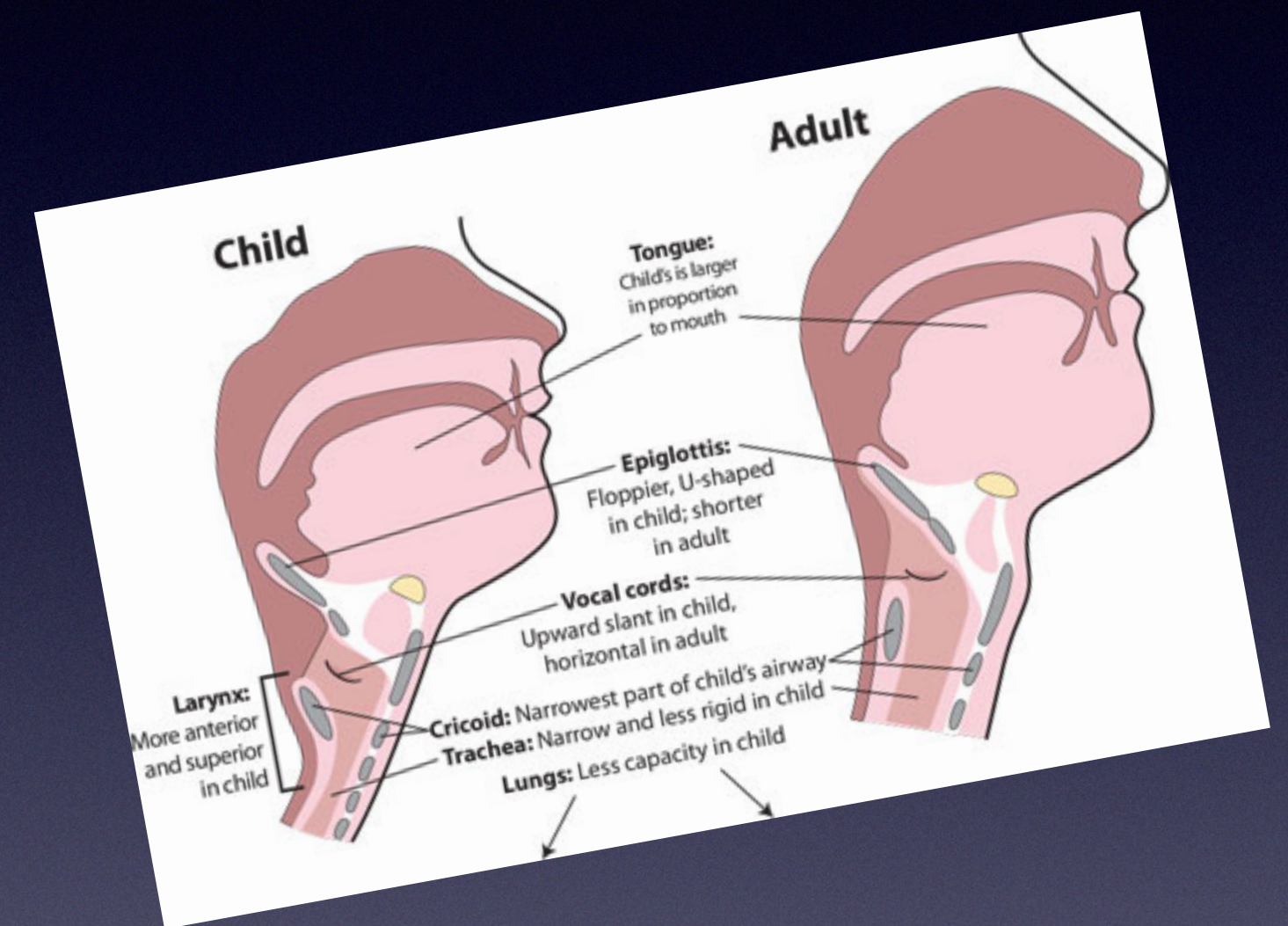
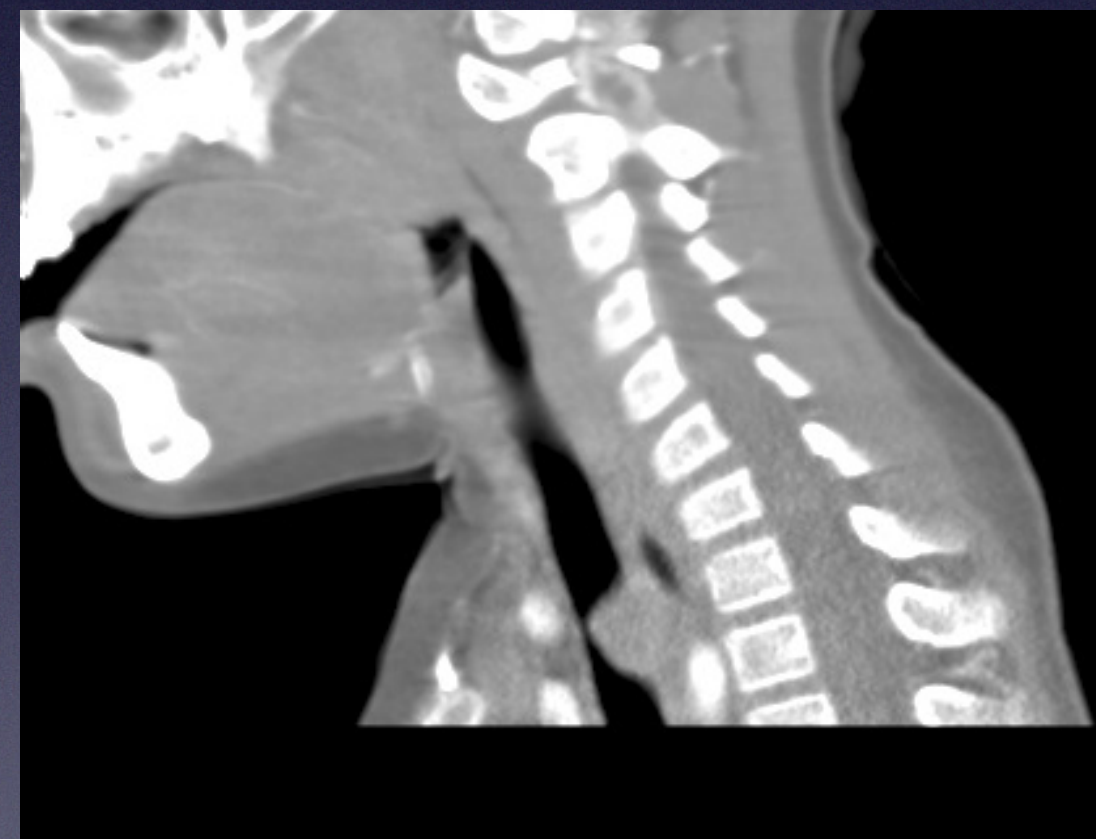
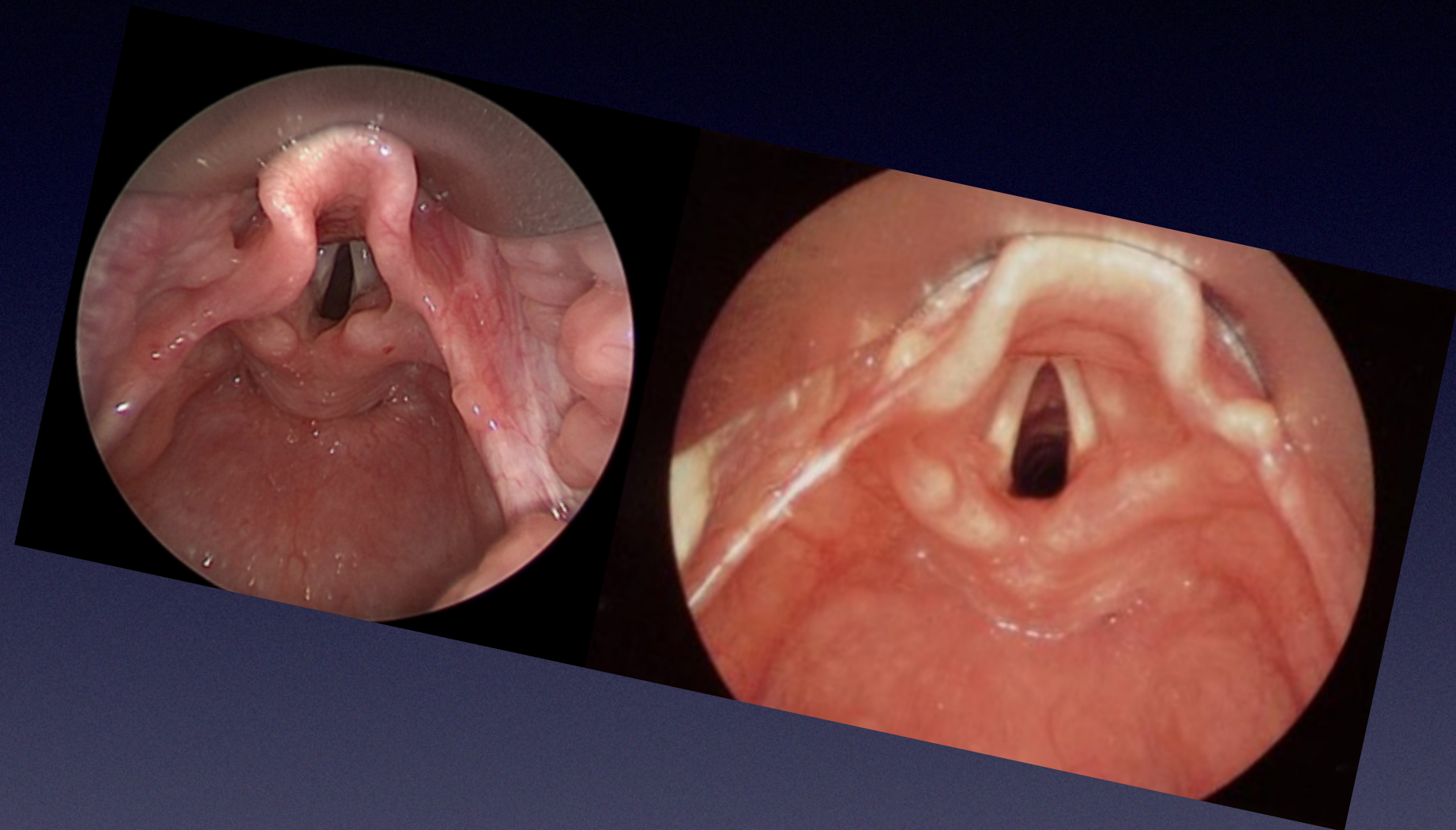


# Barneluftveien









Anatomi

Litteratur, den vanskelige luftveien

Basal teknikk

Hvordan håndtere den vanskelige barneluftveien



# Cornelia de Lange



6 år gammel

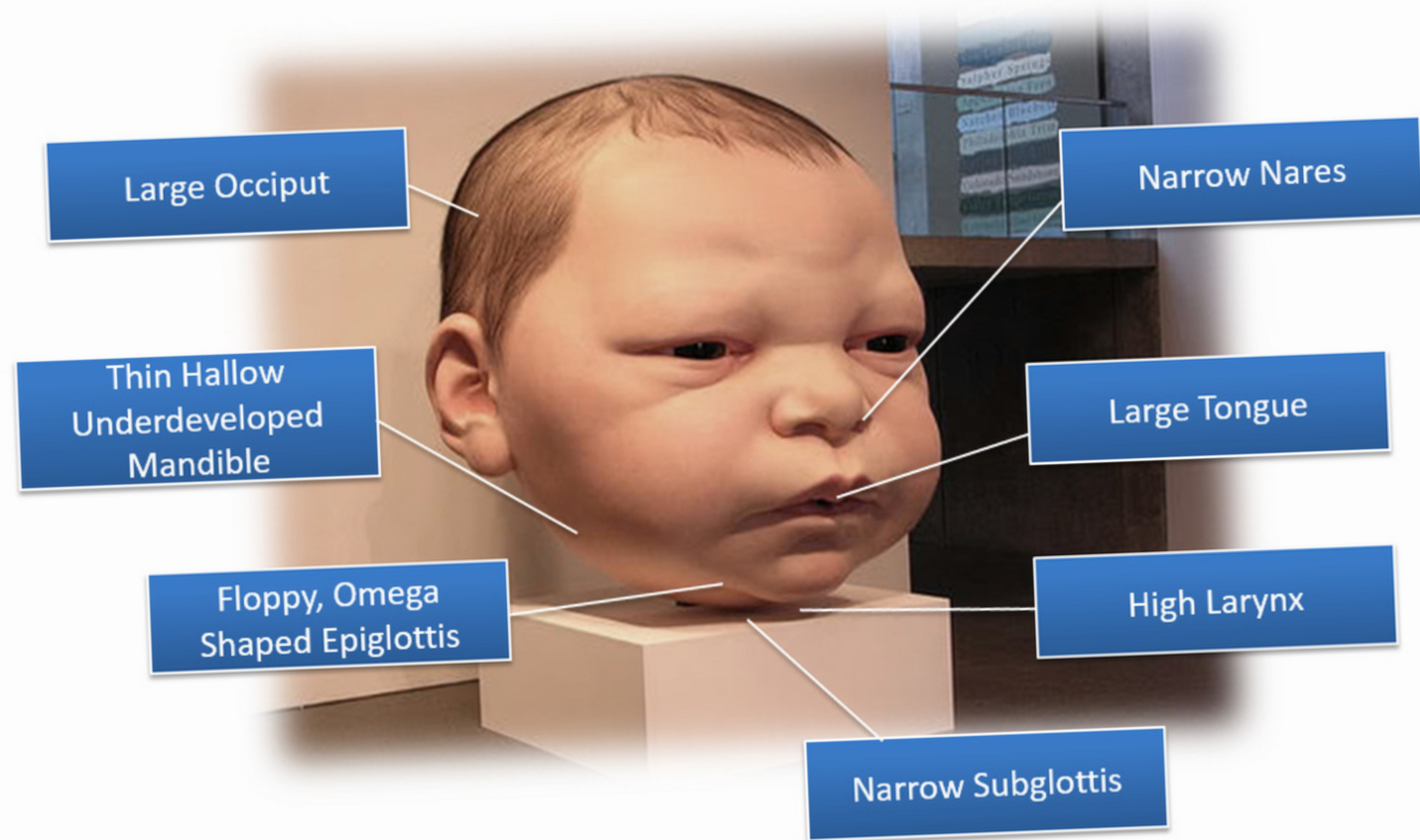
13 kg

Aldri hatt anestesi før



# anatomy

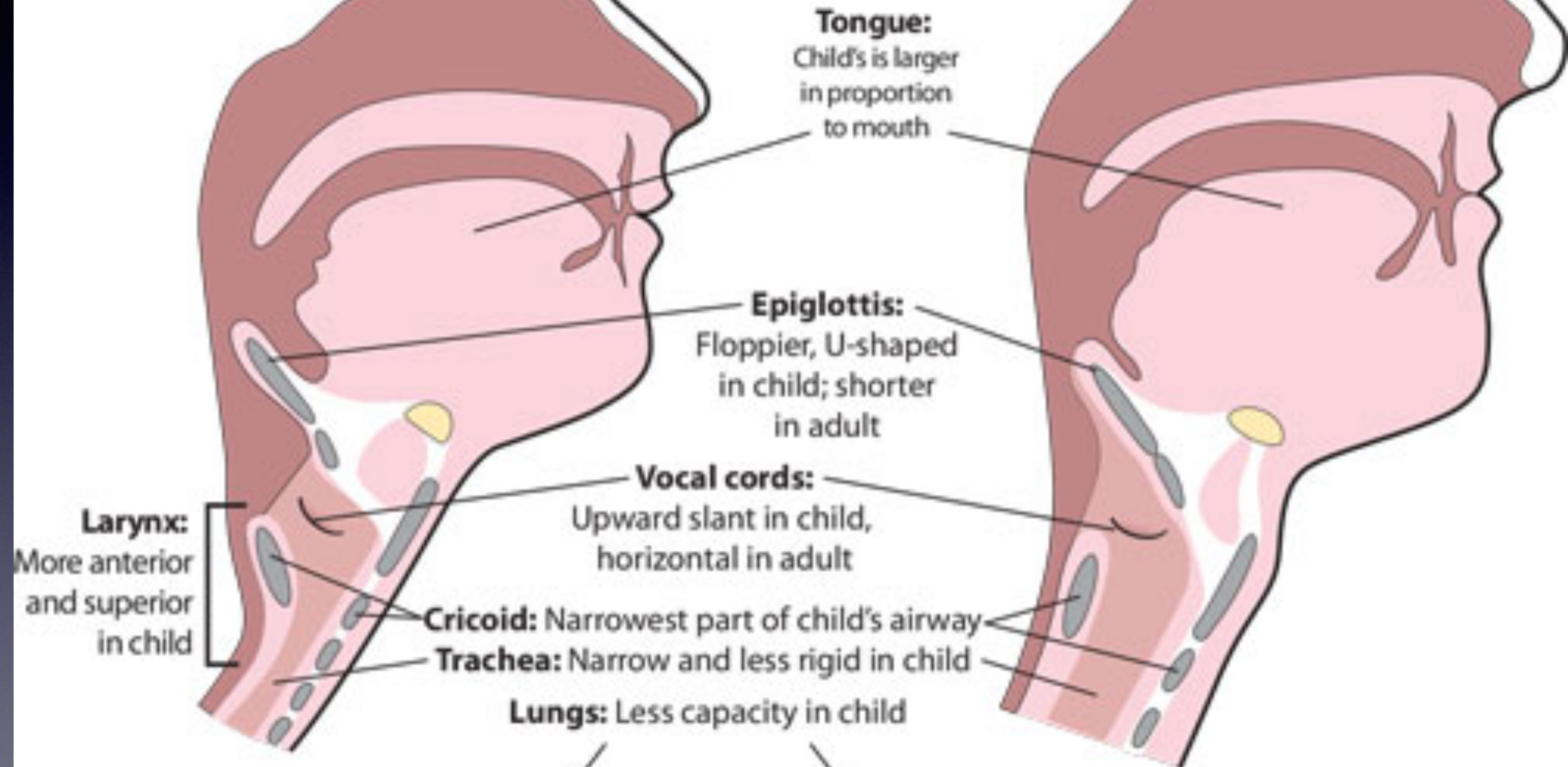
## Infants are Different !





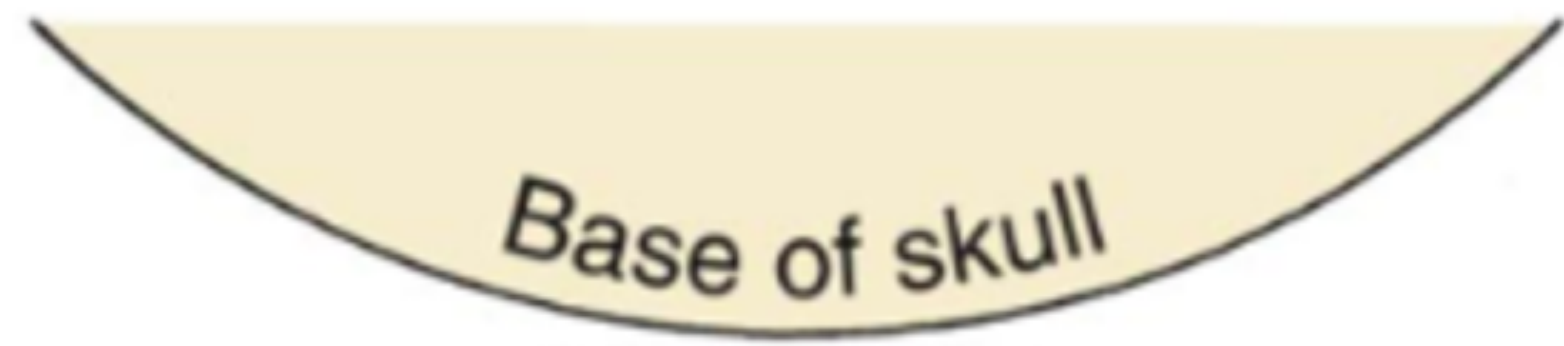
## Child

## Adult





# Glottic Opening Relative to Cervical Vertebra (C)



C1

C2

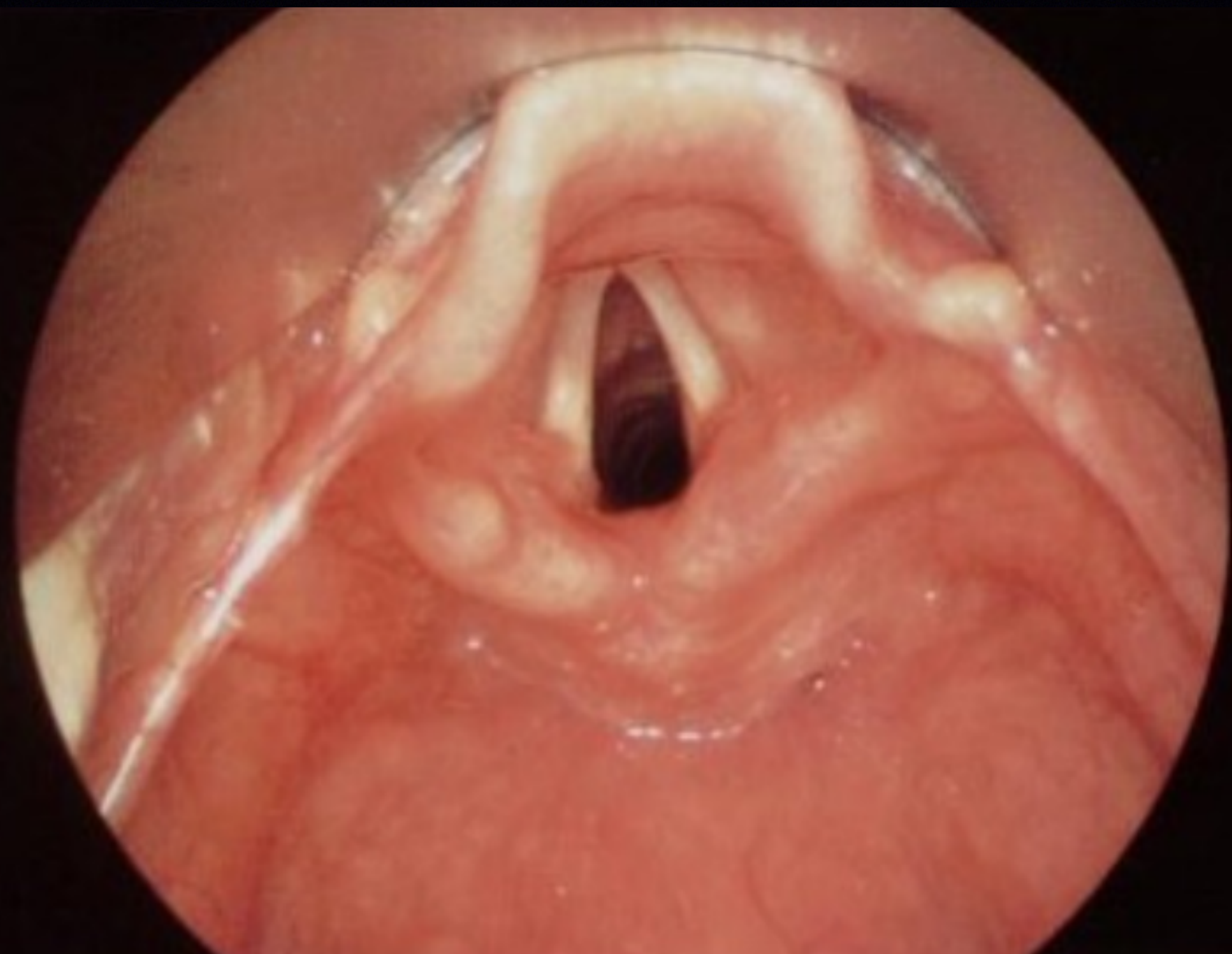
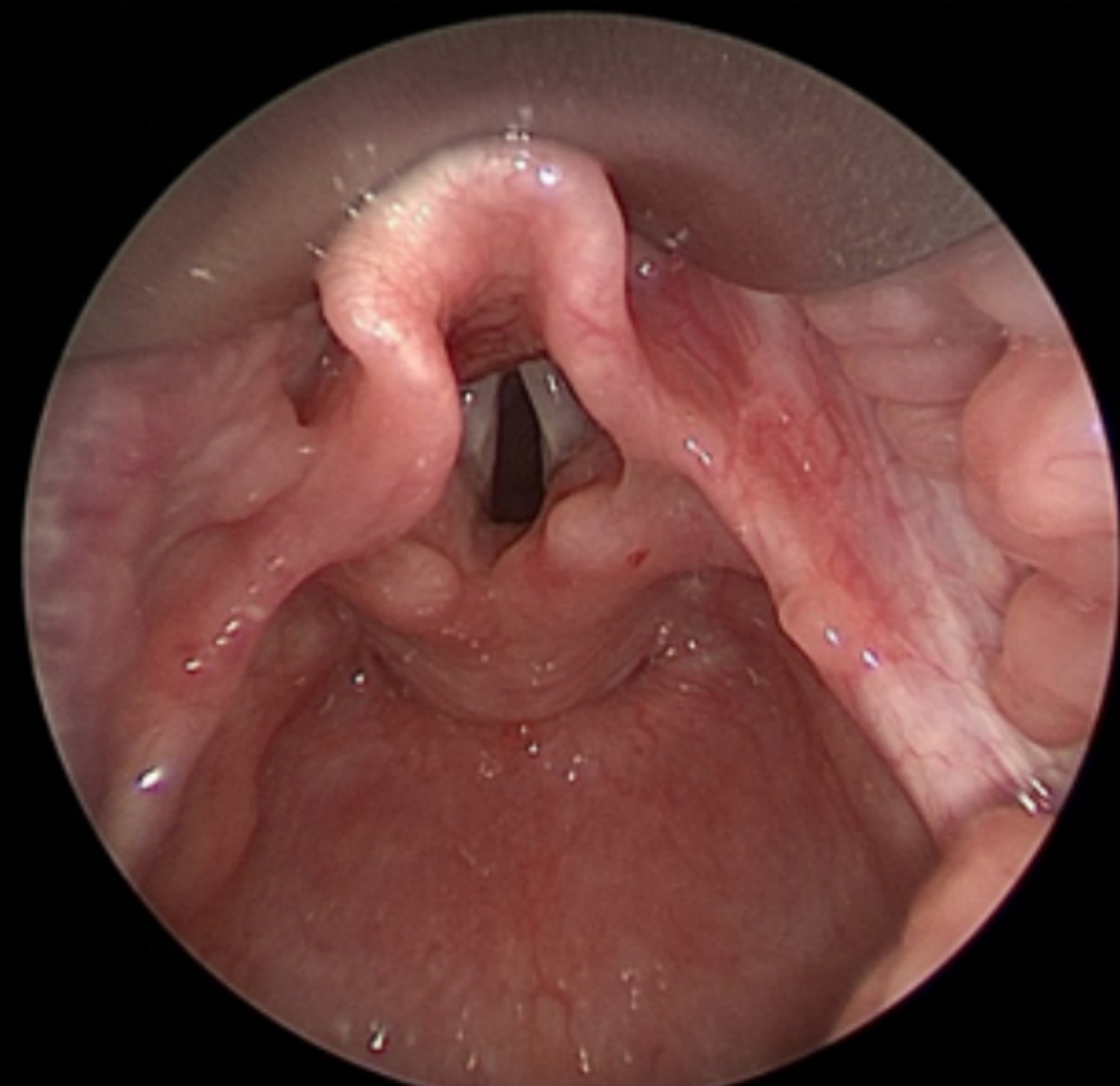
C3

C4

C5

- ← Preterm infant
- ← Full-term infant
- ← Adult











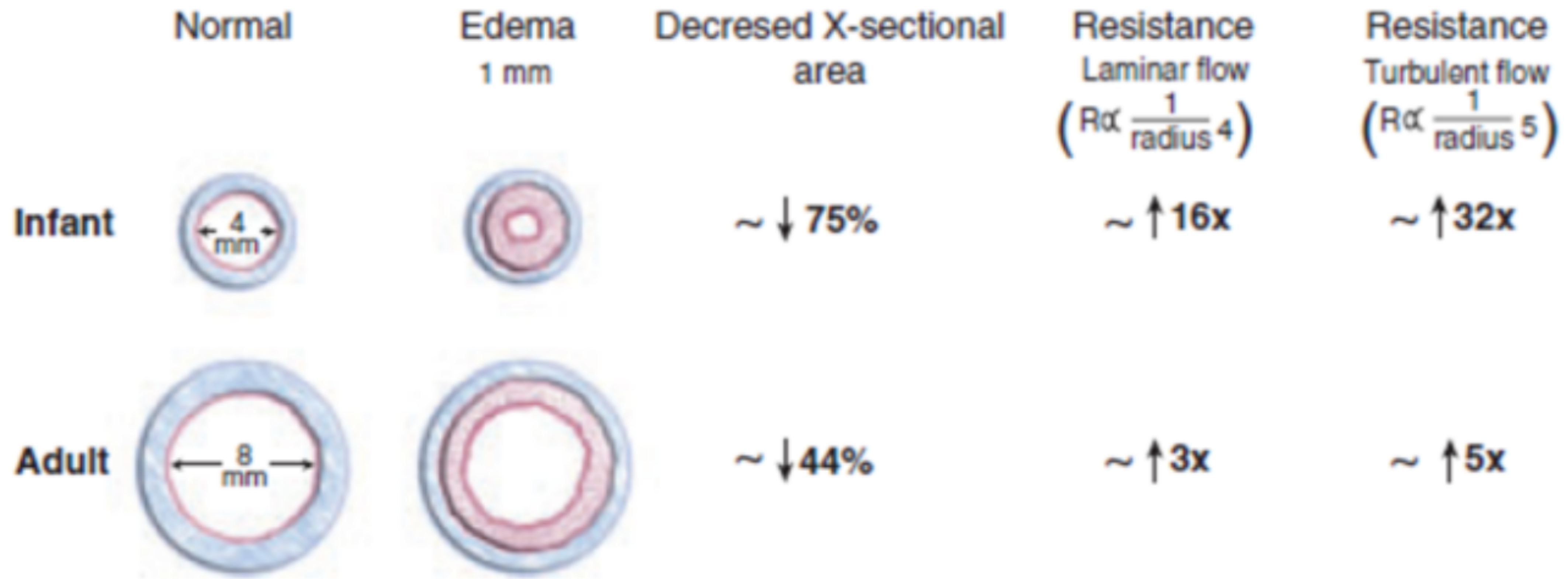


Figure 4. Relative effects of airway edema in infants and adults. Reproduced with permission from Litman RS, et al. *The pediatric airway*. In: Coté CJ, Lerman J, Anderson J: *A practice of anesthesia for infants and children*. 5th edition. Philadelphia, PA. Elsevier, 2013. 237-276.



# Forskjeller barn vs voksne

Luftveien er mindre i diameter og luftveien kortere

Større hode

Større tunge relativt sett

Laryngs mer anteriort hos barn og høyere (c3 og vandrer til c5)

Lang floppy smal epiglottis

Smaleste parti er cricoid( under 10 år)

Større sannsynlighet for turbulent flow pga trangere luftveier

Høyere trykk trengs ved turbulent flow



# Andre utfordringer

Vanskelig kanylering

Faller raskere i saturasjon

Samarbeider dårlig

Foreldre som gråter





Men hva sier litteraturen?





# THE LANCET

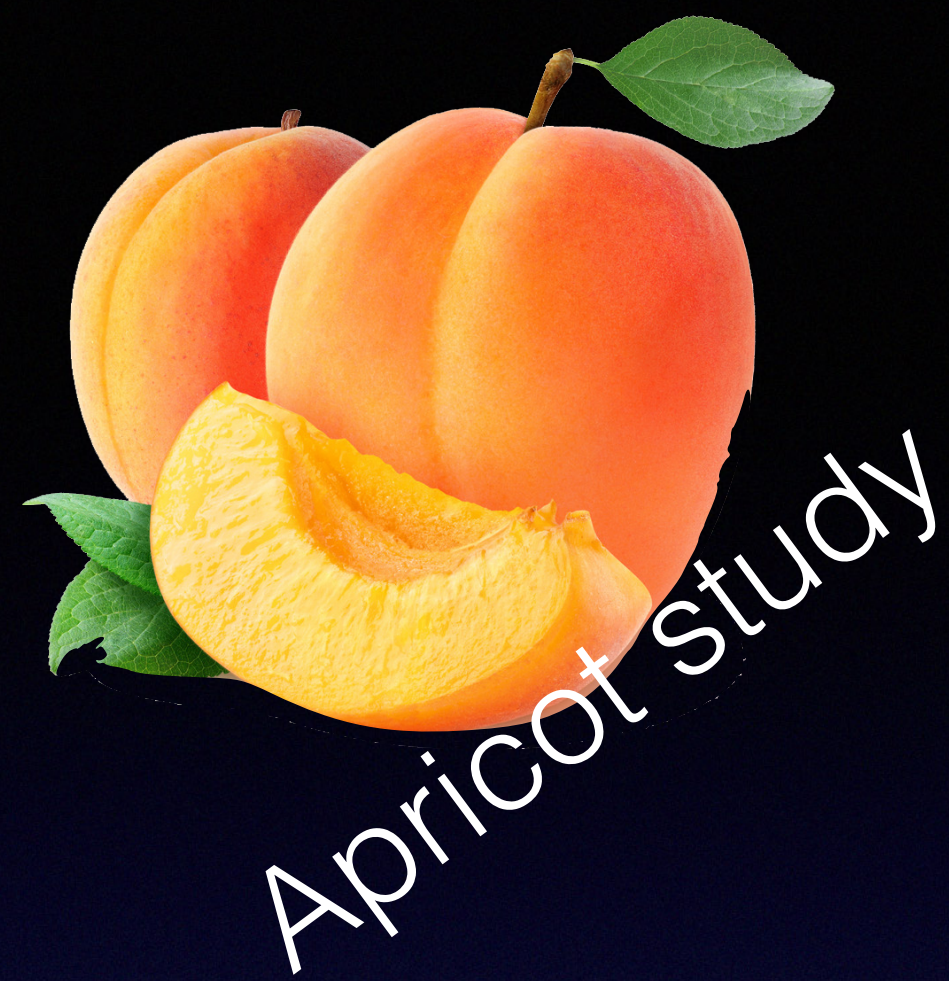
## Respiratory Medicine

ARTICLES | [VOLUME 5, ISSUE 5, P412-425, MAY 01, 2017](#)

### Incidence of severe critical events in paediatric anaesthesia (APRICOT): a prospective multicentre observational study in 261 hospitals in Europe

[Prof Walid Habre, MD](#)   • [Nicola Disma, MD](#) • [Katalin Virag, MSc](#) • [Karin Becke, MD](#) • [Tom G Hansen, MD](#) • [Martin Jöhr, MD](#) • et al. [Show all authors](#) • [Show footnotes](#)





# Risk

30 874 children with a mean age of 6,35 years were included.

The incidence of perioperative severe critical events was 5,2% with an incidence of respiratory critical events of 3,1%

Cardiovascular instability occurred in 1,9% with an immediate poor outcome in 5,4% of these cases.





Respiration and Airway

# Airway management in paediatric anaesthesia in Europe—insights from APRICOT (Anaesthesia Practice In Children Observational Trial): a prospective multicentre observational study in 261 hospitals in Europe

T. Engelhardt<sup>1</sup>  , K. Virag<sup>2</sup>, F. Veyckemans<sup>3</sup>, W. Habre<sup>4,5</sup>,  
the APRICOT Group of the European Society of Anaesthesiology Clinical  
Trial Network

## Results

Details for 31 024 anaesthetic procedures were available for analysis. Three or more tracheal intubation attempts were necessary in 120 children (0.9%) and in 40 children (0.4%) for supraglottic airways insertions. The incidence (95% confidence interval) for failed tracheal intubation and failed supraglottic airway insertions was 8/10 000 (0.08%; 0.03–0.13%) and 8.2/10 000 (0.08%; 0.03–0.14%) children, respectively.



Thomas Engelhardt  
Board Member  
Montreal

Safetots



# Weiss et al

**Unexpected or unanticipated difficult airway:** patients with an apparently normal airway who present complications during anaesthesia management. The incidence of difficulties in this group is 0.08%–1.1%, increasing to 3.5% in children under 1 year of age. The vast majority of these events are caused by functional and/or dynamic changes in the airway arising from inadequate airway management<sup>2, 3, 4</sup>.



Markus Weiss  
Board Member

Zurich



## Results

Tracheal intubation was planned in 4683 procedures. Difficult tracheal intubation, defined as two failed attempts of direct laryngoscopy, occurred in 266 children (271 procedures) with an incidence (95% confidence interval [CI]) of 5.8% (95% CI, 5.1–6.5). Bradycardia occurred in 8% of the cases with difficult intubation, whereas a significant decrease in oxygen saturation ( $SpO_2 < 90\%$  for 60 s) was reported in 40%. No

Nectarine study





Difficult or impossible facemask ventilation in children with difficult tracheal intubation: a retrospective analysis of the PeDI registry

## Results

The incidence of difficult mask ventilation was 9% (483 of 5453 patients). Infants and patients having increased weight, being less than 5th percentile in weight for age, or having Treacher-Collins syndrome, glossoptosis, or limited mouth opening were more likely to have difficult mask ventilation.

likely to have difficult mask ventilation. Anaesthetic induction using facemask and having Treacher-Collins syndrome, glossoptosis, or limited mouth opening were more



# Konklusjon

Luftveien er vanskeligere jo mindre barnet er

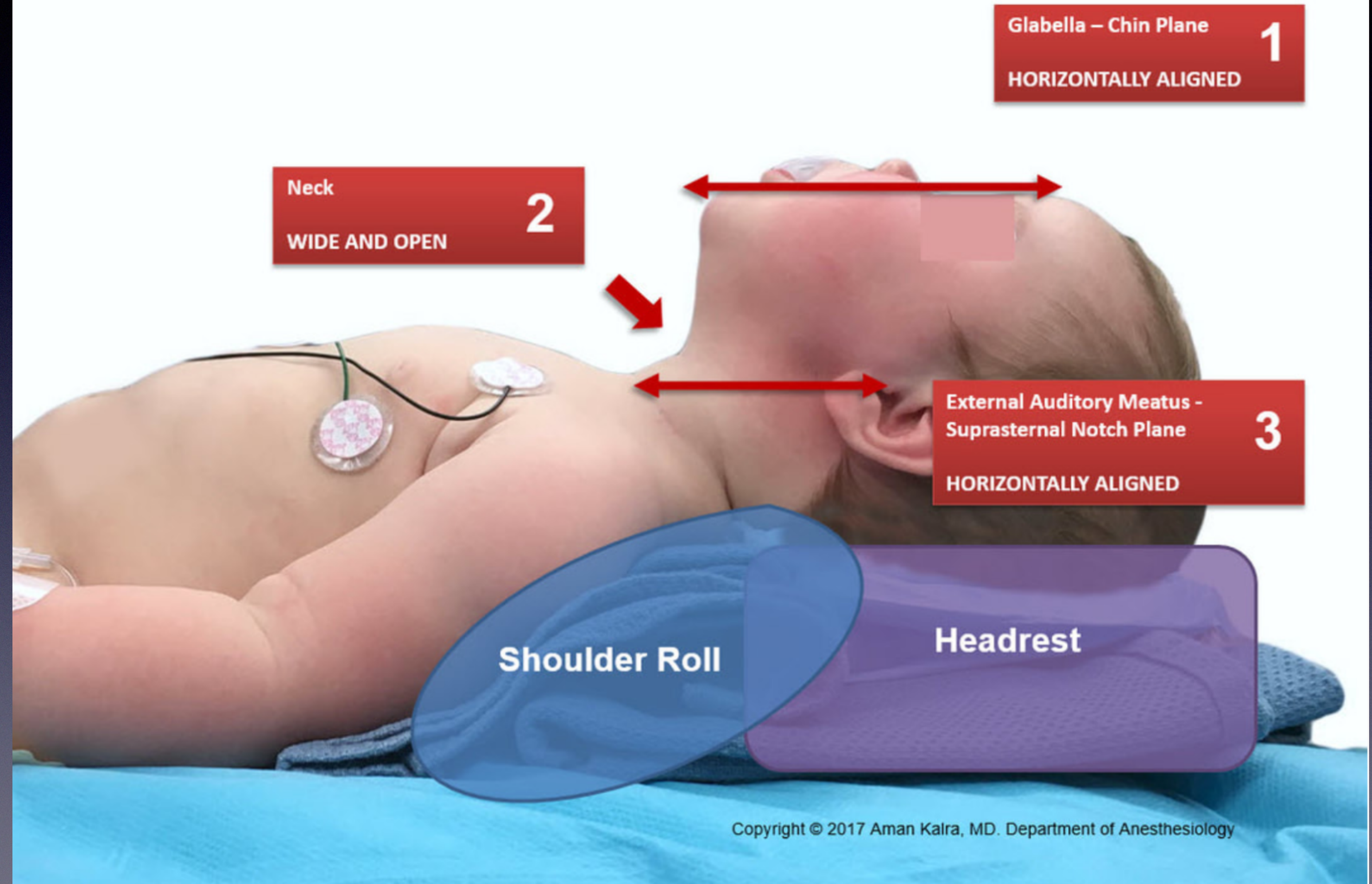
Neonatale har mindre å gå på

Øvelse gjør mester!



# basal teknikk

## An Infant in the “Sniffing Position”





# Masking Technique: Two Hands

A two hand technique provides for optimal jaw thrust, neck extension and mouth opening

Always place the mask on the face starting at the "Glabella". This will assure proper placement and avoid occlusion of the nostrils

Glabella

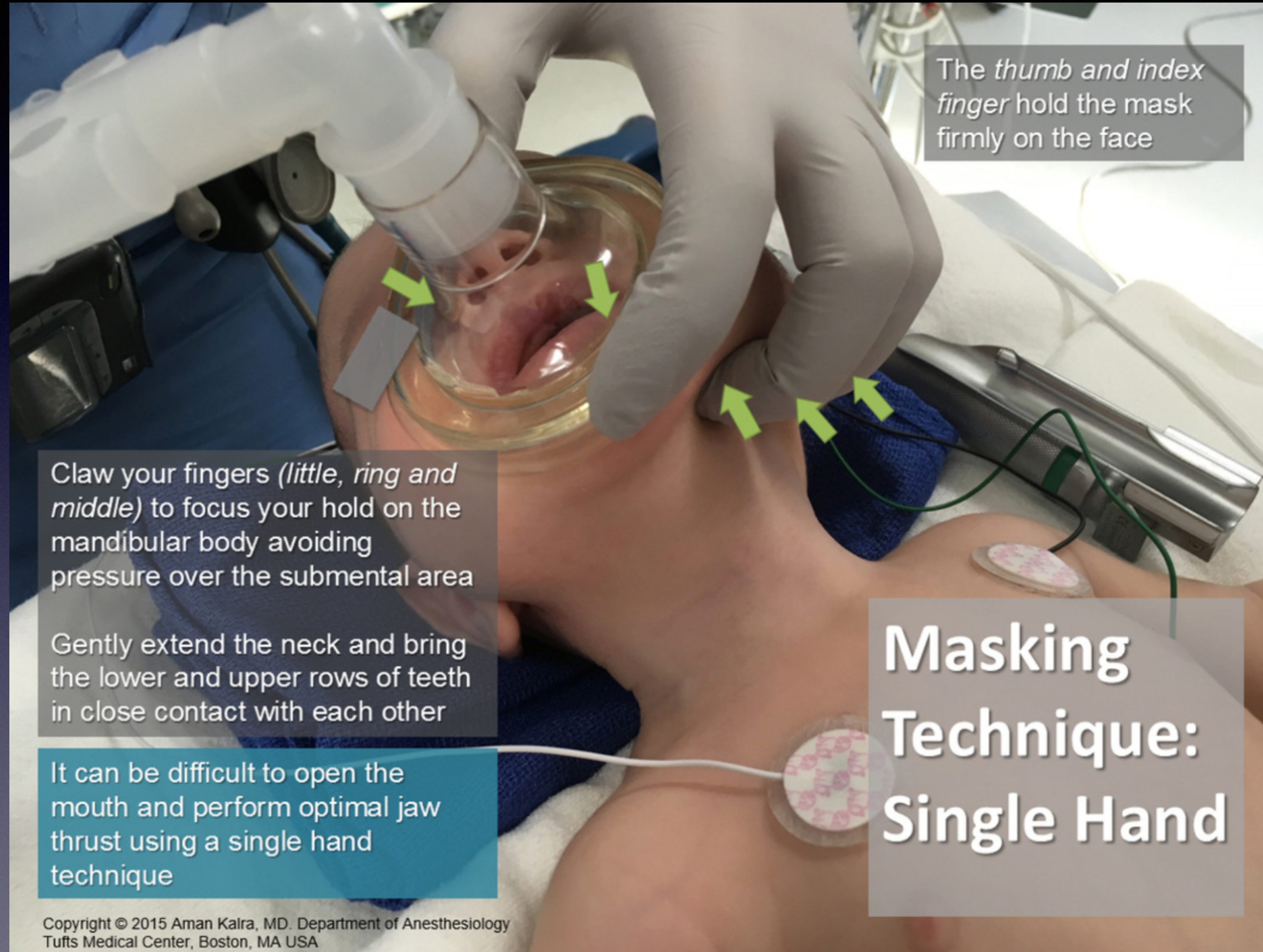
## 2 FORCE VECTORS IN PLAY:

- Mandible is lifted upward and anteriorly (jaw thrust)
- Anesthesia mask is pushed down posteriorly to seal around the mouth and nares

Angle of the Mandible

Use your index / middle finger to gently lift the mandible upward and anteriorly from behind the angle of the mandible, sub-luxating the TMJ in the process





The *thumb and index finger* hold the mask firmly on the face

Claw your fingers (*little, ring and middle*) to focus your hold on the mandibular body avoiding pressure over the submental area

Gently extend the neck and bring the lower and upper rows of teeth in close contact with each other

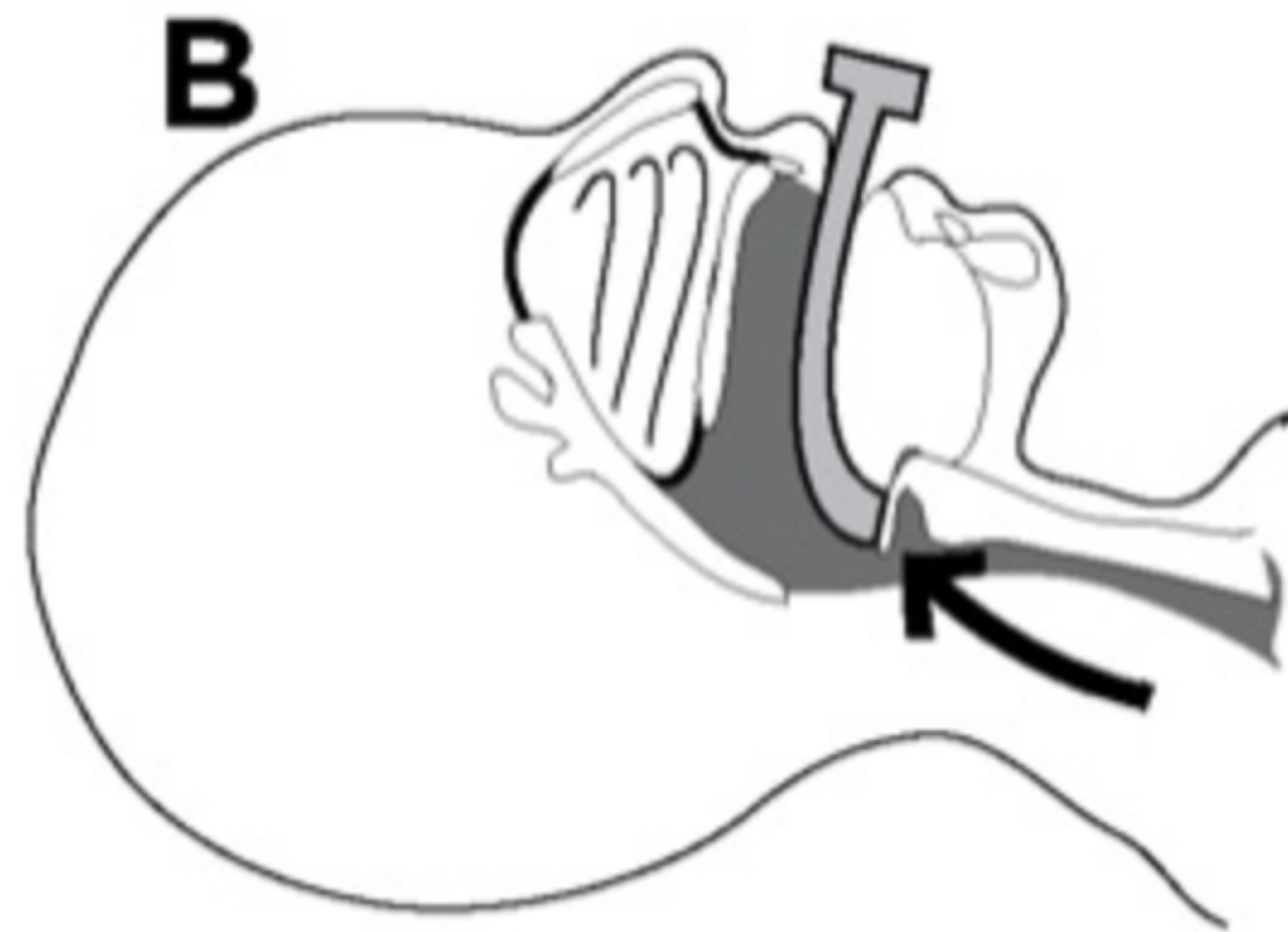
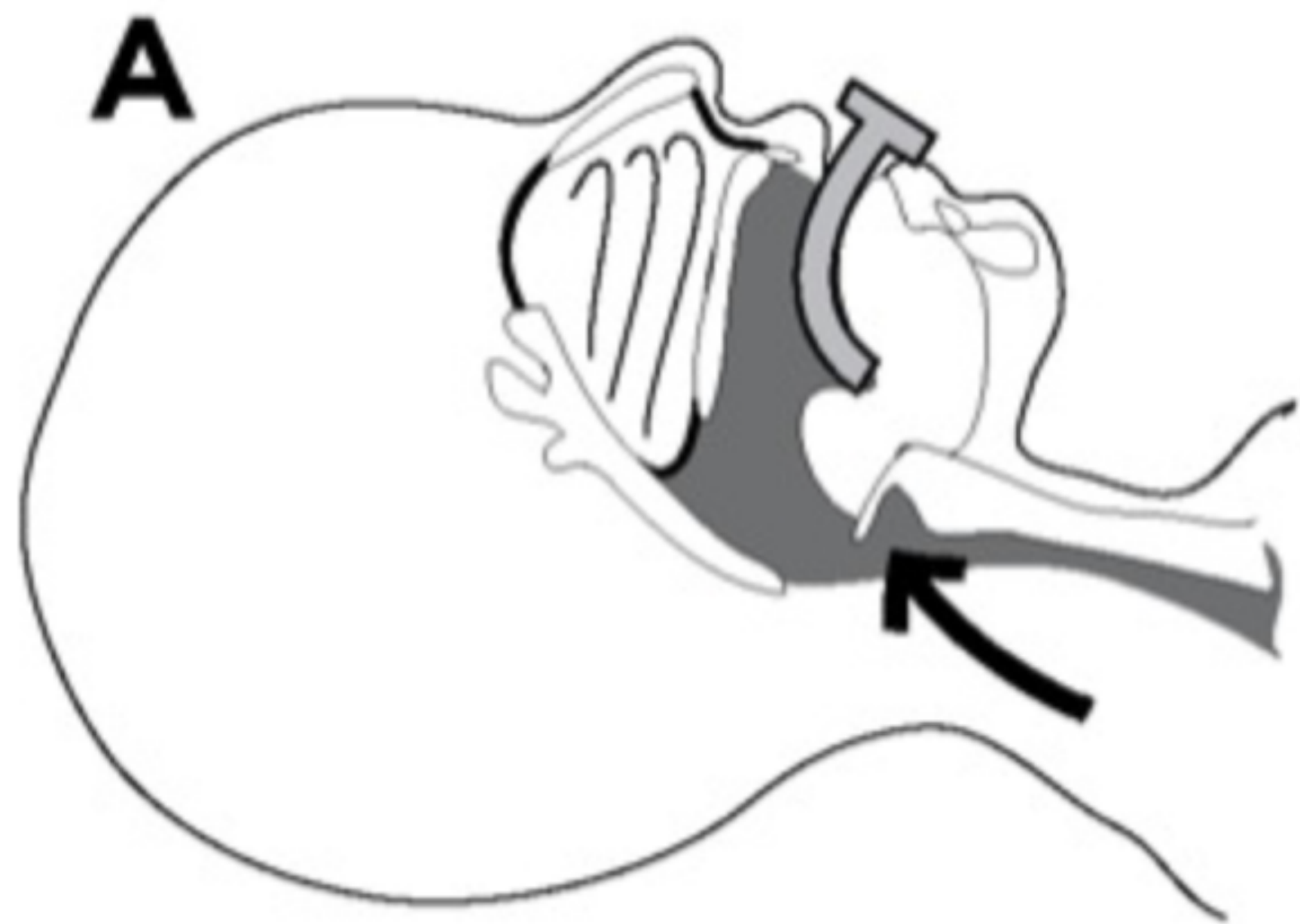
It can be difficult to open the mouth and perform optimal jaw thrust using a single hand technique

# Masking Technique: Single Hand

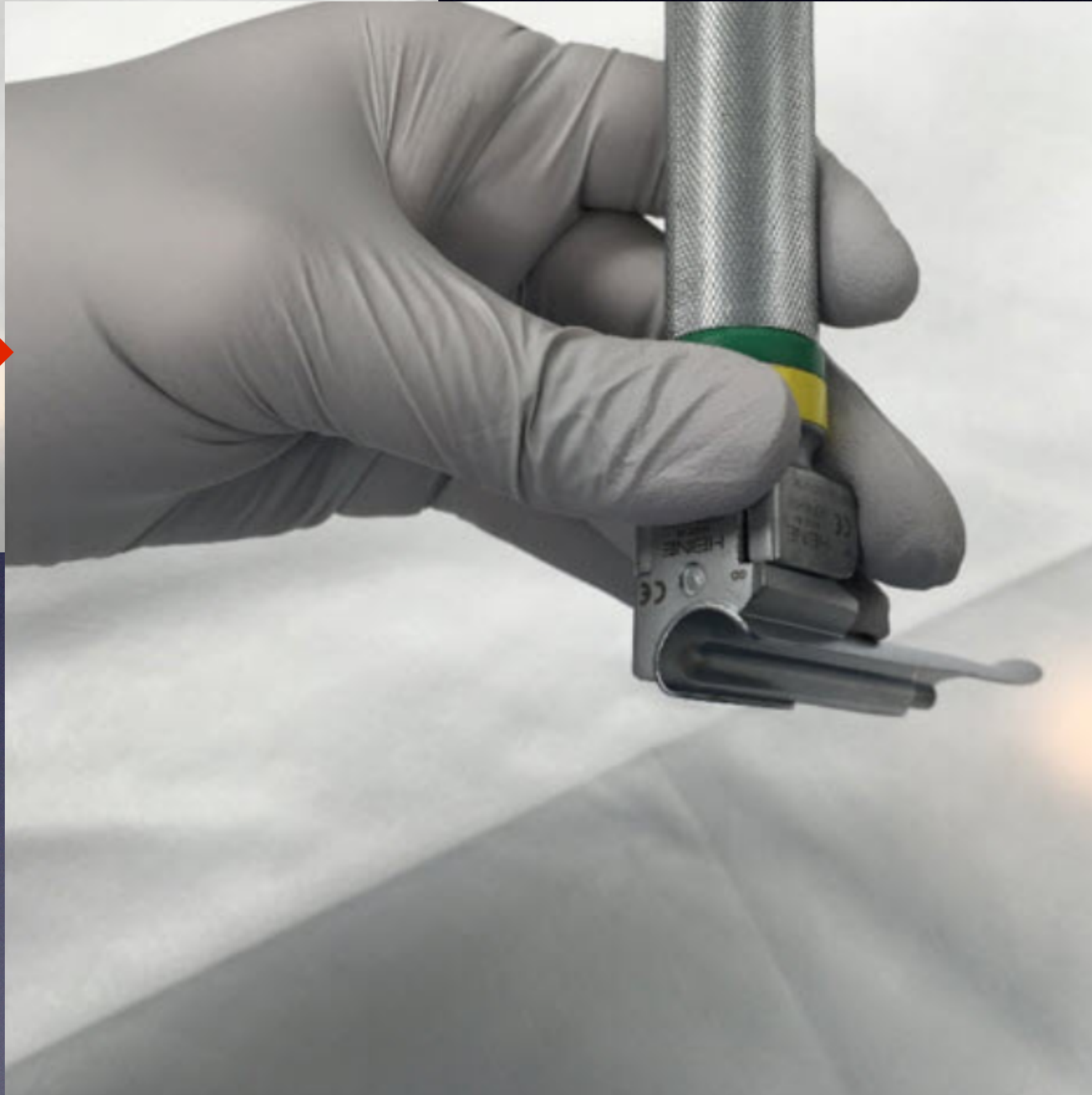
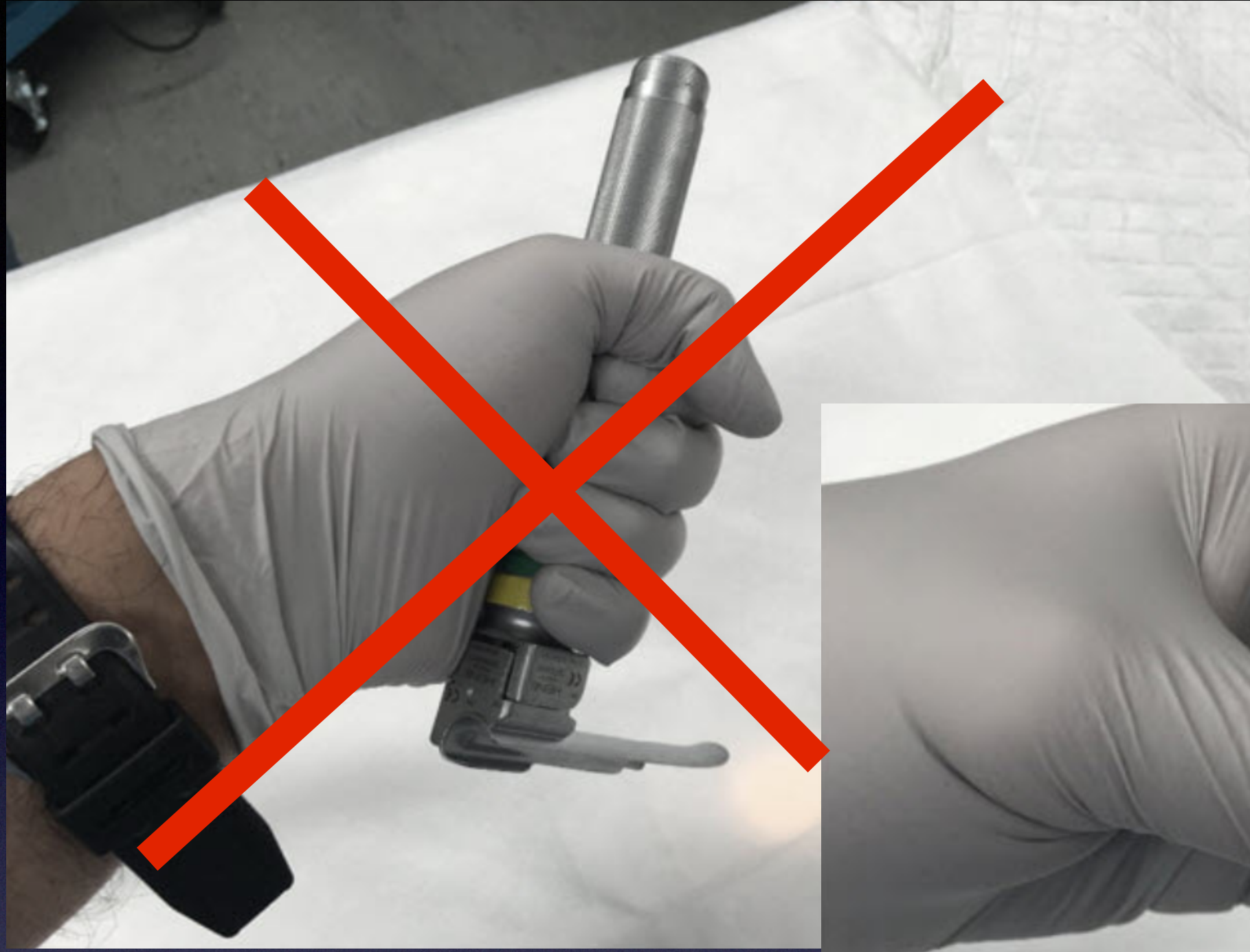


maskinduction.com er i fullskjermmodus.  
Sveip ned for å avslutte.

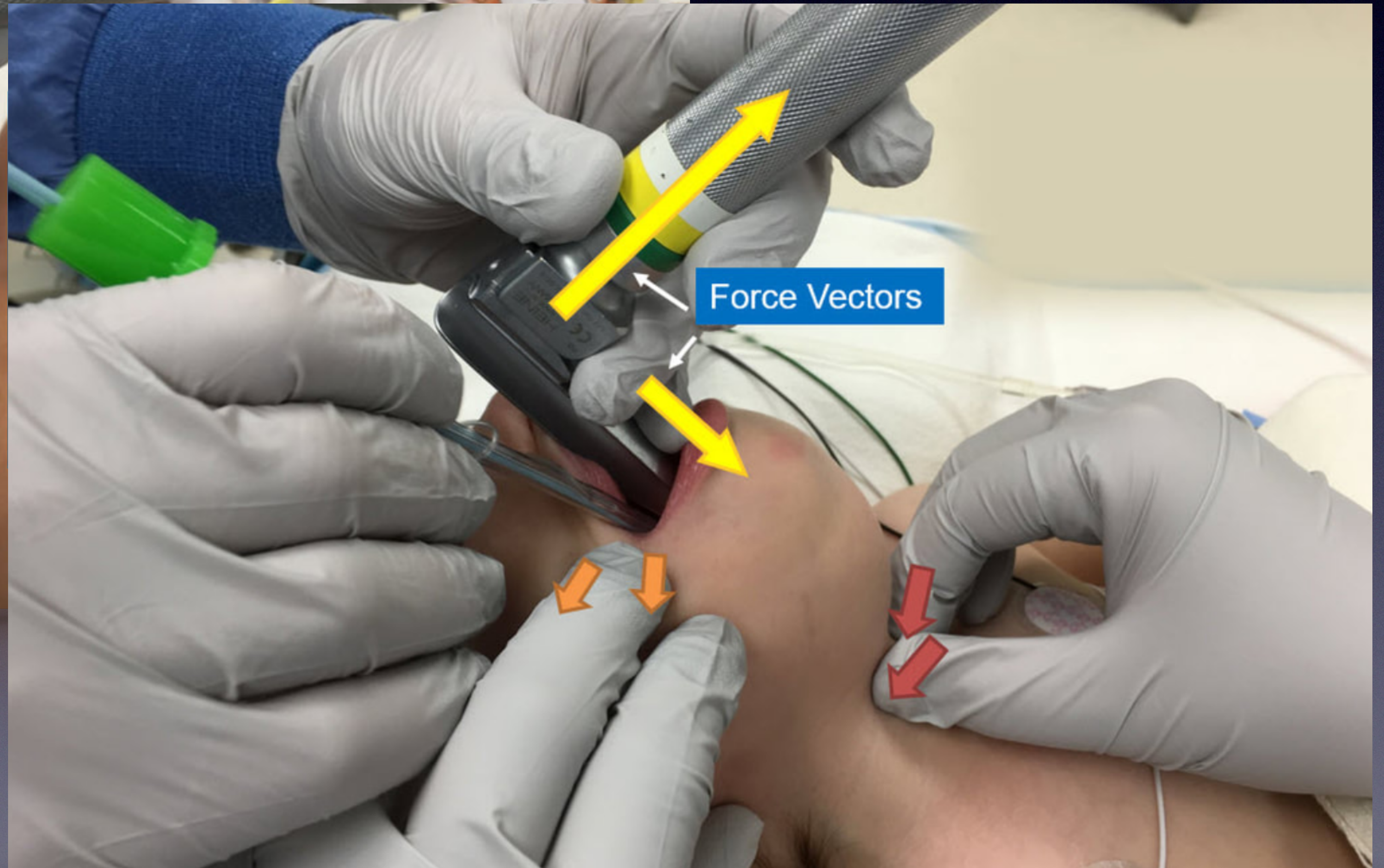










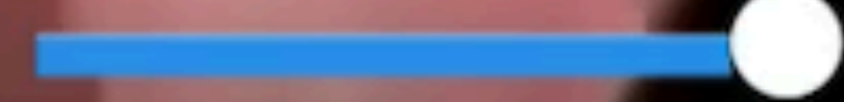




# Den vanskelige luftveien

De to vanligste utfordringene







# Noen luftveisutfordringer vi møter

Fremmedlegemer

Tumorer

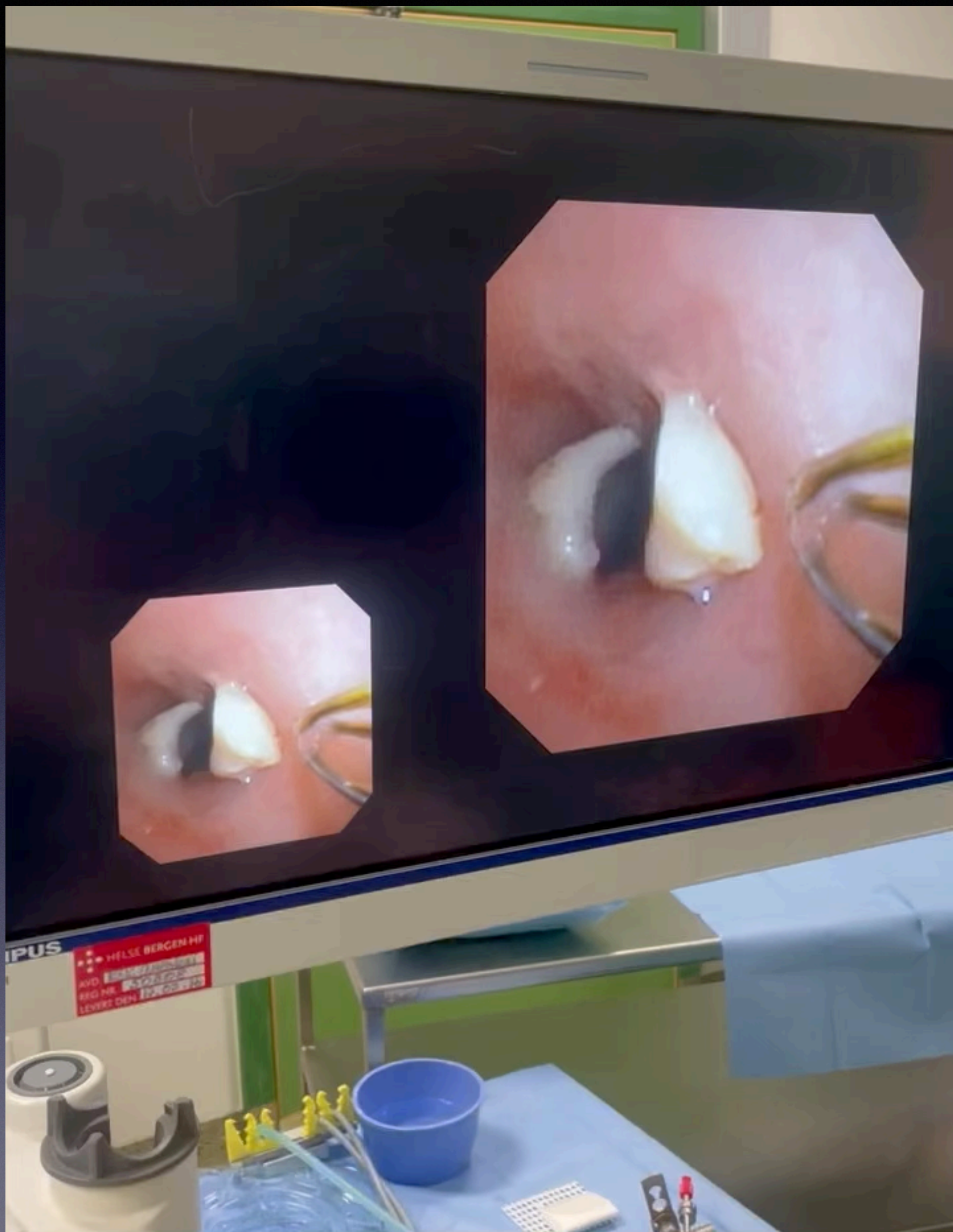
Laryngomalasi

Syndromer

Brannskadesekveler

Skader, infeksjoner, postop blødninger

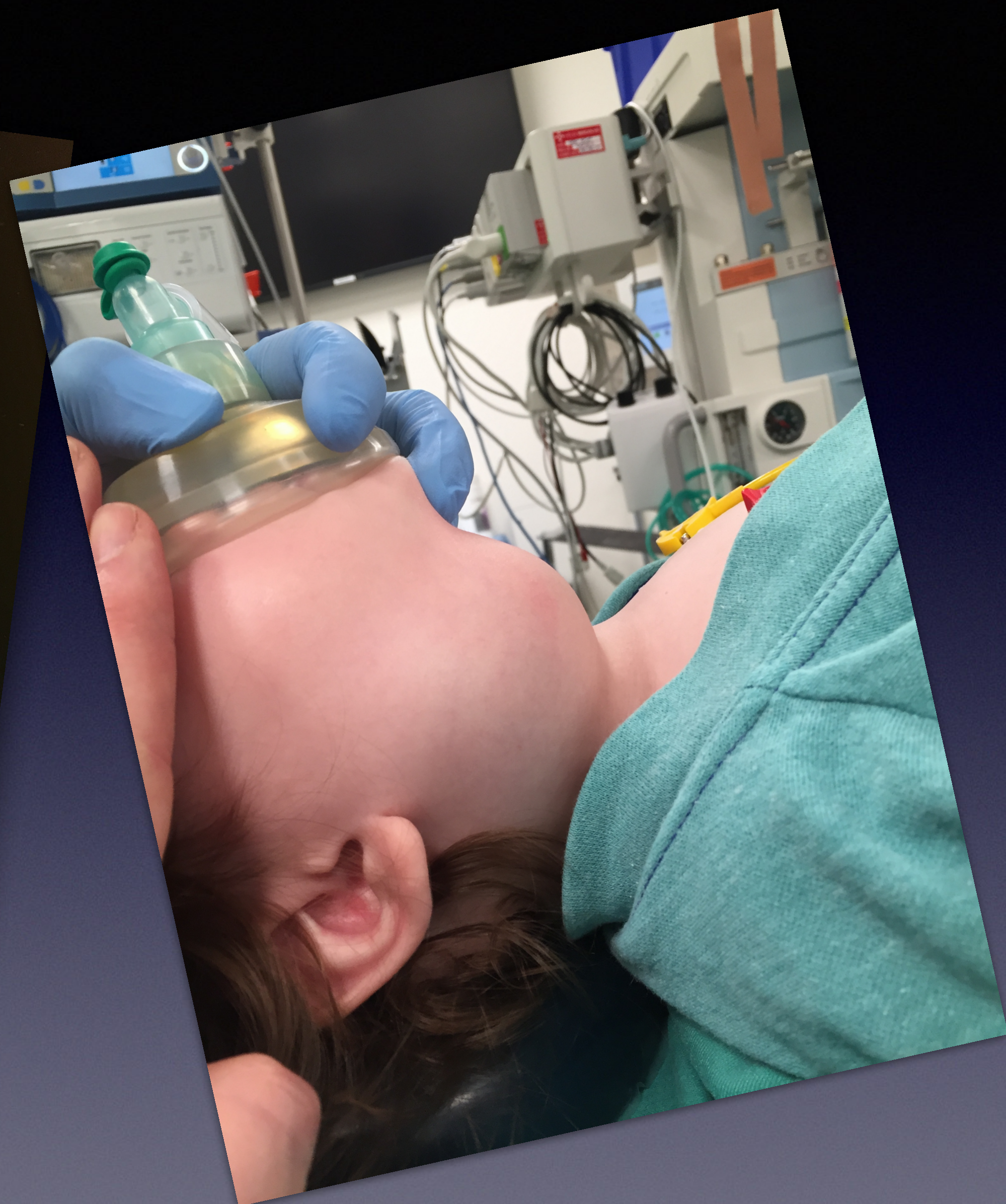
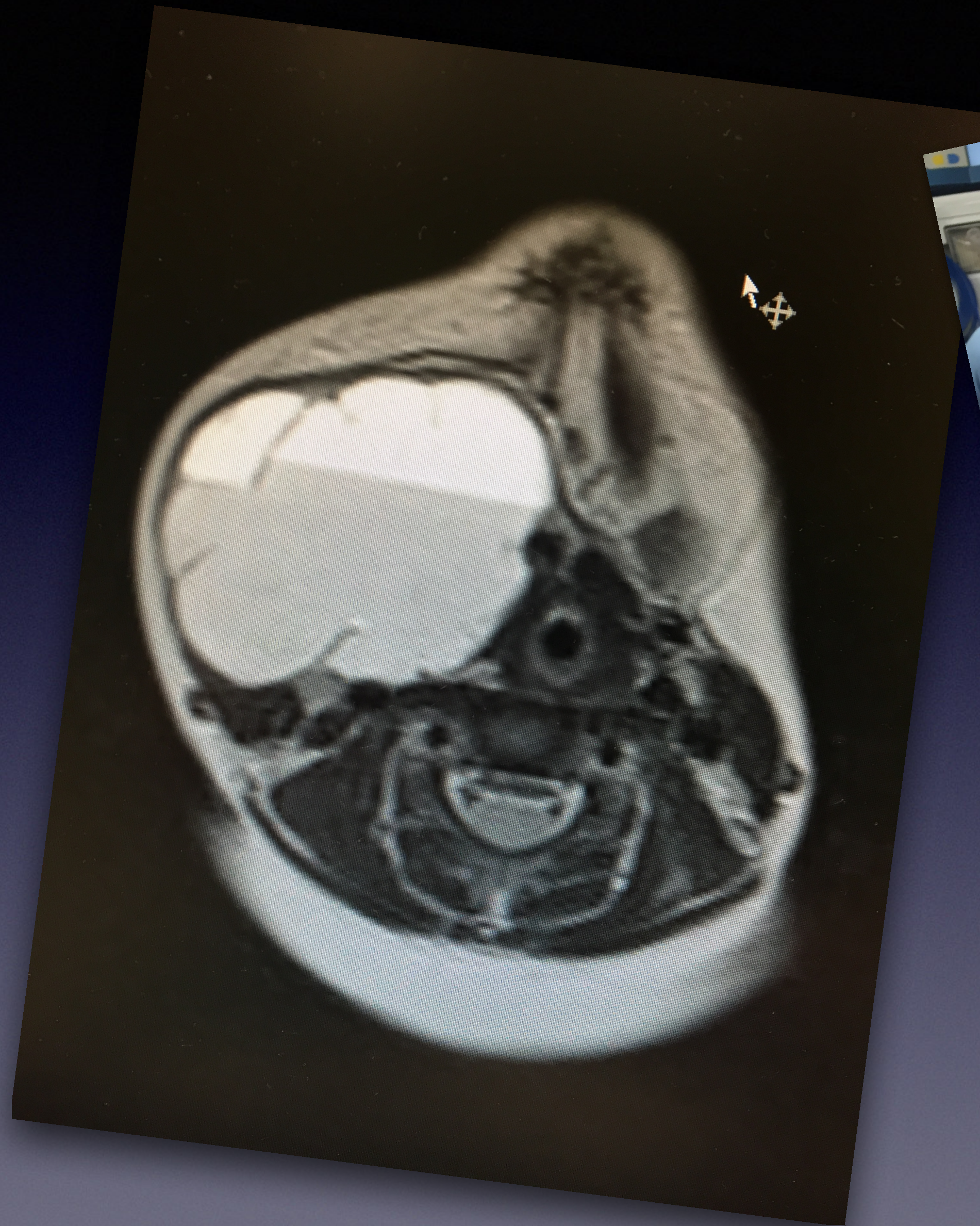




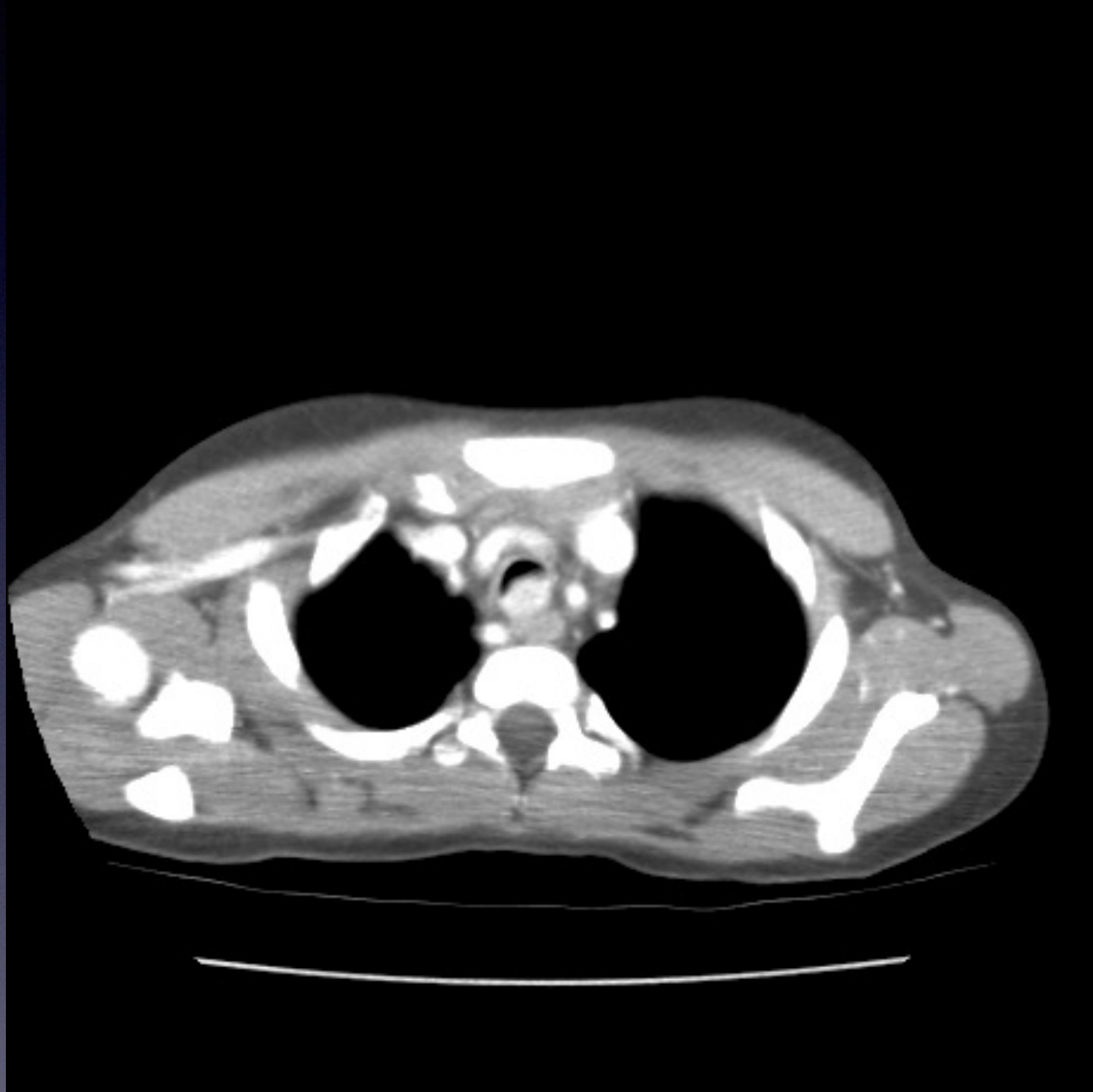




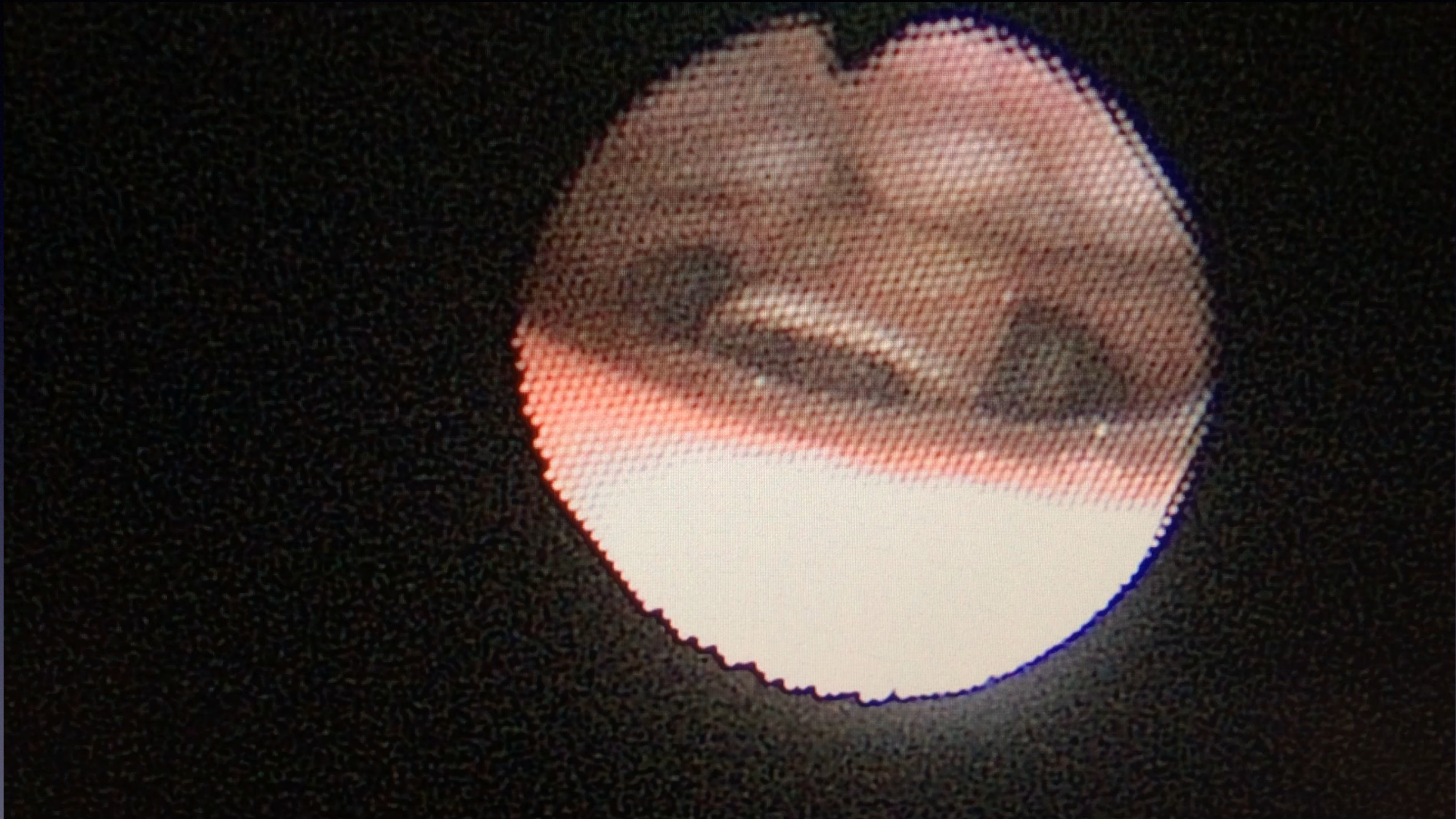














## Syndromes in children associated with difficult airways with key airway features observed

Syndrome	Airway Features
Pierre Robin sequence	Micrognathia; glossoptosis (backward displacement of tongue); airway obstruction at rest; and improves with age
Treacher Collins	Micrognathia; limited mouth opening; airway obstruction at rest; and worsens with age (in spite having mandibular distraction)
Goldenhar syndrome	Micrognathia; hemifacial macrosomia; occipitalization of atlas; and limited mouth opening
Mucopolysaccharidoses (Hunter's and Hurler's syndromes)	Accumulation of mucopolysaccharides in various tissues, including airway; short, immobile neck; cervical instability, airway obstruction at rest; difficult mask ventilation and tracheal intubation; and worsens with age
Apert syndrome	Midface hypoplasia; possible choanal stenosis; progressive calcification of cervical spine; and airway obstruction
Down syndrome	Macroglossia; atlantoaxial instability; and pharyngeal hypotonia
Crouzon syndrome	Midface hypoplasia; maxillary hypoplasia; short neck; and restricted neck movement
Pfeiffer syndrome	Midface hypoplasia and airway obstruction
Klippel-Feil syndrome	Fusion of variable number of cervical vertebrae and limited neck movement
Beckwith-Wiedemann syndrome	Macroglossia



**BJA** British Journal of Anaesthesia

RESPIRATION AND THE AIRWAY | VOLUME 131, ISSUE 1, P178-187, JULY 2023

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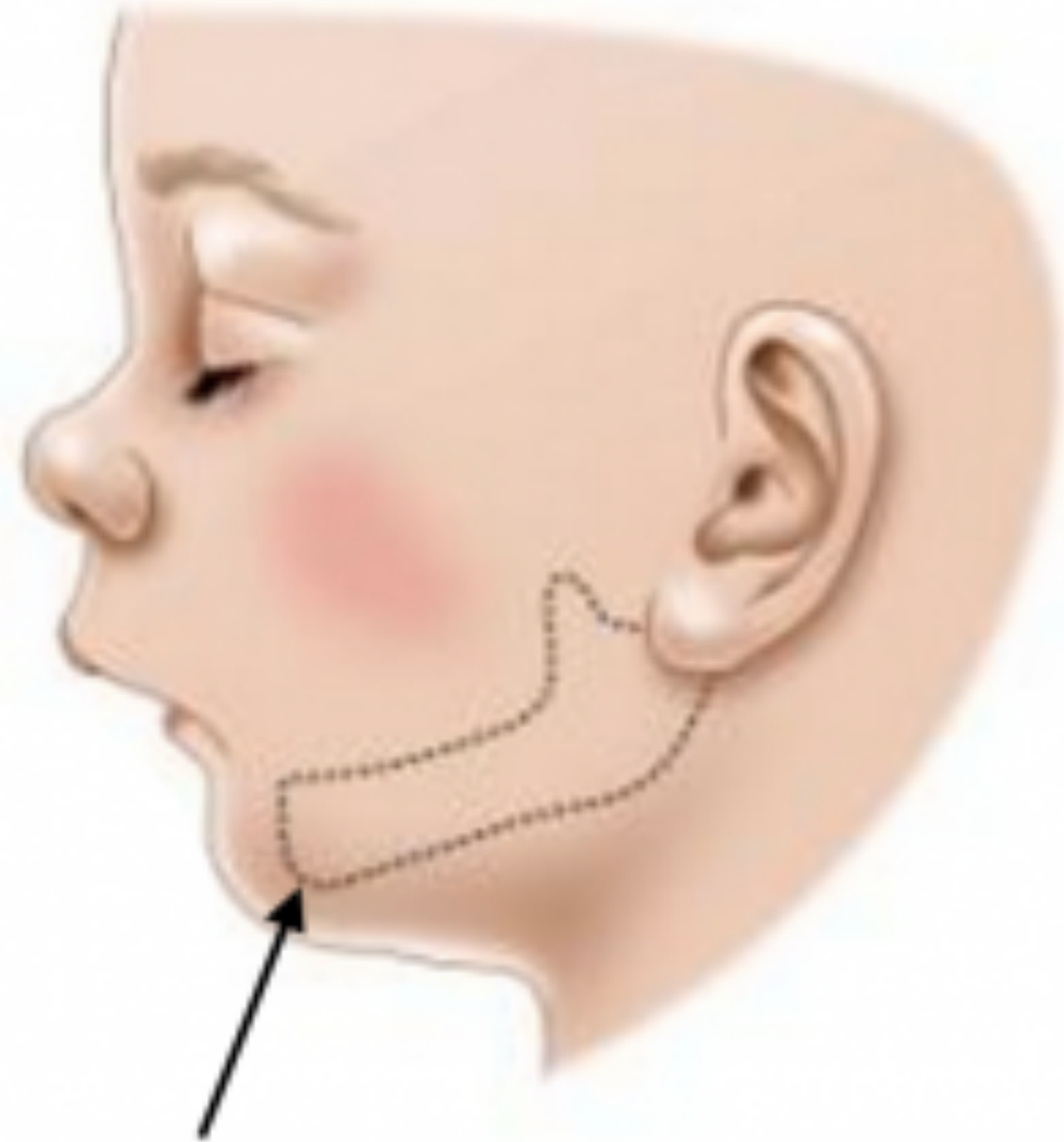
**Difficult or impossible facemask ventilation in children with difficult tracheal intubation: a retrospective analysis of the PeDI registry**

Annery G. Garcia-Marcinkiewicz † • Lisa K. Lee † • Bishr Haydar • ... Brad M. Taicher • Thomas W. Templeton •  
 on behalf of the PeDI Collaborative • Show all authors • Show footnotes

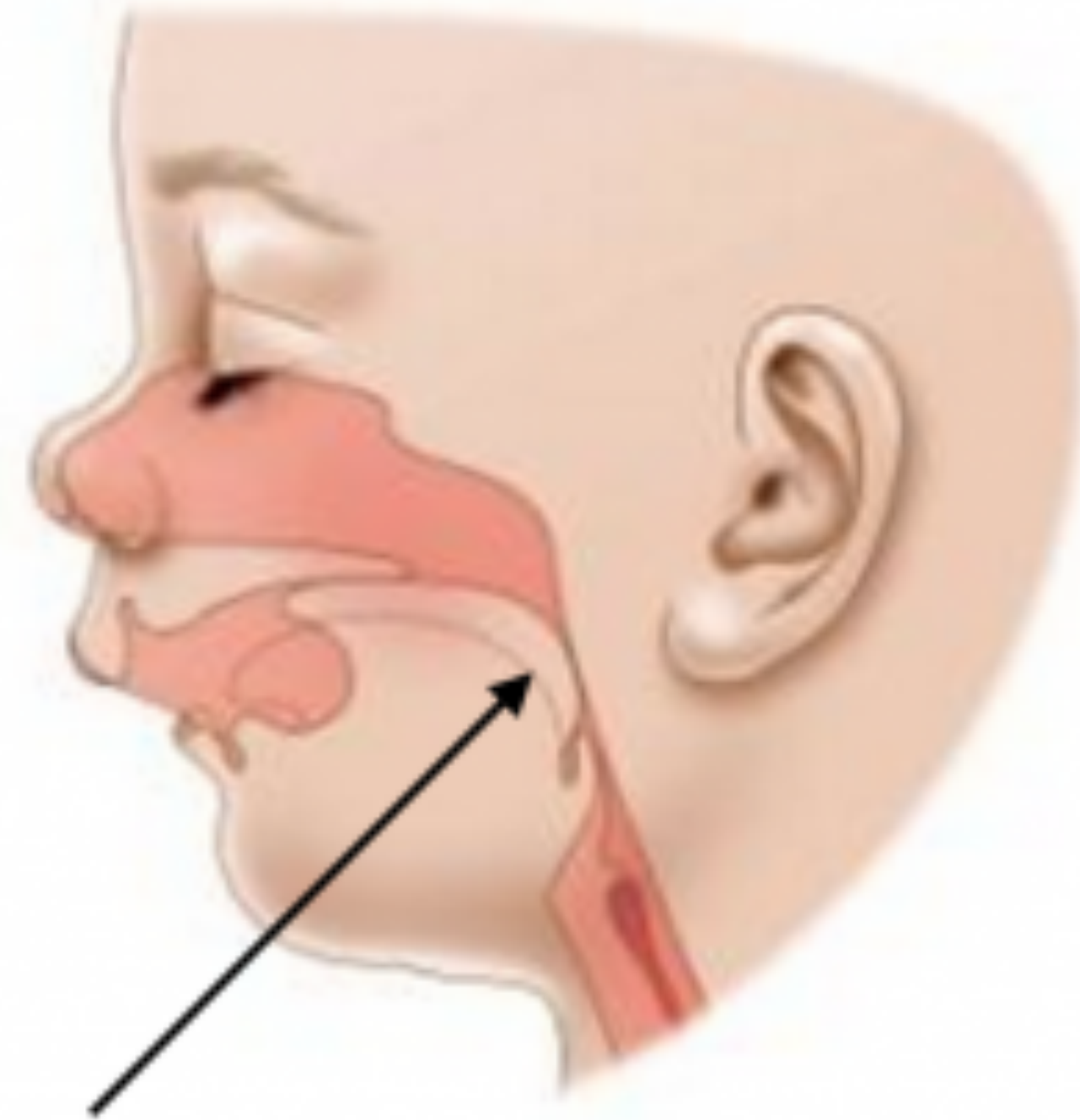
Open Access • Published: April 17, 2023 • DOI: <https://doi.org/10.1016/j.bja.2023.02.035>

Syndrome	Difficult or impossible face mask ventilation (n=483)	
	n	%
Other syndromes	119	24.6%
Pierre-Robin sequence	72	14.9%
Goldenhar syndrome	36	7.5%
Treacher Collins syndrome	26	5.4%
Klippel-Feil syndrome	9	1.9%
Arthrogryposis	8	1.7%
Hurler syndrome	7	1.5%
Stickler syndrome	7	1.5%





Micrognathia - a small jaw with a receding chin



Tongue that is large compared to the jaw, resulting in airway obstruction

with a receding chin  
micrognathia - a small jaw

jaw, resulting in airway obstruction  
tongue that is large compared to the



23/6/2015 4:38

V447361 2.BIN



Hvordan håndtere den  
vanskelige barneluftveien?

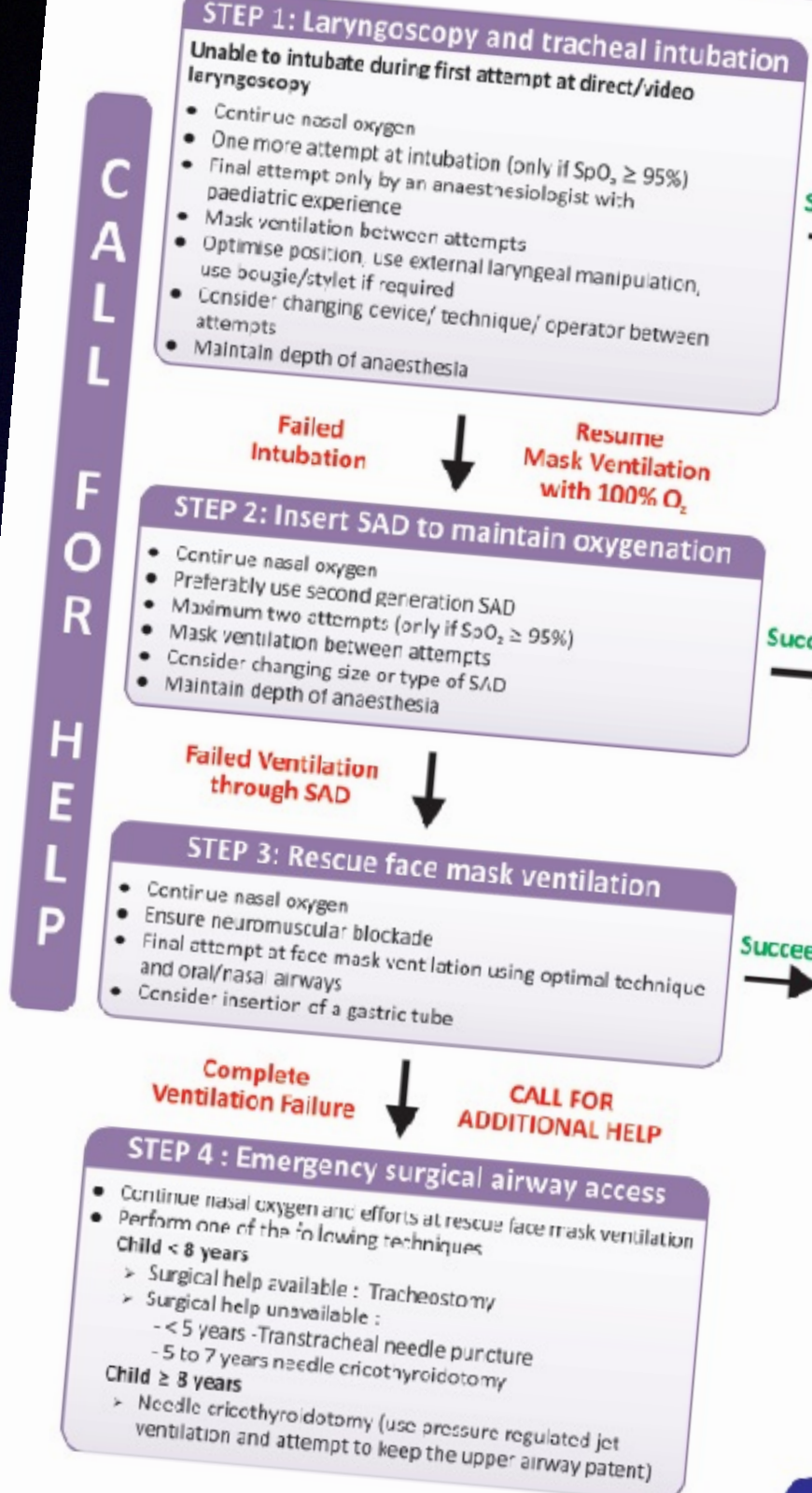


«most children who have difficult to manage  
airways can be indentified in advance»

*Black AE. pubmed 2015*

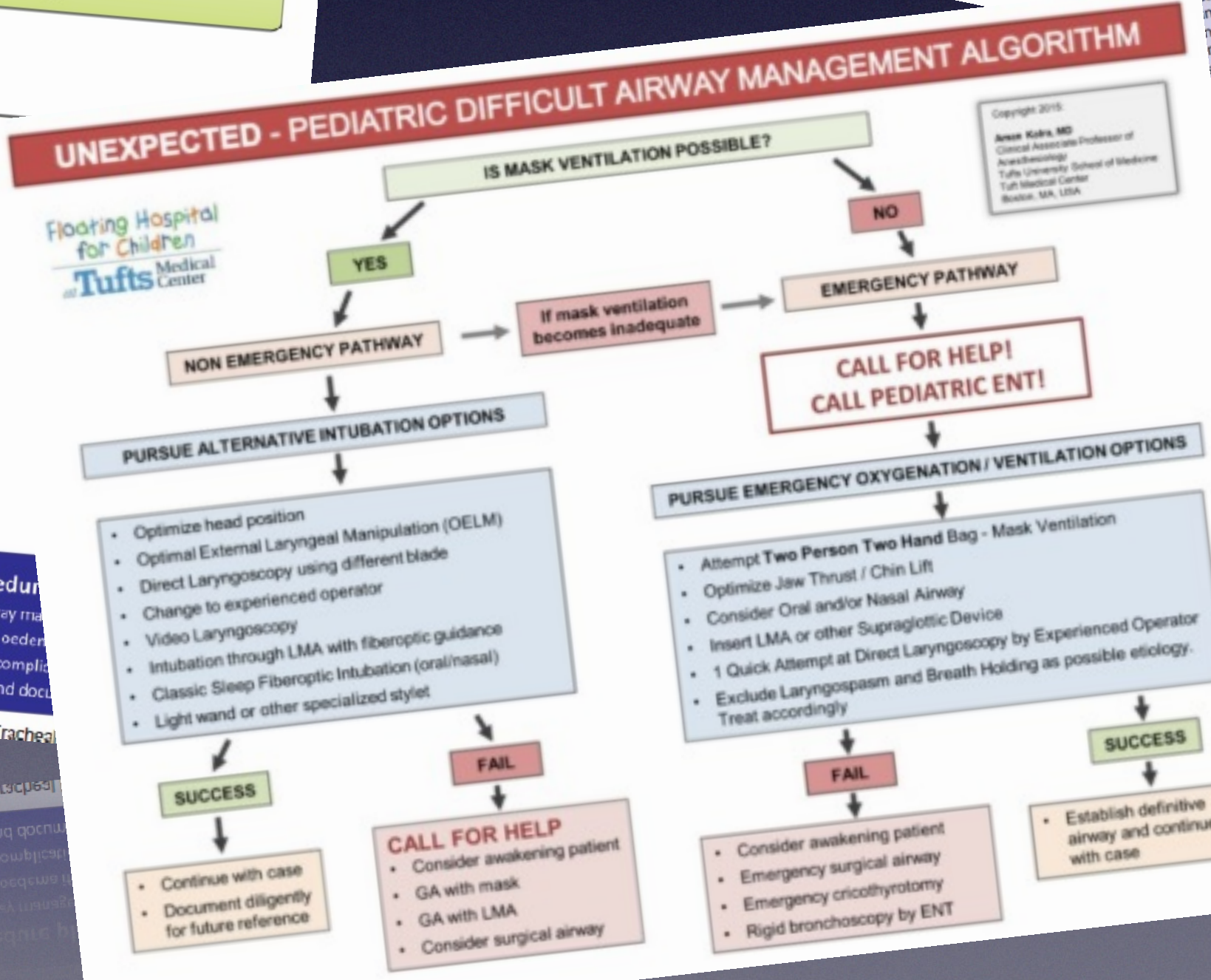
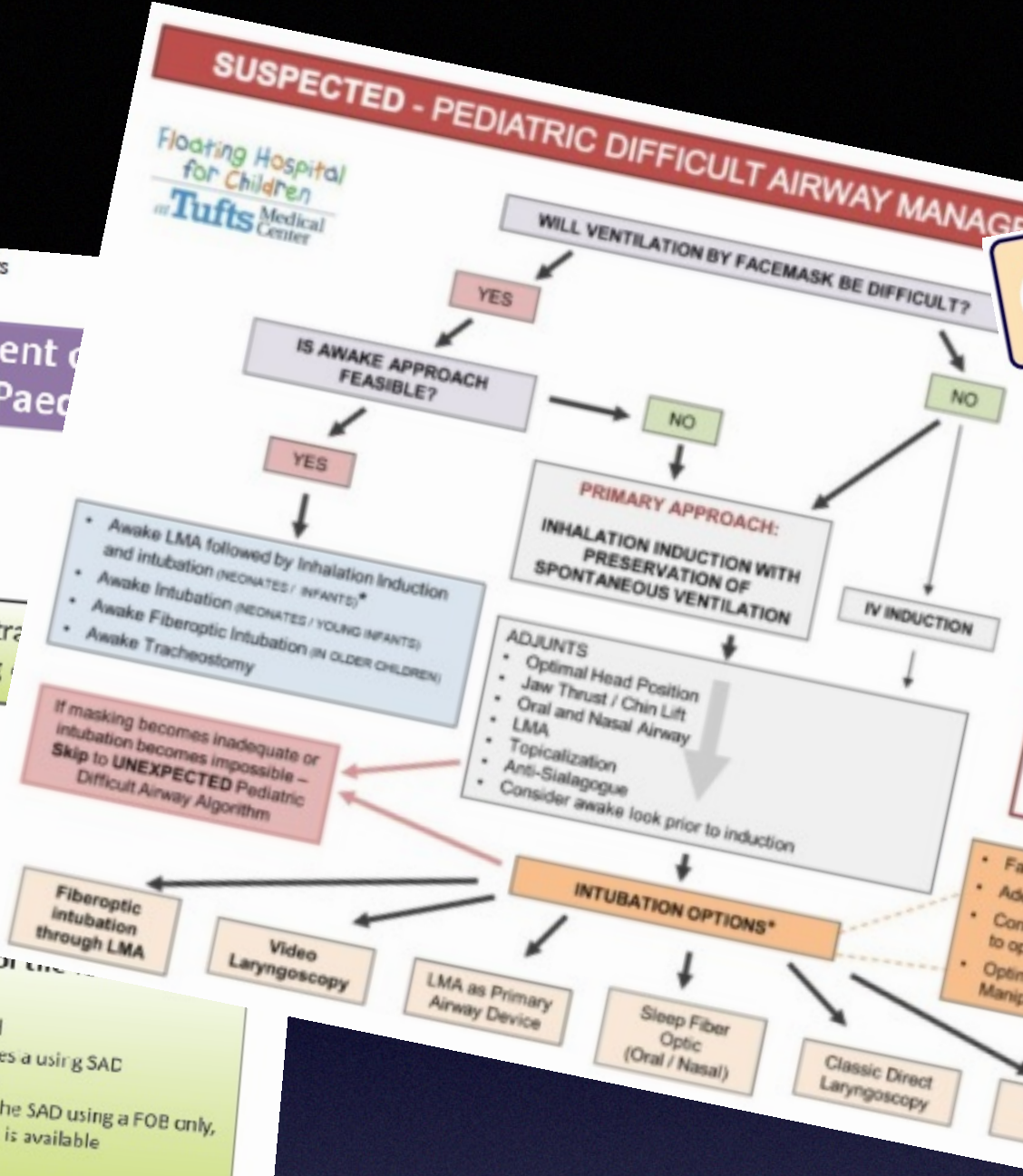


# AIDAA 2016 Guidelines for the Management of Unanticipated Difficult Tracheal Intubation in Paediatrics



**Post-procedure**

1. Further airway management
2. Treat airway oedema
3. Monitor for complications
4. Counseling and documentation



# APA Unanticipated difficult tracheal intubation - during routine induction of anaesthesia in a child aged 1 to 8 years

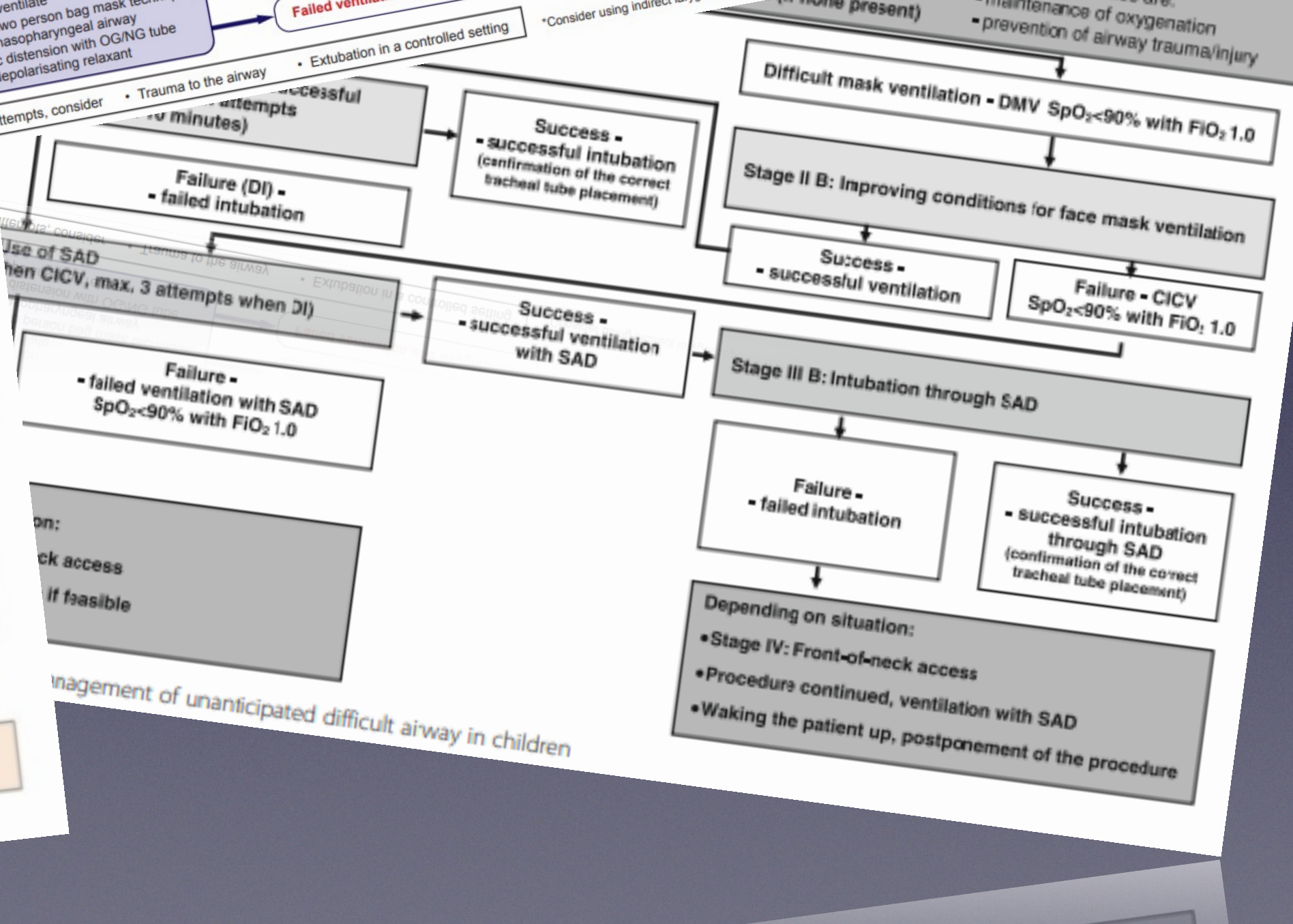
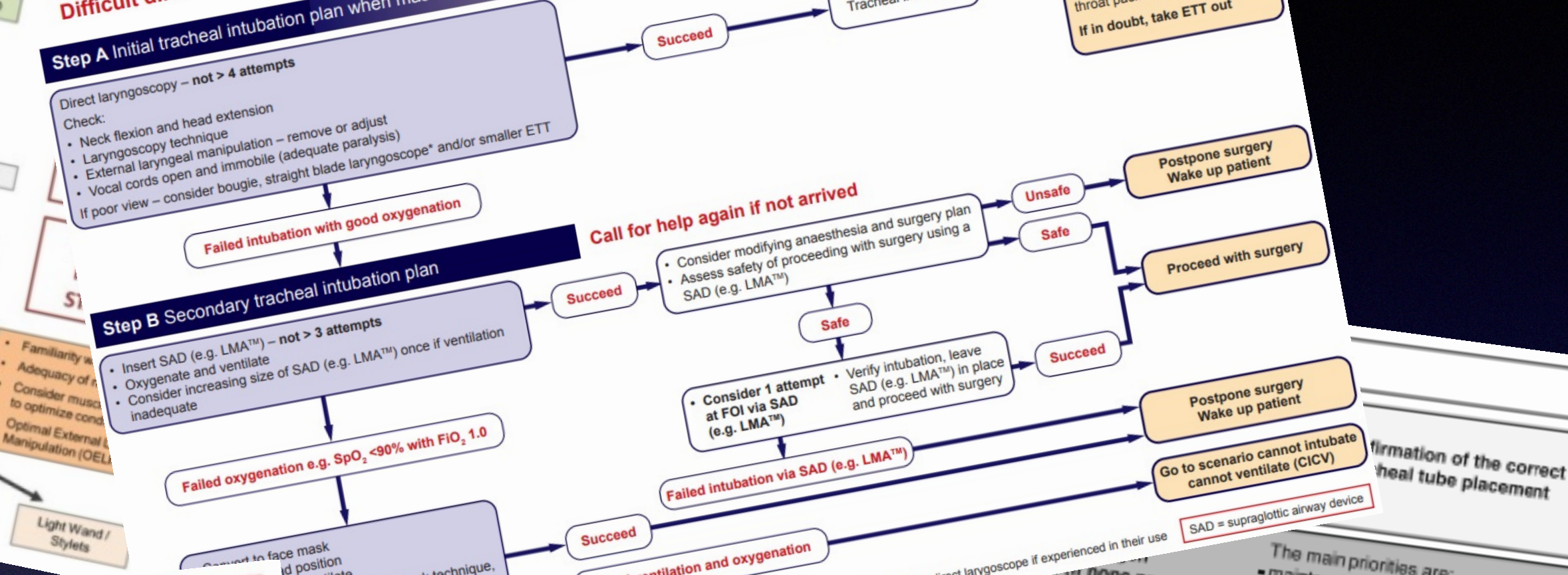


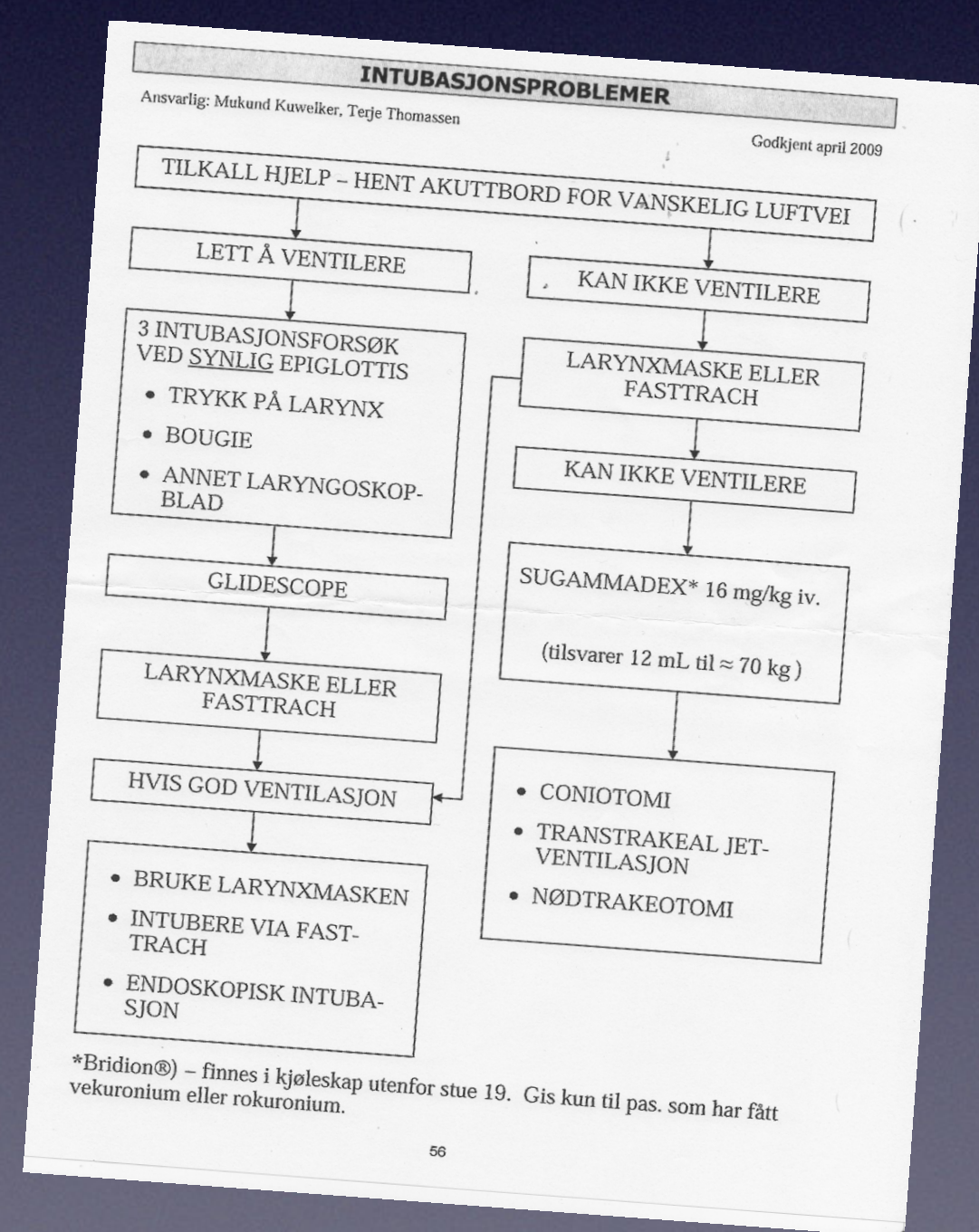
Figure 1: All India Difficult Airway Association 2016 algorithm for the Management of Unanticipated Difficult Tracheal Intubation in Paediatrics



# Vanskelig luftvei

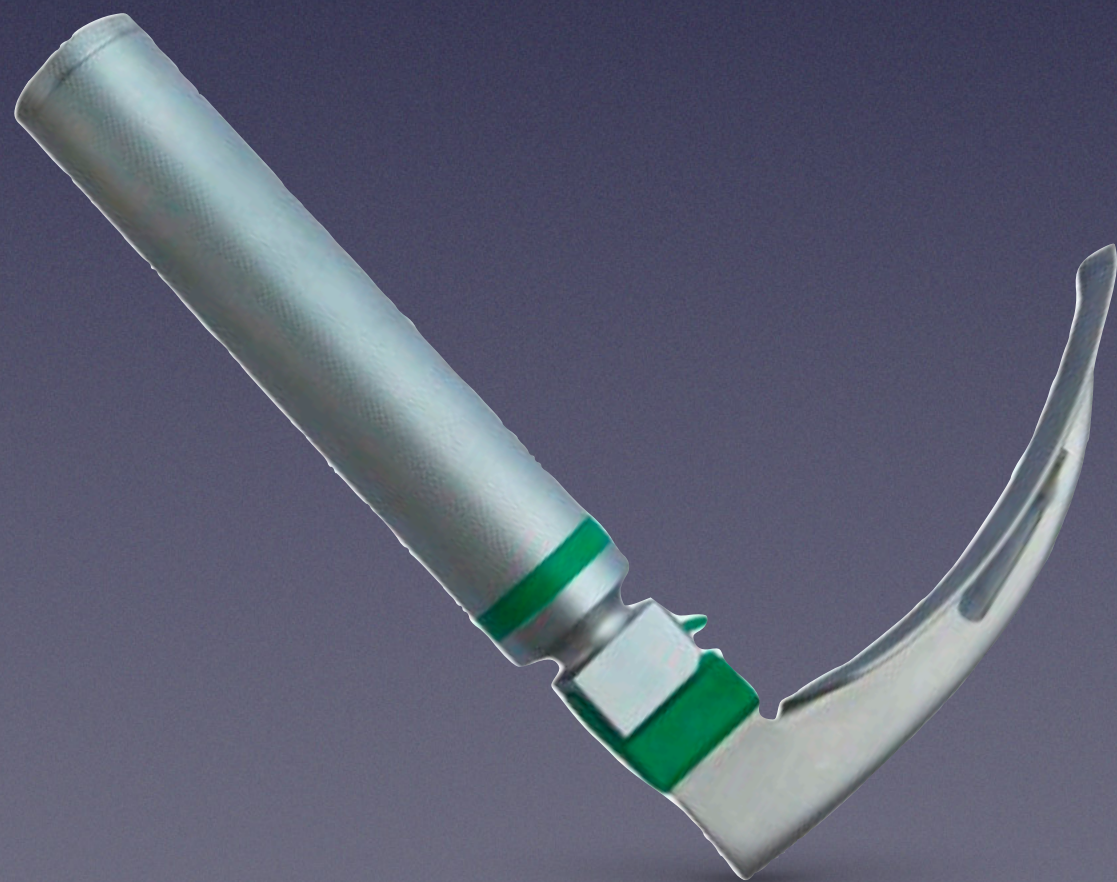
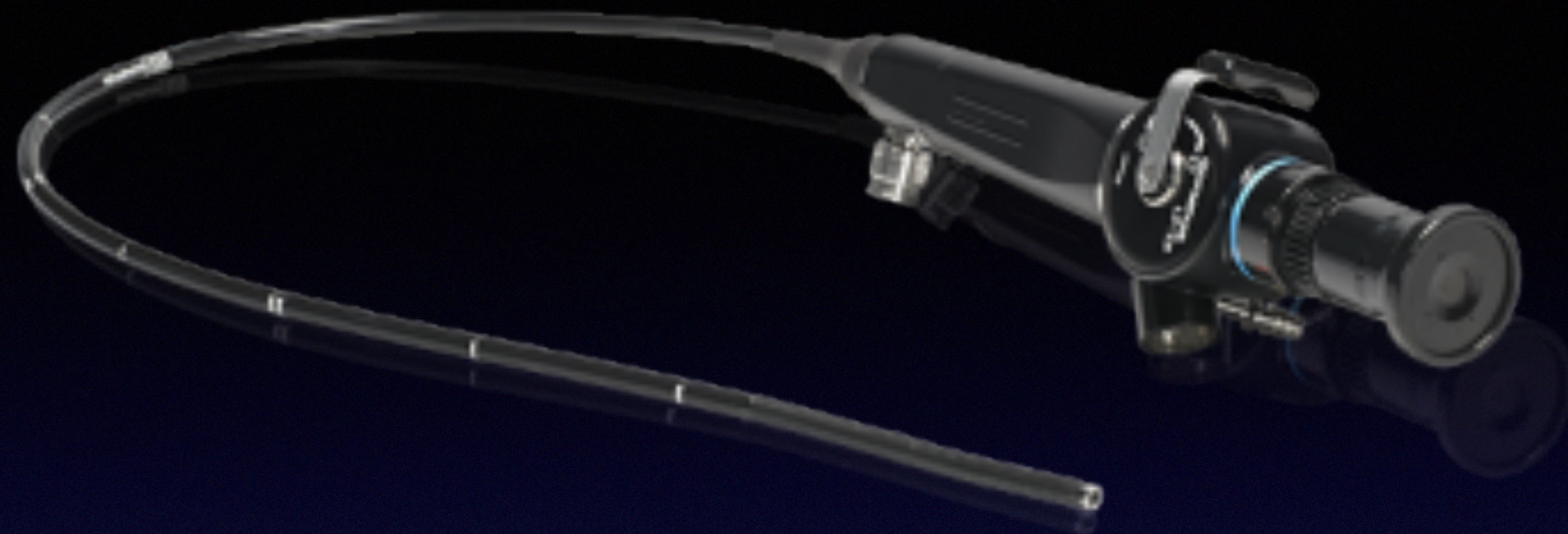
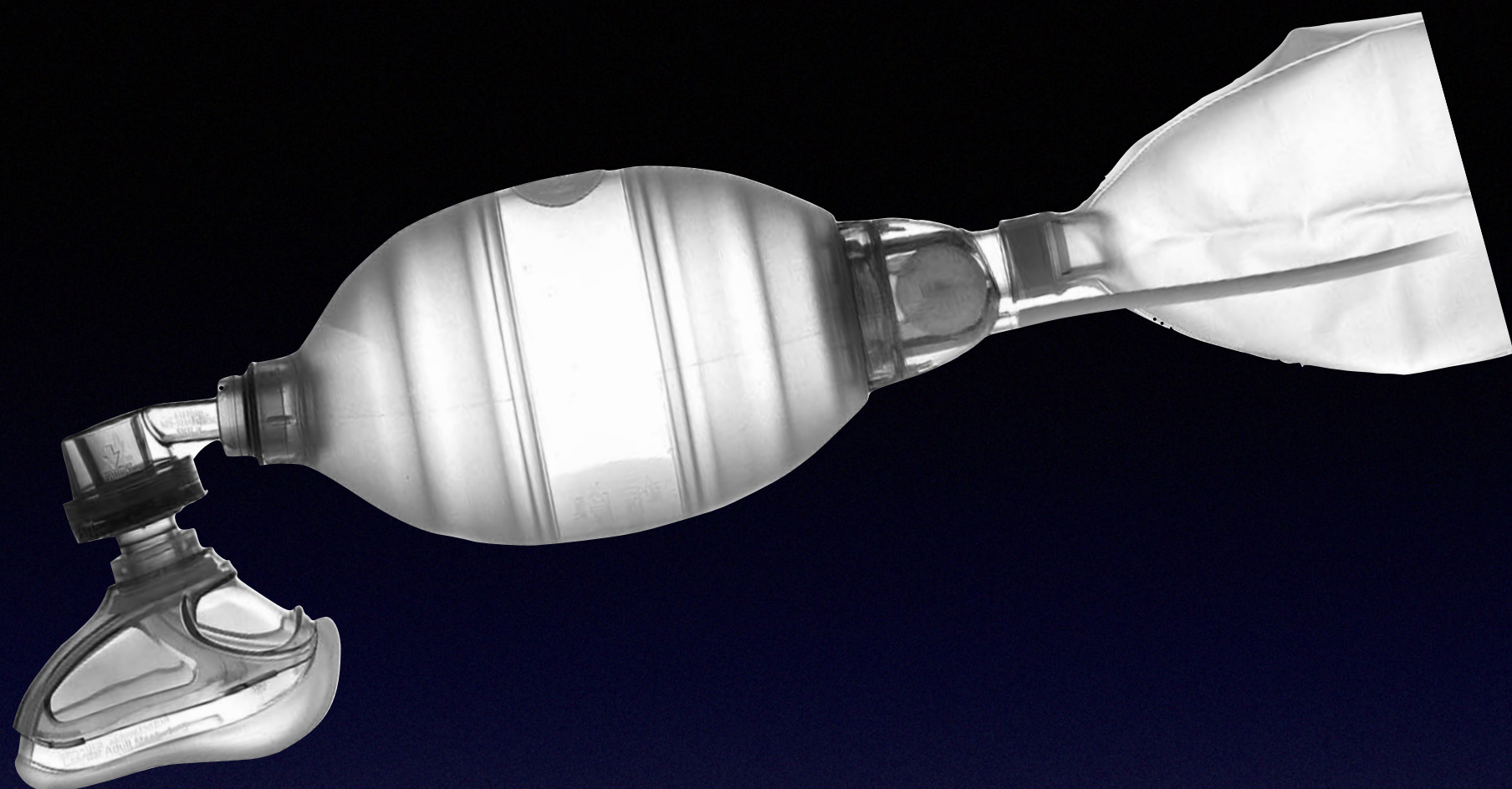
Ikke forventet

forventet



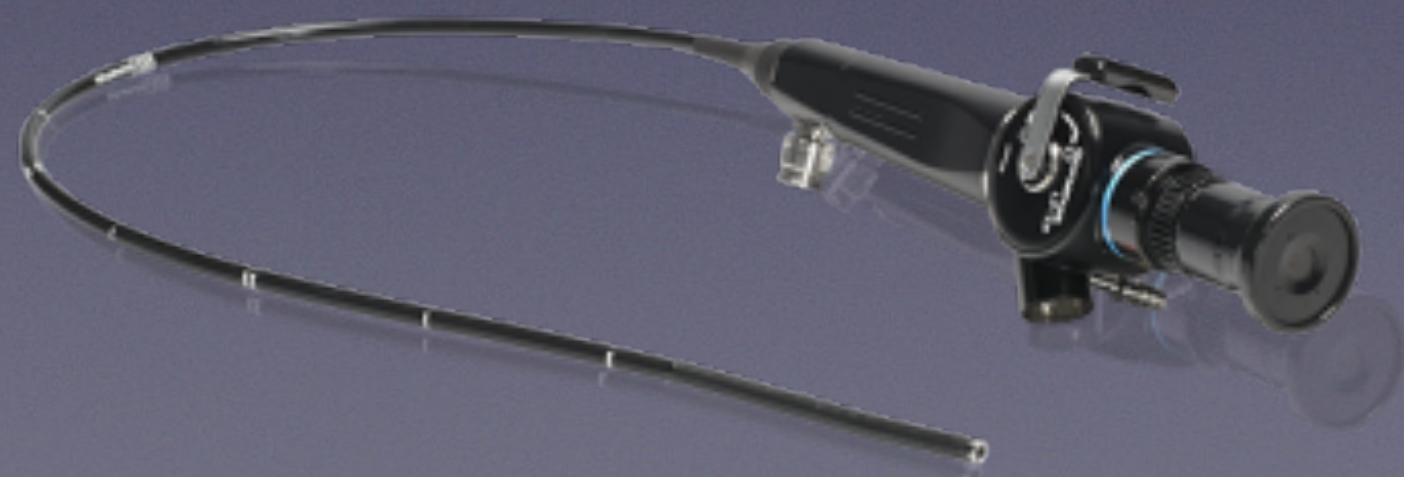
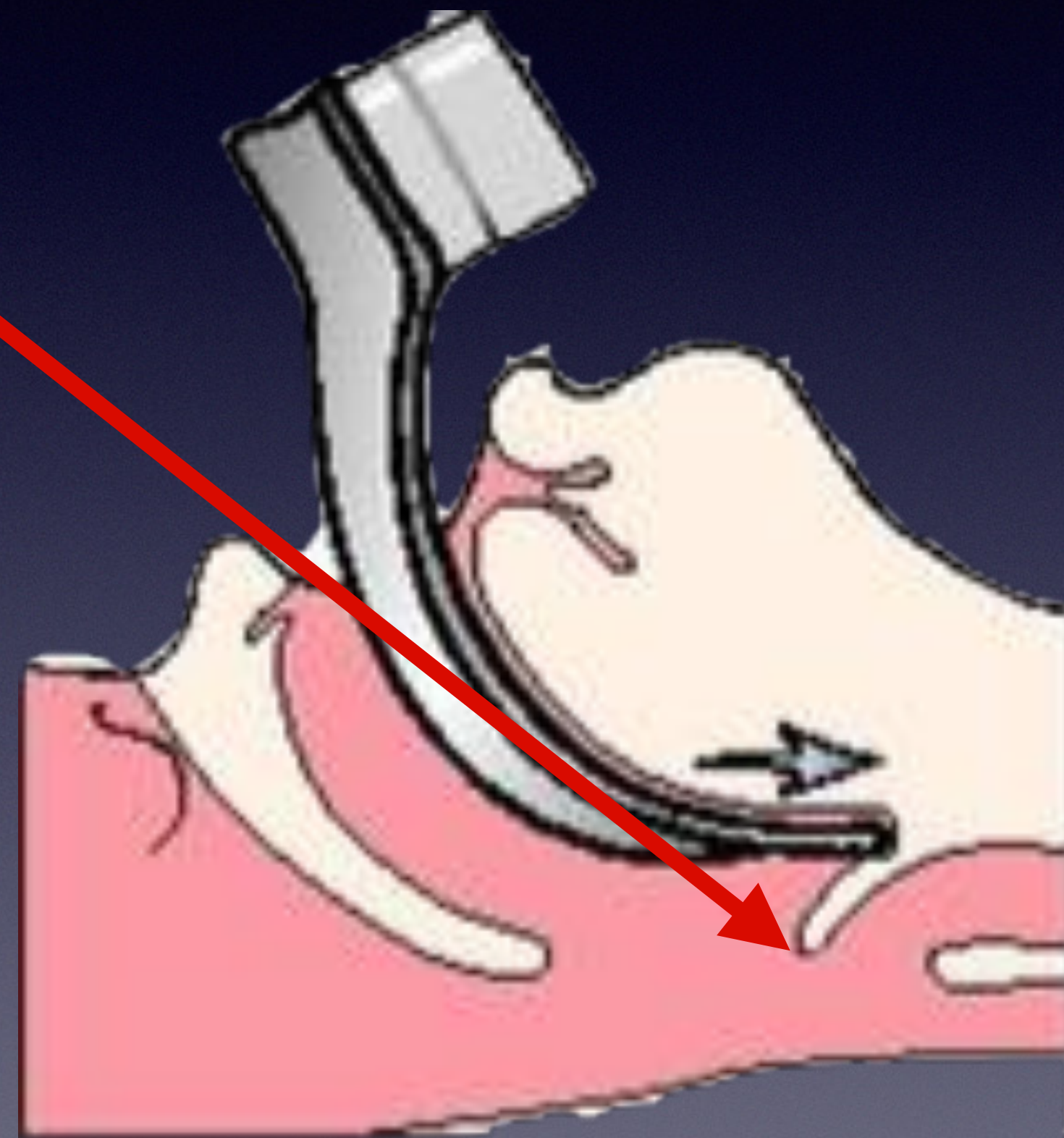
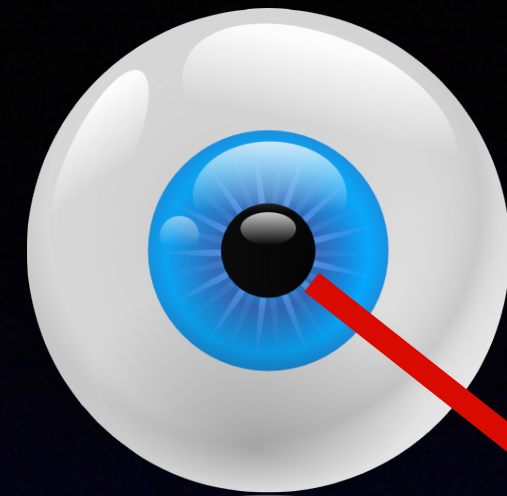
Tilpasset plan,  
Riktig utstyr,  
Riktig kompetanse



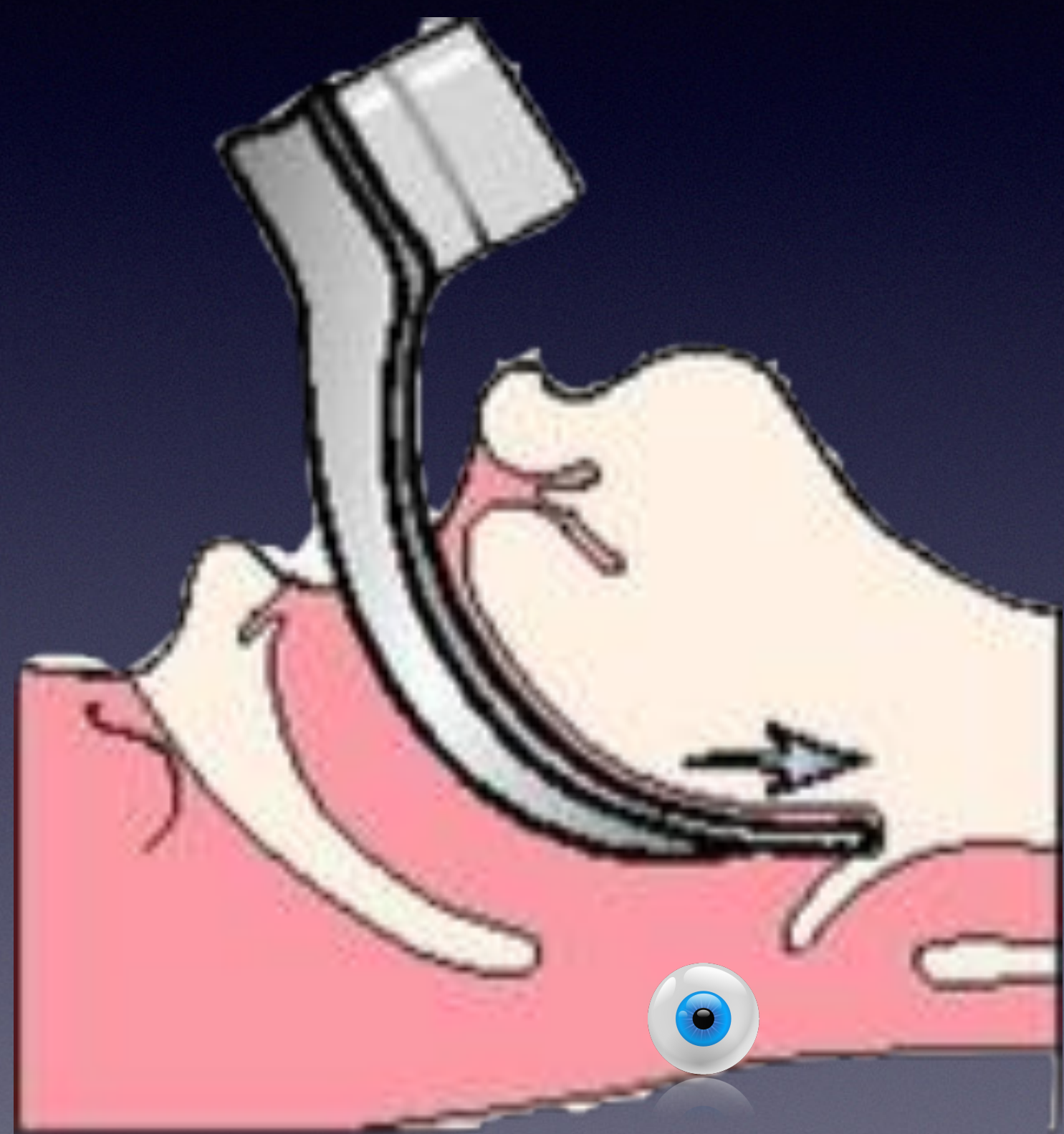
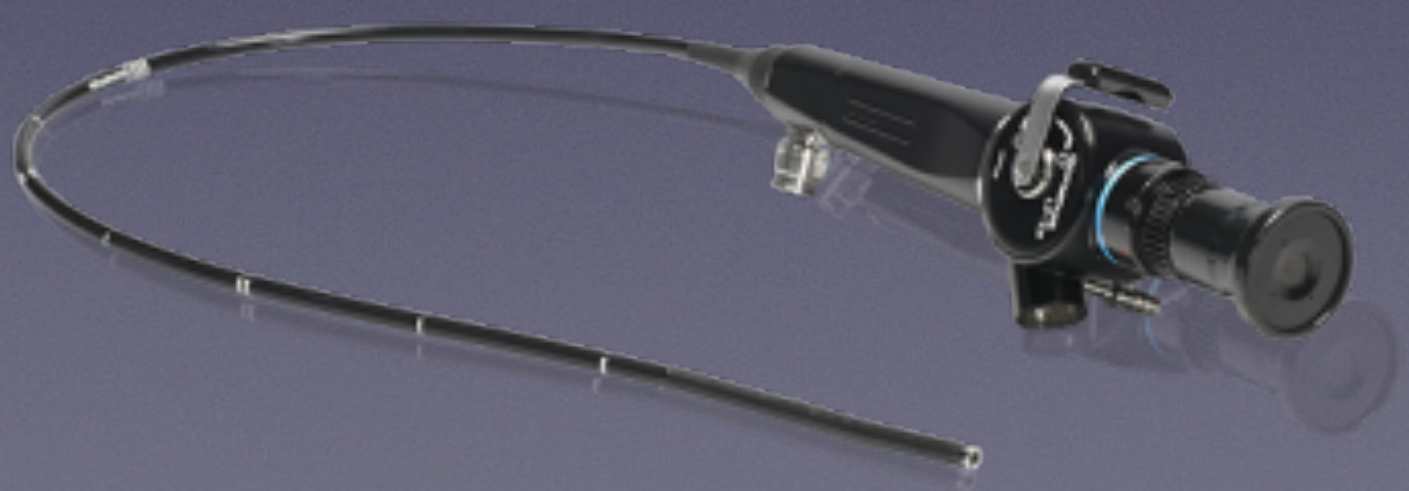




«The art of bending light»











Review

> *Paediatr Anaesth.* 2022 Sep;32(9):1000-1014. doi: 10.1111/pan.14521.

Epub 2022 Jul 13.

## Videolaryngoscopes versus direct laryngoscopes in children: Ranking systematic review with network meta-analyses of randomized clinical trials

Clístenes C de Carvalho<sup>1</sup>, Stéphanie L P A Regueira<sup>2</sup>, Ana Beatriz S Souza<sup>3</sup>,  
Lucas M L F Medeiros<sup>3</sup>, Marielle B S Manoel<sup>3</sup>, Danielle M da Silva<sup>3</sup>, Jayme M Santos Neto<sup>4</sup>,  
James Peyton<sup>4 5 6</sup>

Holdepunkter for høyere first pass success

Helt klart at videolaryngoskop har en sentral plass i den vanskelige barneluftveien



Hvordan håndtere den vanskelige barneluftveien?

~~Våkenintubasjon?~~

Beholde barnet spontanpustende,  
nasopharyngeal airway



Beholde spontan respirasjon



Legge ned nasopharyngeal  
airway



Evt Ima



Intubere fiberoptisk motsatt  
nesebor eller via Ima

Vurder  
vekking  
om  
mulig

Direkte  
intubasjonsforsøk



Nødtrach



# Pediatric Anesthesia

 Free Access

## Awake tracheal intubation through the laryngeal mask in neonates with upper airway obstruction

TAKASHI ASAI MD PhD, ATSUSHI NAGATA MD, KOH SHINGU MD

First published: 11 December 2007 | <https://doi.org/10.1111/j.1460-9592.2007.02354.x> | Citations: 24

✉ Takashi Asai, MD, PhD, Department of Anaesthesiology, Kansai Medical University, 10-15 Fumizono-cho, Moriguchi City, Osaka, **570-8507**, Japan (email: address: [asait@takii.kmu.ac.jp](mailto:asait@takii.kmu.ac.jp)).





+



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Intubation with the Glidescope®. Using intubation fibroscope as a steerable stylet when it is difficult to insert the tube.

F. Kristensen, E. søfteland.



# Cornelia de Lange



6 år gammel

13 kg

Aldri hatt anestesi før



# Cornelia de Lange



Veneflon

Sevofluran spontanpustende

Maskeventilasjon

Vecuronium

Intubasjon CL1





**THE  
END**



<https://onlinelibrary.wiley.com/doi/full/10.1111/j.1460-9592.2007.02354.x>