

The compromised paediatric airway: Infection, bleeding, swelling, trauma

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No conflict of interest



Compromised airway in children

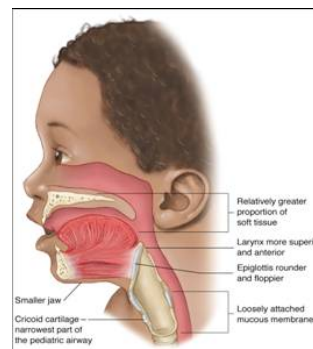
- **Paediatric airway**
- **Etiology of the compromised airway**
 - Infection
 - Anaphylaxis
 - Trauma, bleeding
- **Management of the compromised airway**
 - Basic principles
 - Practical considerations

Compromised airway

- **Airway where you expect difficult ventilation and intubation**
 - Airway obstruction
 - Airway bleeding
- **Cardiac arrest in children often follows acute compromised airway with hypoxemia**

Paediatric airway

- **Subglottic area as narrowest part**
- **Submucosa high number of mucous glands and capillary vessels**
- **Cricoid ring confines swelling to the interior**



Airway infections

- **Acute infections are the most common reasons for airway obstruction**
 - Croup
 - Epiglottitis and bacterial tracheitis
 - Upper airway abscesses
 - Unusual infections

Acute laryngotracheitis (croup)

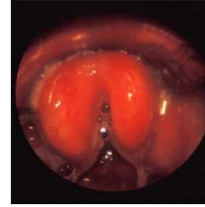
- **Children from 6 months to four years**
 - Parainfluenza and influenza viruses
 - Acute inspiratory stridor, hoarseness and barky cough
 - The pharynx is minimally inflamed
- **Application of humidified air, nebulised racemic epinephrine, oxygen and steroids**
- **Intubation in some cases**



Bjornson, C.L. and D.W. Johnson, Lancet, 2008. 371(9609): p. 329-39.
Hammer, J., Paediatr Respir Rev, 2004. 5(1): p. 25-33.

Acute epiglottitis

- **Serious potentially life-threatening disease**
 - Children 2 to 7 years
 - Seen rarely due to immunization against Hib
 - Anxiety, high fever, drooling, muffled voice, stridor and respiratory distress, no cough
- **Preference of typical position**
 - Maximises airway opening



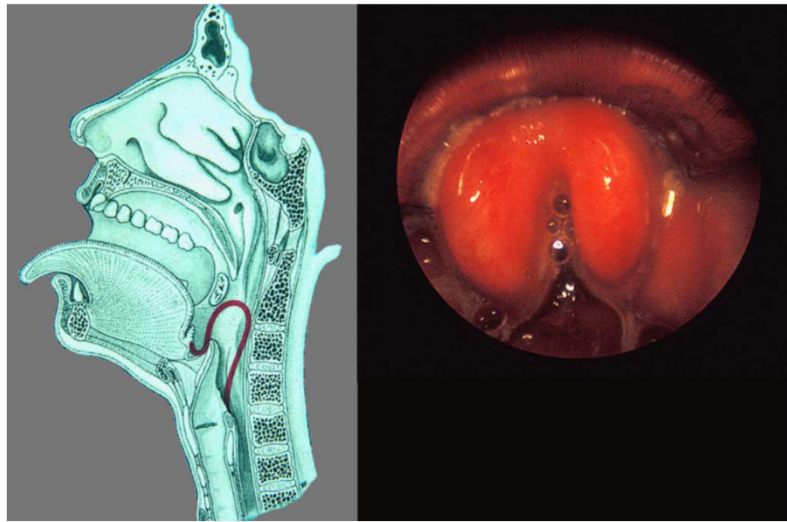
Hammer, J. Paediatr Respir Rev, 2004. 5(1): p. 25-33

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Body posture and airway opening



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Management of epiglottitis

- **Doctor attended transport to a paediatric unit**
 - Respiratory arrest without warning signs
- **Intubation performed by most experienced paediatric anaesthetist**
 - Avoid anxiety-provoking procedures
 - Allow sitting posture during induction
 - Prefer inhalation induction

Hammer, J. Paediatr Respir Rev, 2004. 5(1): p. 25-33



Bacterial tracheitis

- **S. aureus, H influenza and others**
- **Infants and young children**
 - Low grade fever
 - Barking cough
 - Control of secretions
- **Antimicrobial coverage and airway management**

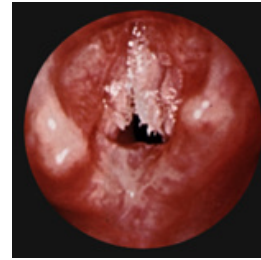
Peritonsillar and retropharyngeal abscesses

- **Age related**
 - Peri- and retrotonsillar abscesses in later childhood
 - Retropharyngeal abscesses 2-6 years
- **History of sore throat and viral URI**
 - Low grade fever „hot potato“ voice
 - Neck pain
 - Occasionally trismus and torticollis
- **Antimicrobial coverage and surgical drainage**



Unusual airway infections

- **Diphtheria**¹
 - Countries without immunization programme
 - Adherent pseudomembranes
- **Infectious mononucleosis**
- **Human Papilloma Viruses (HPV)**
 - Multiple papillomata of the airways

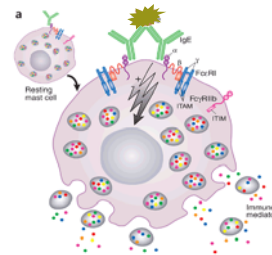


1. Sasidaran, K., A. et al Indian J Pediatr, 2011. 78(10): p. 1256-61

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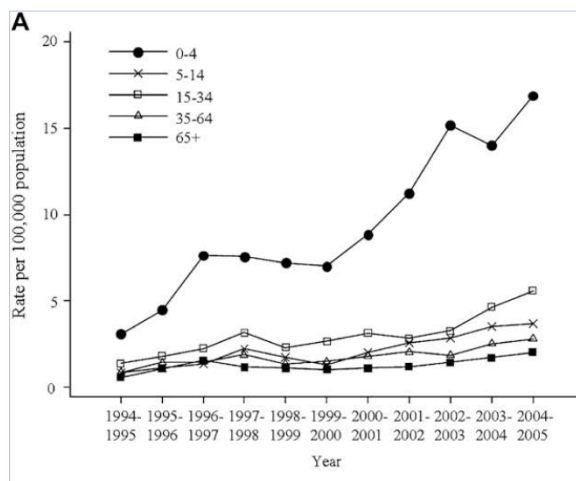
Anaphylaxis

- **Life-threatening airway obstruction**
 - Rapid release of inflammatory mediators
- **Food induced anaphylaxis in children**
 - Fish, milk, nuts and peanuts



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Anaphylaxis

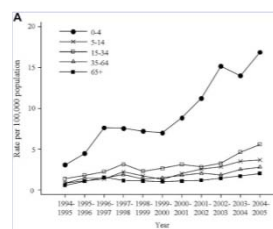


Liew WK et al. *J Allergy Clin Immunol* 2009; 123:434-442.

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Anaphylaxis

- **Life-threatening airway obstruction**
 - Rapid release of inflammatory mediators
- **Food induced anaphylaxis in children**
 - Fish, milk, nuts and peanuts
 - Respiratory symptoms and cutaneous signs
 - Circulatory symptoms are less frequent
- **Application of i.m. adrenaline (10 µg/kg), oxygen, nebulised adrenaline and immediate hospital admission**

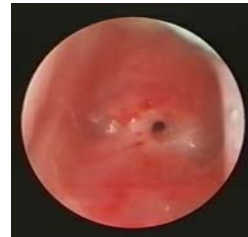


Koplin JJ et al. *Curr Opin Allergy Clin Immunol* 2011, 11:492-496

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Airway trauma

- Trauma caused by direct impact is uncommon
- Laryngeal burns due to hot liquid aspiration ¹
 - Toddlers with facial scalding
- Most paediatric airway traumata are iatrogenic
 - Vocal cord paralysis
 - Subglottic stenosis as a result of prolonged tracheal intubation



1. Rosen, D., et al. *Acta Paediatr*, 2000. **89**(8): p. 1018-20.

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Foreign body aspiration

- Peak incidence in children below 3 years
 - More boys than girls
- Aspirated material
 - Organic, seeds, peanut
 - Toys
- Severe airway obstruction in cases when foreign body is proximal to the carina



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Postoperative complications

- **Swelling and postextubation stridor**
 - Manipulation of the airway
 - Application of dexamethasone and nebulised adrenaline
- **Bleeding**
 - Bleeding after tonsillectomy which needed surgery in about 5 % ¹
 - Impaired laryngoscopic vision



1. Sarny, S., et al., Laryngoscope, 2011. 121(12): p. 2553-60.

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Management of the compromised airway

- **Specific therapy due to the particular aetiology**
 - Antibacterial coverage
 - Steroids, adrenaline
 - Surgery and bronchoscopy
- **Establishing a secure airway**
 - Paediatric anaesthetist will be asked for airway management

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Evaluation and history

- **Characteristics of the illness**
 - Onset and development of respiratory signs
 - Fever, its duration, severity
 - Voice and voice changes
- **Trauma**
- **Foreign body aspiration**
- **Anaphylaxis**



Case report

Food allergy masquerading as foreign body obstruction

Anh Dai K. Nguyen, MD* and James E. Gern, MD†

Background: Allergic reactions to peanut and tree nuts can present as upper airway obstruction.
Objective: To increase awareness that food allergy should be considered in the differential diagnosis of upper airway obstruction in children.
Methods: We report an allergic reaction to cashew that was initially misdiagnosed as foreign body aspiration.
Results: When the presenting signs and symptoms of food allergy are limited to upper airway obstruction, they can be confused with foreign body aspiration.
Conclusions: As peanuts and tree nuts are common causes of both food allergy and foreign body aspiration in children, both of these diagnoses should be considered in the differential diagnosis of airway obstruction.

Ann Allergy Asthma Immunol 2003;90:271-272.

Nguyen AD, Gern JE: *Ann Allergy Asthma Immunol* 2003, 90:271-272. .



Clinical assessment

- **General appearance**
 - Anxiety, posture, cutaneous signs
 - Signs of craniofacial abnormalities, tumour, trauma, position of the trachea
- **Respiratory signs**
 - Stridor, dyspnoea, cyanosis, suprasternal retractions
 - Quality of voice, presence of drooling
 - Use of auxiliary muscles, presence of apnoeic episodes

Careful preparation

- **Anticipating possible mishaps**
 - Knowledge of possible complications
 - Efficient communication
- **Preparing the workplace**
 - All instruments and medications used to manage possible complications should be ready to hand



Anaesthetic medication

- **Short acting, controllable anaesthetics with a wide safety range**
 - Sevoflurane ¹
 - Propofol ²
 - Remifentanil ³
 - Lidocaine

1. Meretoja OA et al. Br J Anaesth. 1996 Jun;76(6):767-71
2. Litman RS et al. Anesth Analg. 2000 Dec;91(6):1389-91
3. Ross AK et al. Anesth Analg. 2001 Dec;93(6):1393-401



Choice of induction technique to manage a compromised airway

- **Survey of 262 anaesthetists in UK (2000) ¹**
 - 100% prefer an inhalational technique in children with a difficult airway (acute epiglottitis)
 - 96% prefer sevoflurane
- **Survey of 63 (136) paediatric anaesthetists in Canada (2005) ²**
 - 90% prefer an inhalational technique in a 9 month old child with Pierre-Robin sequence

1. Moore EW, Davies MW (2000) Eur J Anaesthesiol 17(1):33-7
2. Brooks P et al. (2005). Can J Anaesth 52(3):285-90.



Anaesthetic management

- **The anaesthetist who is most experienced in airway management should perform the procedure**
 - A second anaesthetist or ENT-surgeon should be present in severe cases
 - Don't upset the child
 - Allow the child to keep the preferred posture
- **Inhalational induction with 100 oxygen and sevoflurane in cases of airway obstruction**

Summary

- A compromised paediatric airway can result in a variety of different diseases
- Specific therapy consists in the application of antibiotic medications, corticosteroids, surgical treatment and airway management
- Airway management will be the task of the paediatric anaesthetist in many cases
- The anaesthetist who is most experienced in airway management should perform it
- Careful preparation of the workplace, use of short acting, controllable anaesthetics, anticipating possible complications and good communication skills are essential