Aspiration During Pediatric Burn Dressing Change

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INTRODUCTION

A 3-year-old ASA 2 male presents for a burn dressing change in a procedural unit on the floor, outside of the OR. The emergency treatment report stated that the patient had initially spilled a cup of hot tea over himself a few days ago, sustaining a 2nd degree (partial thickness) scald burn to the posterior torso. After initial burn debridement was performed under Ketamine sedation, the patient was admitted for further treatment & monitoring.

LEARNING OBJECTIVES

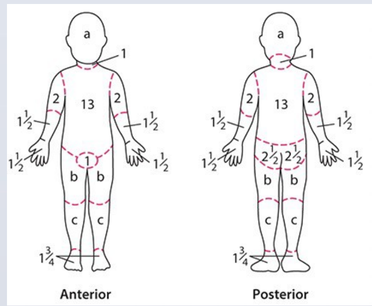
- Discuss preoperative evaluation of the burn patient
- Outline ASA requirements & preparation for NORA
- Discuss physiologic effects of aspiration
- Describe anesthetic management of aspiration

BACKGROUND

Non-OR Anesthesia (NORA): anesthesia outside of a traditional OR, requiring providers to work in remote locations of a hospital, where ease of access to patient & equipment may be limited (Butterworth et al., 2022)

Rule of Nines: used to calculate % body surface area (BSA) burned

- In pediatric patients, proportions change with <u>age</u> (Jones, 2021)
  - Head is a large proportion of BSA during infancy
  - As they age → *legs larger portion of BSA*



Body part	Age 0 yr	1 yr	5 yr	10 yr	15 yr
a = 1/2 of head	9 1/2	8 1/2	6 1/2	5 1/2	4 1/2
b = 1/2 of 1 thigh	2 3/4	3 1/4	4	4 1/4	4 1/2
c = 1/2 of 1 lower leg	2 1/2	2 1/2	2 3/4	3	3 1/4

Smith E.B., & Hunsberger J (2021). Intraoperative complications and crisis management. Ellinas H, & Matthes K, & Alrayashi W, & Bilge A(Eds.), *Clinical Pediatric Anesthesiology*. McGraw Hill. https://accessanesthesiology-mhmedical-com.su.idm.oclc.org/content.aspx?bookid=2985&sectionid=250592 58 7

Different Types of Burns:

- Scald burns: caused by hot water or steam
  - *65% of burns in children < 5 YO*
- Treatment (*2nd & 3rd degree burns*):
  - Fluid replacement indicated once ≥ 20% TBSA involved
  - Skin grafting & debridement

Superficial (*1st degree*)	Partial thickness (*2nd degree*)	Full thickness (*3rd degree*)
Do <u>NOT</u> penetrate epidermis	Penetrate epidermis & part of dermis, blistering	Penetrates dermis & destroys nerves / vessels

CASE DESCRIPTION

Preoperative Evaluation:

- Non-labored respirations, stable & cooperative
- Rule of Nines: 4.5% (301.5 cm^2) BSA
- Dentition & airway exam WNL
- No anesthetic hx or familial hx of complications
- **NPO > 8 hours (food & drink) →*reported by mother***
  - Consent for sedation obtained following confirmation of NPO status
- Anesthetic plan: MAC w/ propofol infusion

ASA NPO Guidelines

Timing Before Surgery	Guidelines
8 hours	Fatty food
6 hours	Light meals, infant formula, non-human milk
4 hours	Breast milk
2 hours	Clear liquids

Prior to procedure start, supplemental O2 was administered via nasal cannula at 4 L/min. After administration of 15 mg IV lidocaine, the propofol infusion was started at 250 mcg/kg/min and the patient was moved into left lateral decubitus position. About 5 minutes into sedation, the patient began coughing, prompting a 30 mg propofol bolus. Patient expelled a high volume of thick, chunky, pink emesis out of the nose & mouth, prompting immediate suction. While suctioning, the tubing became clogged, and the patient quickly desaturated (SpO2 = 20-30%) during replacement of suction equipment.

Nasal cannula was stopped, and the patient was supported with 100% O2 via AMBU bag mask ventilation. After advancing a flexible suction catheter into the stomach, emergent intubation was required as the patient's saturations were not improving. The patient's airway was secured atraumatically using a miller 1.5 laryngoscope and a 4.5 microcuffed ETT.

Post-Operative Care:

- CXR:
  - Streaky perihilar opacities →*vascular congestion / edema vs. atelectasis*
  - Leftward tracheal deviation
- PICU admission for overnight observation

DISCUSSION

After further questioning, mother admitted that the patient had received a "high volume of water" at 12:00 pm → *procedure began at* ***12:15 pm***

- Pediatric patients regurgitate in **~1/200** procedures
- Gastric emptying rates decrease by **37-42%** after burn injuries as soon as 6 hours post-injury (Smith & Hunsberger, 2021)
  - If bowel sounds are present & there is no ileus, RSI may not be necessary
  - Opioids avoided →*respiratory depression & slowed gastric emptying*

Signs & Symptoms of Aspiration:

- Coughing
- Wheezing
- Cyanosis
- Hypoxia w/ increased O2 requirements
- Fever
- Tachypnea

Physiologic Effects of Different Aspiration Contents

Acidic Fluid	Non-Acidic Fluid	Particulate
<u>FIRST PHASE</u>: Chemical pneumonitis (*lung tissue reacts to acid*)	Less severe than acidic fluid aspiration	Physical obstruction of the airway
<u>SECOND PHASE</u>: Inflammatory response (*to original pneumonitis*)	Atelectasis Alveolar collapse	Hypoxia Hypercapnia Hyperinflation & atelectasis on CXR

Treatment for Aspiration:

- Supportive:
  - Immediate suctioning
  - Ventilation & supplemental O2 →*secure airway if necessary*
  - PEEP →*decrease atelectasis & alveolar collapse*
  - Antibiotics & steroids <u>NOT</u> routinely administered
- Bronchoscopy →*may be required if large particulates aspirated & cause obstruction*
- Lung lavage →*<u>NOT</u> recommended*
  - May push particulates further down into lungs

CONCLUSIONS

Prepare for all adverse outcomes <u>REGARDLESS</u> of how "unlikely" it may seem for certain events to occur (*especially when outside of OR*):

- Pediatric crash cart wasn't appropriately stocked
- Equipment for NORA:
  - Appropriately sized ETTs, LMAs, OAWs, laryngoscope blades, pediatric transport mask
  - Syringes, blunt tip & IM needles, flush syringes, infusion tubing, infusion pump
  - <u>ALWAYS</u> check suction prior to procedure start
- Emergency medications:
  - Epinephrine
  - Atropine
  - Succinylcholine

Risk Factors for Aspiration (Jones, 2021)

Emergency surgery → *especially abdominal surgery*	**Recent ingestion of food**	Trauma
Decreased consciousness	Neuromuscular diseases	**Delayed gastric emptying**, bowel obstruction, ileus
Difficult airway	Increased ASA status	**Young age**

ASA Minimal Requirements for NORA
Reliable O2 source, delivery method (nasal cannula, face mask), & backup supply
Adequate suction
Self-inflating resuscitator bag that can administer at least 90% O2 & PPV
Anesthetic drugs, monitoring, & supplies
Scavenging when inhaled anesthetic agents required
Adequate lighting & electrical outlets for proper visualization & operation of equipment
Sufficient space for anesthesia provider, unobstructed a/w access
Emergency cart w/ defibrillator & emergency drugs for cardiopulmonary resuscitation
Adequate post-anesthesia care

REFERENCES

- Ambulatory & non–operating room anesthesia. Butterworth IV J.F., & Mackey D.C., & Wasnick J.D.(Eds.), (2022). *Morgan & Mikhail's Clinical Anesthesiology, 7e*. McGraw Hill. https://accessanesthesiology-mhmedical-com.su.idm.oclc.org/content.aspx?bookid=3194&sectionid=266523488
- Bittner E.A., & Martyn J (2017). Evaluation and anesthetic management of the burn-injured patient. Longnecker D.E., & Mackey S.C., & Newman M.F., & Sandberg W.S., & Zapol W.M.(Eds.), *Anesthesiology, 3e*. McGraw Hill. https://accessanesthesiology-mhmedical-com.su.idm.oclc.org/content.aspx?bookid=2152&sectionid=164239874
- Jones C (2021). Trauma and special emergencies. Ellinas H, & Matthes K, & Alrayashi W, & Bilge A(Eds.), *Clinical Pediatric Anesthesiology*. McGraw Hill. https://accessanesthesiology-mhmedical-com.su.idm.oclc.org/content.aspx?bookid=2985&sectionid=250591642
- Riad I.A., & Abdelmalak B (2017). Monitored anesthesia care and non–operating room anesthesia. Longnecker D.E., & Mackey S.C., & Newman M.F., & Sandberg W.S., & Zapol W.M.(Eds.), *Anesthesiology, 3e*. McGraw Hill. https://accessanesthesiology-mhmedical-com.su.idm.oclc.org/content.aspx?bookid=2152&sectionid=164238770
- Smith E.B., & Hunsberger J (2021). Intraoperative complications and crisis management. Ellinas H, & Matthes K, & Alrayashi W, & Bilge A(Eds.), *Clinical Pediatric Anesthesiology*. McGraw Hill. https://accessanesthesiology- mhmedical-com.su.idm.oclc.org/content.aspx?bookid=2985&sectionid=250592587