

JA Rost MD¹, GR Johnson MD²

1. Department of Anesthesiology, Cooper University Hospital, Cooper Medical School of Rowan University, Camden NJ
2. Department of Anesthesiology and Critical Care, The Children's Hospital of Philadelphia, Perlmutter School of Medicine at the University of Pennsylvania

INTRODUCTION

- Anaphylaxis is exceedingly rare under anesthesia, most commonly from neuromuscular blocking agents or antibiotics
- Anaphylaxis is an IgE immune mediated mast cell degranulation response, releasing histamine, tryptase, leukotrienes and prostaglandins
- Previous exposure to allergens predisposes to more severe reactions with each subsequent exposure
- Hereditary Angioedema is related to complement derangement and C1-esterase deficiency
- We present a case of apparent anaphylaxis to sevoflurane in a young woman undergoing tonsillectomy

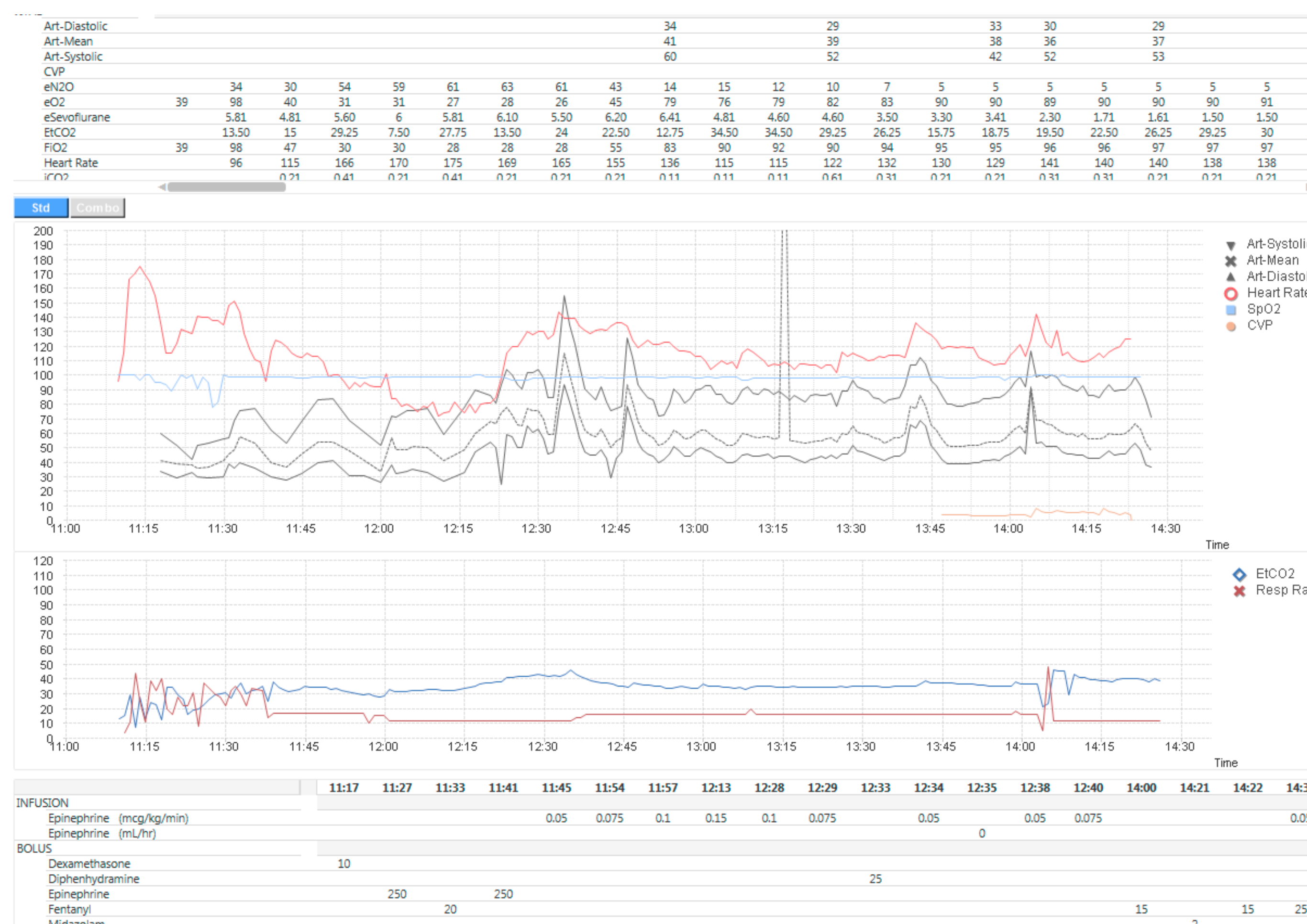
HISTORY

She is a 11 year old female presenting with a history of idiopathic angioedema, amplified musculoskeletal pain syndrome, and recurrent tonsillitis. She had four previous anesthetics – BMT, division of tongue tie, adenoidectomy, and dental extraction. Her initial BMT was uncomplicated, consisting of sevoflurane by mask. Her division of tongue tie had a normal intraoperative course; however, she experienced perioral and periorbital edema after. She made a full recovery and was diagnosed with angioedema. Upon mask induction with sevoflurane for her adenoidectomy, she developed oropharyngeal and periorbital edema, requiring treatment with steroids, epinephrine infusion, and admission to the PICU. She had a normal tryptase, C1E, C4 and C3 compliment levels, but abnormally elevated IgE-antibody levels; confirming a type-1 immune response and a diagnosis of anaphylaxis to sevoflurane from allergy specialists. Her subsequent anesthetic for dental extraction was performed without complication via total intravenous anesthetic.

TONSILLECTOMY

- Pre-medicated with midazolam 15 mg PO to little effect.
- Inhaled NO provided for IV placement, however, she experienced severe anxiety with marked choking, and coughing.
- She physically refused IV placement; ergo, IM ketamine 200 mg was administered to the left deltoid, facilitating IV placement and induction.
- Anesthesia was maintained with a propofol infusion, supplemented with fentanyl.
- She was extubated to nasal cannula, experienced no signs of hypersensitivity, and was discharged home the following day.

IMAGES



Previous anesthetic: hemodynamic collapse and response to epinephrine

DISCUSSION

- Drug related hypersensitivity can be immune-mediated (anaphylactic) or non-immune mediated (anaphylactoid).
- Non-immune mediated hypersensitivity can be complement mediated or occur via direct drug interaction with mast cells or basophils.
- Both types of hypersensitivity cause release of tryptase, histamine, leukotrienes and prostaglandins leading to a systemic syndrome.
- Hypersensitivity syndrome is marked by bronchospasm, angioedema, hemodynamic collapse and cutaneous signs, including rash
- Types of reactions are differentiated by timely serum lab work, including tryptase, complement proteins and IgE concentrations.
- Immune-mediated reactions become more severe with subsequent exposures by sensitizing the immune system to the irritant. Non-immune mediated reactions may not progress in severity.

Anaphylaxis

Rash, bronchospasm, hypotension

- Increase O₂ to 100%
- Remove suspected trigger(s)
 - If latex is suspected, thoroughly wash area
- Ensure adequate ventilation/oxygenation
- If HYPotensive, turn off anesthetic agents

Common causative agents:

- Neuromuscular blockers
- Latex
- Chlorhexidine
- IV colloids
- Antibiotics

Purpose	Treatments	Dosage and Administration
To restore intravascular volume	NS or LR	10-30 mL/kg IV/IO, rapidly
To restore BP and ↓ mediator release	Epinephrine	<ul style="list-style-type: none"> 1-10 MICROgrams/kg IV/IO, as needed, may need infusion 0.02-0.2 MICROgrams/kg/min Additionally, can give 10 MICROgrams/kg IM for depo effect
To ↓ bronchoconstriction	Albuterol (Beta-agonists)	4-10 puffs as needed
To ↓ mediator release	Methylprednisolone	2 mg/kg IV/IO MAX 100 mg
To ↓ histamine-mediated effects	Diphenhydramine	1 mg/kg IV/IO MAX 50 mg
To ↓ effects of histamine	Famotidine or Ranitidine	0.25 mg/kg IV 1 mg/kg IV

CONCLUSION

- There is only one case report of possible anaphylaxis to volatile anesthetic (isoflurane)
- Our patient was initially diagnosed with HAE after surgery was complicated by facial edema in PACU
- However, she had more severe symptoms with subsequent surgeries prompting immunologic work up for hypersensitivity.
- Displaying normal complement levels and elevated serum IgE, immune-mediated anaphylaxis to sevoflurane was diagnosed.
- During our case, the patient experienced pain, local trauma, emotional stress, and exposure to multiple medications, *except* volatile anesthetics. She did well, never experiencing edema, rash, bronchospasm, airway obstruction or hemodynamic collapse

REFERENCES

- Csuka, D., Veszeli, N., Varga, L., Prohaszka, Z., Farkas, H. "The Role of the Complement System in hereditary Angioedema". *Molecular Immunology*, vol. 89, pp 59-68, Sept 2017.
- Slegers-Karsmakers, S., Stricker, BH. "Anaphylactic Reaction to Isoflurane." *Anaesthesia*. Jun 1988 vol 43, pp 506-507
- Henao MP, Kraschnewski JL, Keibel T, Craig TJ. Diagnosis and screening of patients with hereditary angioedema in primary care. *Therapeutics and Clinical Risk Management*. 2016;12:701-711. doi:10.2147/TCRM.S86293.
- Mali S. Anaphylaxis during the perioperative period. *Anesthesia, Essays and Researches*. 2012;6(2):124-133. doi:10.4103/0259-1162.108286.
- Moneret-Vautrin DA¹, Mertes PM. Anaphylaxis to general anesthetics. *Chem Immunol Allergy*. 2010;95(180-9). doi:10.1159/000315951. Epub 2010 Jun 1.