Reminder of important clinical lesson

Never trust a croup...

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Summary

A 2-year-old girl presented to the James Paget University Hospitals Trust with croup-like symptoms and was later discharged with dexamethasone syrup. The patient re-presented 6 h later following maternal concern with signs of acute respiratory distress. After a period of clinical stability, she acutely decompensated without any prior signs of a life-threatening deterioration. She was managed using nebulised epinephrine and showed signs of clinical improvement. Although improvement persisted, the child showed signs of exhaustion following the preceding events and was later intubated with an endotracheal tube and transferred to the paediatric intensive care unit at Addenbrooke's University Hospital, Cambridge. Endotracheal aspiration later grew parainfluenza virus, rhinovirus and *Staphylococcus aureus* and the patient was diagnosed with the exceptionally rare life threatening complications of croup, bacterial tracheitis. The patient was discharged from intensive care 7 days later and has since made a full recovery.

BACKGROUND

Croup is a common paediatric condition and although rare, complications can be life-threatening. Contrary to published literature, the administration of nebulised epinephrine produced a sustained clinical improvement. In response to a clear lack of published literature, we discuss a case, which emphasises the unpredictable and poorly understood natural history and progression of bacterial tracheitis (BT) and the non-reliance on nebulised epinephrine as a differentiating factor. We also highlight that all doctors with paediatric involvement should remain alert and responsive and...never trust a croup.

CASE PRESENTATION

We highlight a case of a 2-year-old girl who presented with typical croup like symptoms, which evolved into the scarcely seen acute BT, despite being clinically responsive to nebulised epinephrine.

The patient was referred to the James Paget University Hospitals Trust and admitted at 20:30 with an atypical dry cough, a marked inspiratory stridor at rest, significant breathing difficulties and clear agitation. Clinical assessment showed SpO₂ 99% on air, temperature 37.1°C, respiratory rate (RR) 16, pulse (HR) 155 and a Brighton Paediatric Early Warning Score (PEWS) of 0. The patient was initially sent home at 23:30 following assessment and managed with dexamethasone syrup. Importantly, an appropriate safety net based on further deterioration following non-response to treatment was given to the patient's mother. At 05:33, the child was readmitted following maternal concern. The clinical picture was one of disorientation, signs of acute respiratory distress (tachypnoea, grunting, flaring of the alar nasi and recession), with observations of SpO₂ 96% on air, temperature 38.3°C, RR 38, HR 154 and a PEWS of 4. A florid blanching erythematous rash was also noted over the upper body. In addition, there were no signs of

drooling, her medical history was unremarkable and most importantly, her immunisation status was up-to-date.

After a period of clinical stability, she acutely decompensated at 15:00 without prior signs of an impending life-threatening deterioration. Clinical assessment at the time highlighted the following basic observations: cyanotic, floppy, SpO₂ 70% on air, RR 20, HR 180 and a PEWS 5. The immediate management strategy was one of escalation to the next step, nebulised epinephrine 5 mg. This was commenced and the patient showed signs of clinical improvement: SpO₂ 95% with 100% O₂, RR 27, HR 140 and a PEWS of 3. Within the next 3 h, two subsequent doses were administered as per national guidelines.¹ During this period, some blood investigations were conducted which showed, full blood count: haemoglobin 12.9, white cell count 15.9 (5–15×10⁹/l), neutrophils 14.17 (1.5–8.5×10⁹/l), lymphocytes 0.96 (1.5–8×10⁹/l), eosinophils 0.05 (0.06–0.62×10⁹/l), basophils 0.01 (0.02–0.2×10⁹/l), C reactive protein 96 and creatinine 51. Although sustained clinical improvement persisted for three more hours with treatment, the child was showing signs of exhaustion (tiredness, decreased responsiveness) following the preceding events of the past 24 h. A multi-disciplinary action plan was implemented, with the key element being prophylactic endotracheal (ETT) intubation in a pre-emptive strategy to ensure airway patency in the likelihood of further decline before transfer. The procedure was complicated with subglottic resistance, (predicted ETT size 4.75, actual size used 4). ETT aspiration later grew three separate organisms: parainfluenza virus, rhinovirus and most notably *Staphylococcus aureus*. These findings helped to create the clinical impression of the exceptionally rare life threatening complication of croup, the superinfection of BT. Shortly afterwards, this young girl was transferred to paediatric intensive care unit at Addenbrooke's University Hospital, Cambridge.

INVESTIGATIONS

- ▶ Culture of endotracheal aspirate – grew parainfluenza virus, rhinovirus and *Staphylococcus aureus*.

DIFFERENTIAL DIAGNOSIS

Possible differential diagnoses for this case include:

- ▶ Acute epiglottitis
- ▶ Spasmodic croup.

TREATMENT

- ▶ Nebulised epinephrine – 5 mg, three doses.

OUTCOME AND FOLLOW-UP

The patient was discharged from intensive care 7 days later and has since made a full recovery.

DISCUSSION

This case gives insight into a rarely seen but life-threatening complication of an extremely common paediatric upper airway infection. A 2010 review of the scarce literature available on this topic rendered an estimated incidence of 0.1 per 100 000.² In a severe croup, nebulised epinephrine is often resorted to, following an escalation in clinical symptoms. The clinical effects of epinephrine in acute airway obstruction are believed to be the result of the drug's α and β adrenergic effect, which leads to the reduction in respiratory secretions and respiratory mucosa oedema, the relaxation of airway smooth muscle and inhibition of the inflammatory process.³ Previously published research has stated that the clinical response to epinephrine is a clear discriminatory factor in enabling differentiation between croup and its rarer differentials.^{4 5} However, a case series by Bernstein *et al* showed that 50% of patients with BT (6 out of 12) actually responded to nebulised epinephrine.⁶

Despite previously stated guidelines, on when to suspect BT, our case adds to previous clinical data and emphasises that there is currently no clear method of accurate differentiation between severe croup and life-threatening BT. This case discusses whether response to nebulised epinephrine is an appropriate method of assessment and whether other potential methods (checking for progressive

neutrophilia and ENT exam/swabs) should be used in conjunction to create an overall clinical picture. It is clear from this case, that early management enabled better prognostic outcomes, particularly with reference to maintaining airway patency and oxygen saturations. Apart from the clinical aspects, this case underlines the definitive need for a sensible, low-threshold safety net, implemented with the full understanding of the child's guardians.

Learning points

- ▶ **BT:**
 - ▶ Doctors with paediatric involvement should remain alert to the potential progression of Croup to the life-threatening superinfection, BT.
 - ▶ Despite previous evidence, there is no clear method of accurate differentiation between severe croup and life-threatening BT.
- ▶ **Safety netting:**
 - ▶ Explanation of signs of impending respiratory decompensation.
 - ▶ Clear delivery of open access for potentially progressive croup.
 - ▶ Appropriate explanation of treatment administration.

Competing interests None.

Patient consent Obtained.

REFERENCES

1. Paediatric Formulary Committee. *BNF for Children 2010-2011*. London: BMJ Publishing Group, Pharmaceutical Press and RCPCH Publications 2010:175.
2. **Tebuegge M**, Pantazidou A, Thorburn K, *et al*. Bacterial tracheitis: a multi-centre perspective. *Scand J Infect Dis* 2009;**41**:548–57.
3. **Zhang L**, Sanguetsche LS. [The safety of nebulization with 3 to 5 ml of adrenaline (1:1000) in children: an evidence based review]. *J Pediatr (Rio J)* 2005;**81**:193–7.
4. **Al-Mutairi B**, Kirk V. Bacterial tracheitis in children: approach to diagnosis and treatment. *Paediatr Child Health* 2004;**9**:25–30.
5. **Cherry J**. Croup. *N Engl J Med* 2008;**358**:384–91.
6. **Bernstein T**, Brilli R, Jacobs B. Is bacterial tracheitis changing? A 14-month experience in a pediatric intensive care unit. *Clin Infect Dis* 1998;**27**:458–62.

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