


# A B Cs

## OF PEDIATRIC ANESTHESIA TIPS AND TRICKS FOR TOTS



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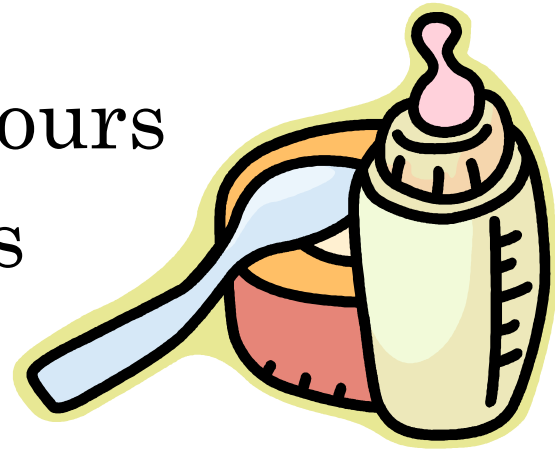
# OBJECTIVES

- Review common NPO guidelines for pediatrics and impact on pediatrics
- Review premedications for pediatrics
- Review airway and induction techniques
- Review IV access/fluid administration



# NPO GUIDELINES

- Clear liquids – 2 hours
- Breast milk – 4 hours
- Formula or milk – 6 hours
- Light meal – 6-7 hours
- Full meal – 8 hours






## TIPS: OPTIMIZING NPO STATUS

- Ensure detailed guidelines are given to the parents when surgery is scheduled
- Schedule early in the day
- Give the child clears after hospital arrival if possible
- Gum? (Poulton, 2012)





# PARENTAL PRESENCE

- Yes or No?
  - Provider comfort level
  - Parent satisfaction
  - Induction: Kain et al. (2000)
  - Emergence: Arai et al. (2007)
  - EB review: Chundamala et al. (2009)
    - 14 studies
  - Kazak et al. (2010)
- 

# TIPS: MAKE THEM LAUGH

- Lightens the mood
- Makes children feel more comfortable
- Might make you more comfortable too!



# PREOPERATIVE MEDICATIONS

- Albuterol
  - 2.5 mg <10 kg pt
  - 5 mg >10 kg pt
- Atropine – 0.1 mg IM
- Metoclopramide
  - 0.15 mg/kg po
  - 0.1 mg/kg IV (max 5-10)



# PREOPERATIVE LABWORK

- Hematocrit/hemoglobin
- Fluid balance panel
- Coagulation studies
- Glucose level
- Packed red blood cells, platelets, fresh frozen plasma





# AIRWAY AND INDUCTION

Just a smaller adult airway...right???





# NOSE

- Floor, roof, medial and lateral wall
- Paranasal sinuses
- Anesthesia implications
  - Obligate nasal breathers until 6 months
  - Choanal atresia
  - Sinusitis





# OROPHARYNX

- Oropharynx

- Lingual and palatine tonsils
- Tongue
- Anesthesia implications
  - Tonsillar hypertrophy
  - Obstruction



# LARYNX

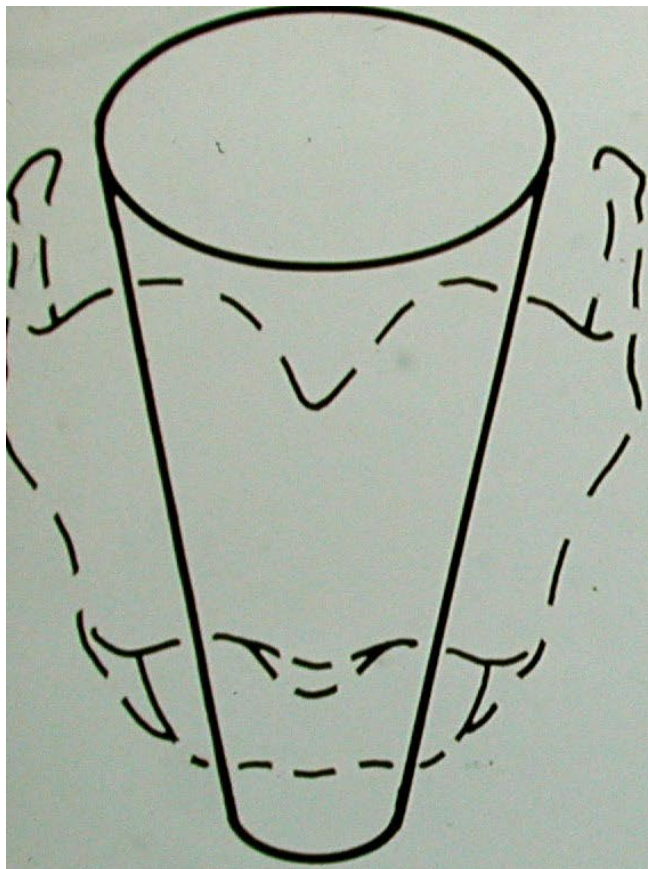
- Thyroid, cricoid, arytenoids, corniculate, cuneiform cartilage and epiglottis, hyoid bone
- Cricoid level at birth C3-4, 6 years C5, adult C6
- Why?
- Innervation
  - Sensory – recurrent laryngeal (supraglottic)
  - Sensory – internal branch superior laryngeal (infraglottic)
  - Motor – external branch superior laryngeal (cricothyroid)
  - Motor – recurrent laryngeal (all other muscles)



# EPIGLOTTIS AND SUBGLOTTIS

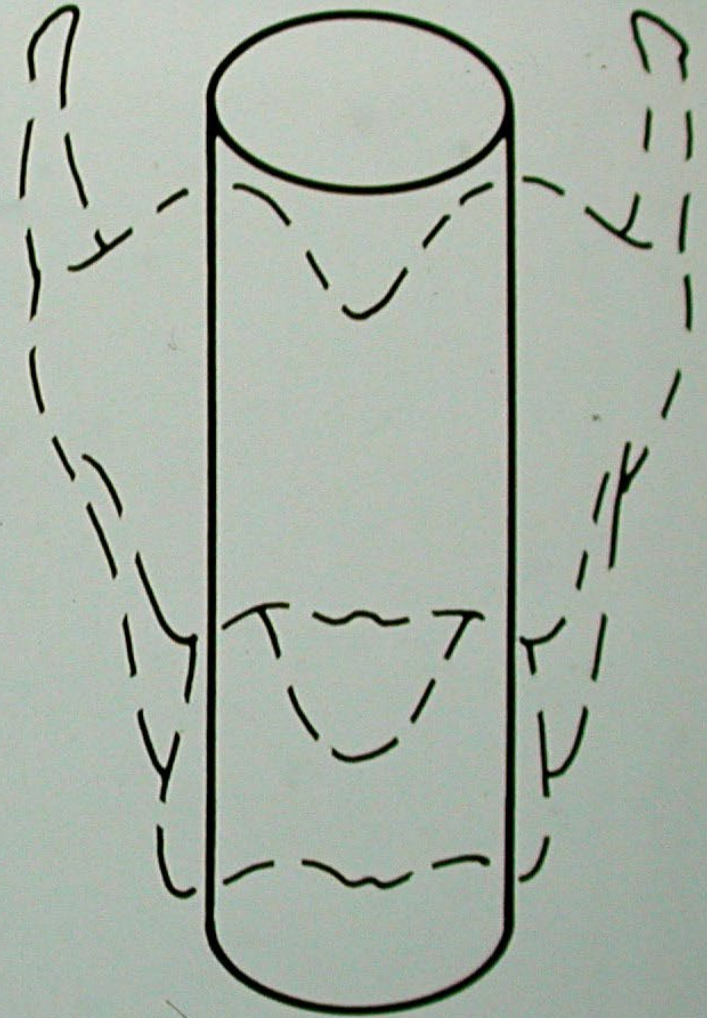
- Epiglottis is narrowed – can be harder to pick up with laryngoscope blade
- Narrowest point is the cricoid
- Too large a tube may cause edema and problems after extubation
- Adult's narrowest point is the rima glottidis – usually around 10-12 years of age





Infant

B.



Adult

# AIRWAY ASSESSMENT TIPS



# TIPS: AIRWAY ASSESSMENT

- Visual inspection
- Snoring history?
- Loose teeth?
- Previously difficult
- Always have plan B (and C, D, and E...)





# INDUCTION TECHNIQUES



# INHALATION INDUCTION

- Can be done on anyone – even with IV
  - Neto et al. 2014
- Stage II – increased chance of spasm
- Oral airway
- Decreased need for IV medications
  - Turnover





# SINGLE BREATH OR SLOW?

- Gradual increase vs. 8% sevoflurane
- Child's choice
- O<sub>2</sub> or N<sub>2</sub>O/O<sub>2</sub>
- Second gas effect - Lee et al. (2013)



# TRICKS: INHALATION INDUCTION

- Nitrous oxide is your friend (sometimes)
- Distraction techniques
  - Miffin et al. (2012), Lee et al. (2010)
- Steal technique - Guedel
- Make it fun!
  - Pop the balloon
  - Blowing out birthday candles
  - Make it smell good





# INTRAVENOUS INDUCTION

- May need increased induction agents
- Supplement with inhalation agents after induction but before intubation
- Take reason for surgery into consideration
- Can still use distraction techniques





# MASKING

- Importance!!!
- Challenges
- Finger placement
- Tongue
- Seal



# TIPS: MASKING

- Forget you have a 3<sup>rd</sup> and 4<sup>th</sup> finger
- Head positioning
- Infants – open mouth
- Side masking?







# TRACHEAL INTUBATION

- Positioning
- Awake
- Asleep
- Blade choice
- Insertion depth
  - 1,2,3,4...7,8,9,10
  - 11 for 1 year old
  - 12 for 2 year old
  - $12 + \text{age}/2$



# INTRAVENOUS ACCESS



# IV ACCESS

- Can be very difficult!
- Compounding factors
  - Long NPO time
  - Baby fat/toddler fat/preteen fat/teenager fat
  - Ex-premature or sick patient
  - Awake
  - Anxiety



# TRICKS: AWAKE

- Premedication
- Distraction
- Warm towels/compresses
- Numbing medication
- Parental presence?

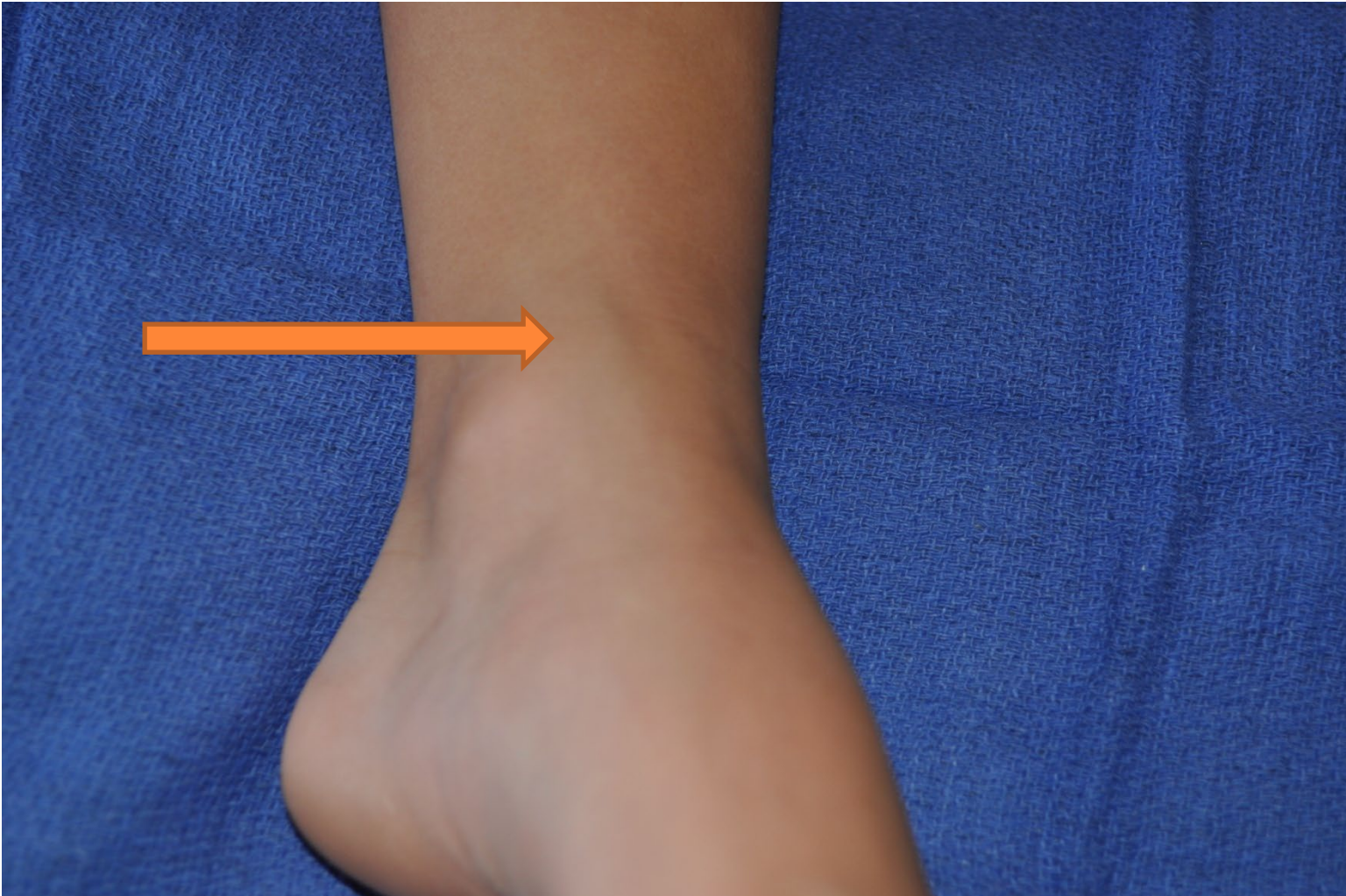


# TIPS: SUCCESS SPOTS

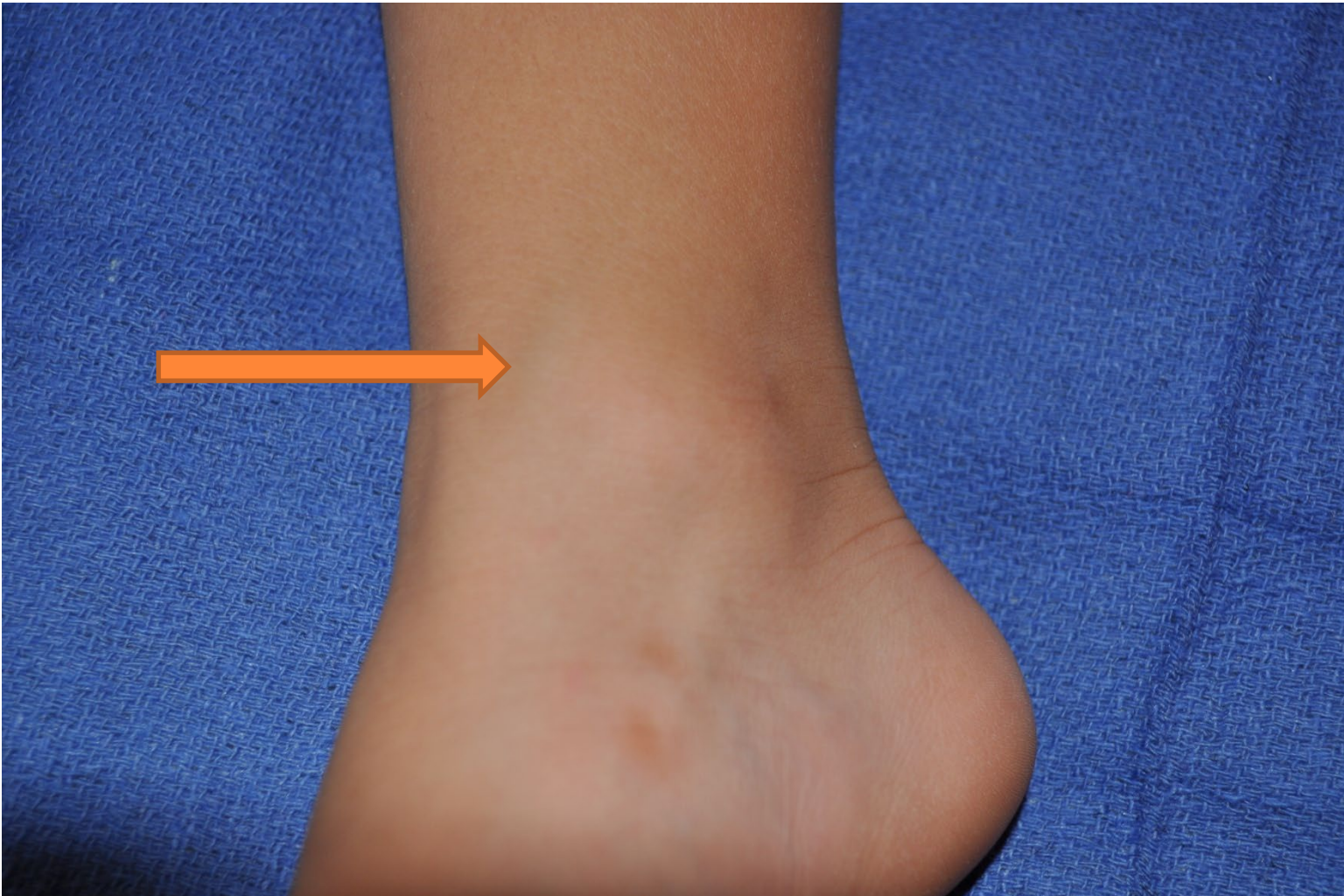
- Saphenous
- Hand veins
- Antecubital
- Wrist
- Feet
- Scalp
- Neck



# SAPHENOUS VEIN



# SAPHENOUS VEIN



# HAND VEIN

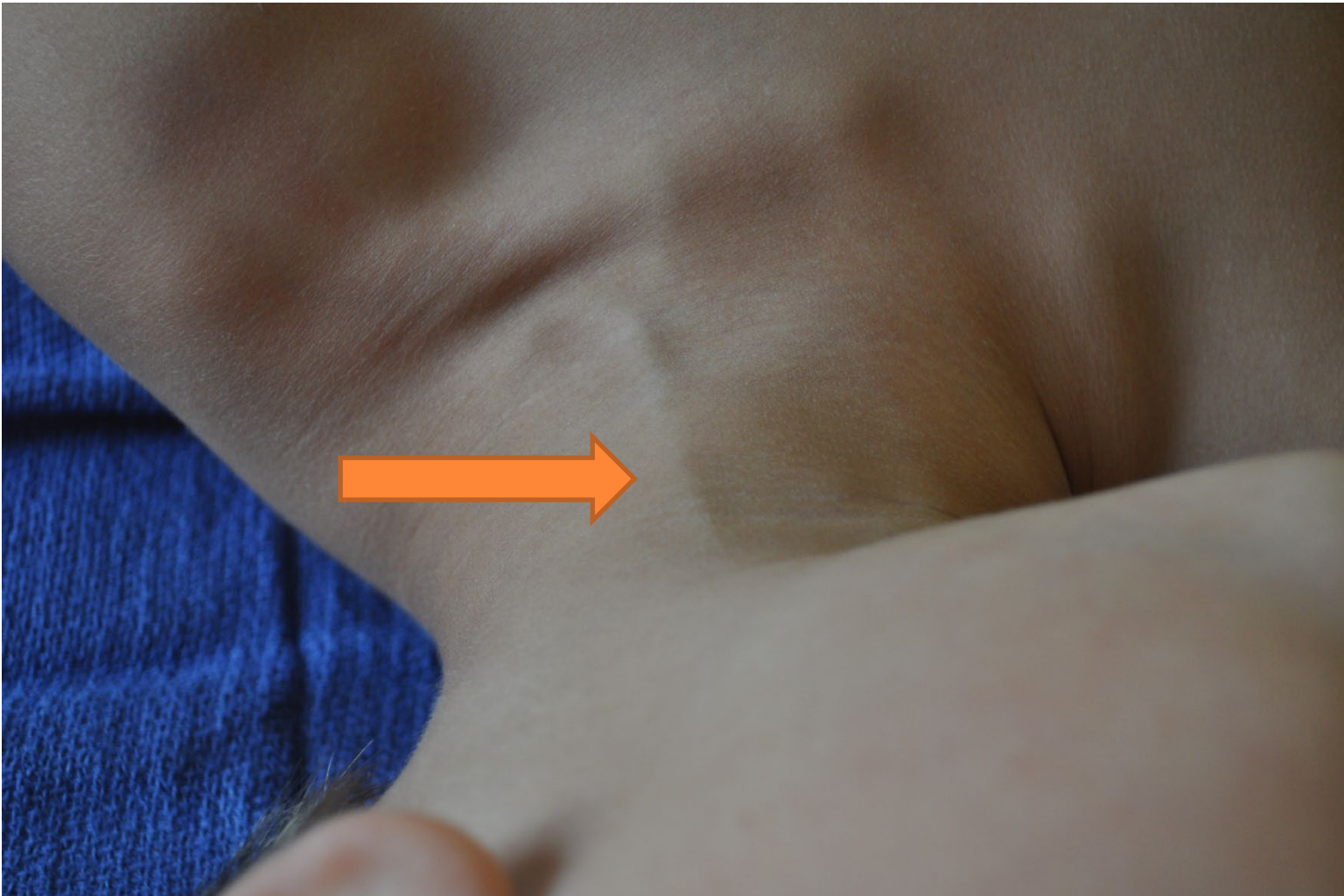




# HAND VEIN



# EXTERNAL JUGULAR



# TRICKS: TOOLS TO INCREASE SUCCESS

- Vein Finders
- Ultrasound
- Intraosseous Cannulation
- Inhalation induction ☺



# INTRAOSSSEOUS CANNULATION

- Locate tibial tuberosity
- Go about 2 cm lower than tuberosity and find flat spot
- Local if patient is awake
- Advance through subcutaneous tissue until bone felt
- Twist into bone with firm pressure until you feel loss of resistance
- Aspirate marrow for confirmation





# INTRAVENOUS FLUIDS

- Fluid choice
- Maintenance rates
- Fluid deficit
- Third spacing
- Blood volume
- Blood replacement



# FLUIDS

## ○ Choice

- NPO maintenance – D5 ½ NS
- OR maintenance – LR, D5LR
- Dextrose??? – Bailey et al (2010)

## ○ Maintenance rate – 4-2-1

- 4 ml/kg for first 10 kg
- 2 ml/kg for second 10 kg
- 1 ml/kg for each kg after



# TRICKS: MAINTENANCE

- If  $> 20$  kg, simply add “40” to the kg weight
- Who says you can't round???
  - (except students ;-))



# FLUIDS

## ○ Deficit

- Maintenance X hours NPO
- Calculate when last had solids and subtract any clears
- Consider additional factors such as bowel prep, nausea, decreased po intake
- Replace  $\frac{1}{2}$  first hour,  $\frac{1}{4}$  hours second and third hour





## EXAMPLE: FLUID DEFICIT

- 15 kg 2 yo, solids at 1900, 2 oz clears 0500
- Enters OR at 0800
- NPO solids – 13 hr
- Deficit:  $(50 \times 13) - (2 \times 30) = 590$
- Same day surgery try to replace over a few hours and consider pt pop
  - Will they drink after
  - Requirements for d/c



# THIRD SPACING

- Minimal – 3-4
- Moderate – 5-10
- Severe – 10-15 (up to 50! (2010))
- Consider differences in pediatric proportions when choosing
- Goal directed management
  - Kehlet (2009)
  - Wakeling et al (2005)



# BLOOD REPLACEMENT

Allowable blood loss

$$\frac{[EBV \times (\text{starting Hct} - \text{lowest acceptable Hct})]}{\div \text{average Hct}}$$

$$\text{Avg Hct} = \frac{(\text{starting Hct} - \text{lowest acceptable Hct})}{\div 2}$$



## BLOOD VOLUME – ML/KG

- Premature – 100
- Neonate – 90
- Infant – 80
- Toddler/Child – 75
- Adult – 65-70





# TIPS: BLOOD REPLACEMENT

- Crystalloid – 3:1
  - Zunini et al. (2012)
- Colloid – 1:1
  - SAFE study (2004)
  - Cochrane review
  - Neonates (O'Brien 2014)
- Simplistic
  - Less than 10% BV loss, crystalloid
  - 10-20% BV loss, crystalloid or colloid
  - >20% BV loss, blood products likely



# TIPS: BLOOD REPLACEMENT

- $\text{MABL} \times \text{Desired HCT} \div \text{HCT of PRBCs}$
- 10 ml/kg raise HCT 10%, HBG 3
- Recommendations for lowest allowable HCT
  - Bleeding after?
- Arya – 2012 good review and good references and FREE





# DEXMEDETOMIDINE

- Uses
  - Preoperatively
  - Intraoperatively
  - Sedation
  - Shivering
- Population
- Timing
- Postoperative admission?



# DEXMEDETOMIDINE

- Doses
  - PO: 1 – 5 mcg/kg
  - IN: 0.5 – 2 mcg/kg
  - IM: 0.5 – 2 mcg/kg
  - IV – cannot bolus (ish)
    - Load 1 mcg/mg over 10 minutes
    - Start at 0.6 mcg/kg/hr
    - Titrate to effect
    - Consider additional agents





MAKE IT FUN!



ARRRRE THERE ANY QUESTIONS?



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