficacy of water vapour or humidified air is largely unproven, despite once being in common use. These therapies are now unnecessary given the usual early response to corticosteroids.

Severe croup

Given that croup is generally very distinctive and a recognised paediatric spot diagnosis, it is sometimes tempting to put the mind in neutral, give the corticosteroids, and leave it at that. Although the outcome would be fine in the vast majority of cases, occasionally the story is more complex and the patient will require further investigation and perhaps referral to avoid an unsatisfactory result.

A particularly worrying sign is that of altered consciousness reflected as anxiety, restlessness, obvious fatigue and substernal intercostal and subcostal retractions. Decreased air entry and respiratory effort, extreme pallor and cyanosis require immediate intervention. Oximetry is of lesser value in contrast to its use in asthma because children may maintain oxygen saturation percentages in the high nineties even when highly obstructed.

If the obstruction is judged to be severe then nebulised adrenaline should be considered. It is generally thought that adrenaline does not change the natural

history of croup (as measured by the length of hospital stay or the need to intubate) because its effects are short lasting. However, the use of adrenaline will buy time while one is waiting for corticosteroids to work or, in a worse case scenario, waiting for an anaesthetist. Five millilitres of adrenaline 1:1000 nebulised with oxygen can be used for all children, and may be repeated after 10 minutes if needed.

In the past it was recommended that any child who received adrenaline for croup be admitted. However, a number of studies have now shown that children may be sent home safely under the following conditions:

- they have received corticosteroids
- they have improved over a number of hours to have no stridor at rest.

In the rare case of a child with a life threatening obstruction, corticosteroid may be administered intramuscularly or intravenously (in injectable form) if there is concern that he or she may aspirate, given the respiratory difficulties. A child with severe croup and a high fever who does not respond to adrenaline and corticosteroids may have a tracheitis and will need a more aggressive approach.

Specialist referral

In most cases, referral to a specialist is not required. However, patients should be referred if the croup is severe and does not start to settle within an hour of receiving corticosteroid, or if there is any suggestion of epiglottitis or tracheitis or preceding mild symptoms of obstruction.

Conclusion

Acute upper airways obstruction in children is usually due to croup, which is easily treated, rarely needs investigation, and is usually self limiting. Diagnosis and treatment are generally straightforward, but it should always be remembered that a rare case of typical 'croup' may progress to life threatening obstruction or be due to a more sinister acute condition. **MT**