

Anaphylaxis

Overview

- Allergic reactions are an important cause of intraoperative morbidity and mortality (3.4% mortality)
- Account for approximately 10% of all anesthetic complications
- More than 90% of reactions occur within 3 minutes but can be delayed by hours with variable presentation
- Can be difficult to identify cause as multiple drugs are given early in anesthetic
- Usually the faster the reaction, the more severe the course will likely be
- Anaphylaxis involves a combination of systemic and dermal signs & symptoms, all due to release of vasoactive mediators which:
 - Increase mucous membrane secretions
 - Increase bronchial smooth muscle tone
 - Decrease vascular smooth muscle tone and increase capillary permeability
- Anaphylactic and anaphylactoid reactions present similarly and are treated IDENTICALLY

Anaphylaxis vs. Anaphylactoid

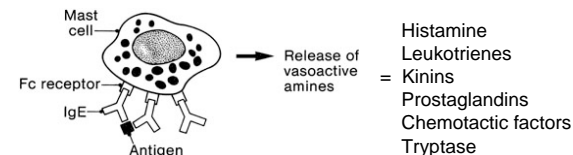
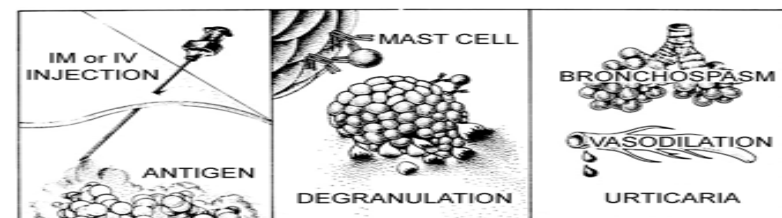
Anaphylaxis

- IgE-mediated Type I hypersensitivity reaction
- Sensitization = prior exposure to an antigen which produces antigen-specific IgE antibodies that bind to Fc receptors on mast cells and basophils.
- Upon re-exposure to the antigen, IgE antibodies then cross-link Fc receptors causing degranulation and release of stored mediators (vasoactive)
- Reaction is Dose Independent!

Anaphylactoid

- Direct activation of mast cells and basophils by non-IgE mechanisms or activation of complement system
- May occur on 1st exposure to an antigen

Sequence of Events



Common Precipitants

- **Muscle relaxants** (~70% responsible for anaphylaxis during GA)
 - NDMBs (rocuronium > vecuronium > cisatracurium) > SCH
- **Latex** (~20%): remember can occur from skin contact alone
- **Antibiotics**
 - Often reported ~10% (skin testing) cross-reactivity between PCN and cephalosporins; actual incidence for systemic response is now reported ~4.5%
- **Local anesthetics**
 - Ester > amides, possible PABA allergy.
- **Propofol**
 - Egg or other protein allergy (peanuts)?
- **Colloids**
 - Hespan (6% HES)
- **Blood products**
- **Protamine**
 - Isolated from salmon sperm, therefore patients with fish allergy or diabetics with NPH allergy have encountered reactions

Latex Allergy

- Obtain a careful history:
 - Healthcare workers
 - Children with spina bifida
 - Urogenital abnormalities (h/o multiple urogenital catheters)
 - Food allergies (mango, kiwi, avocado, passion fruit, bananas)
- Establish a latex-free environment:
 - Schedule patient as first case of the day
 - Most equipment & supplies are latex-free; if available, have a cart of latex-free alternatives available
 - Remove tops of multi-dose vials when drawing up drugs
- Prophylactic steroids and/or H1-blockers (uncertain benefit)
- Prepare for the worst, hope for the best

Sign and Symptoms

System	Symptoms (e.g. MAC/Regional)	Signs (e.g. General or Regional)
Respiratory	Dyspnea Chest tightness	Hypoxia Wheezing Laryngeal edema ↓ Compliance/↑ PIPs Pulmonary edema
Cardiovascular	Dizziness ↓ LOC	Hypotension Tachycardia Dysrhythmias Pulmonary HTN Cardiac arrest
Cutaneous	Itching	Hives Flushing Periorbital edema Perioral edema

Anaphylactic reactions may have variable presentations with some or all of these signs & symptoms.

Management

Acute Phase

1. Stop administration of offending antigen
2. Notify surgeon AND call for help
3. Maintain airway, give 100% O₂
4. In cases of severe cardiovascular collapse, would consider discontinuation of all agents that may augment hypotension such as inhaled anesthetics (via vasodilation) & narcotic infusions (via suppressing sympathetic response).
 - Give other amnestic agents (e.g. scopolamine, midazolam)
5. Fluids 2-4 L or more!, as needed for hypotension
6. Epinephrine
 1. Start 5-10 mcg IV boluses, escalate as needed
 2. ACLS doses (0.1-1 mg) for cardiovascular collapse

Management

Secondary Treatment

- Intubation
- Invasive lines - large-bore IVs, arterial line, central venous catheter, Foley catheter
- Drugs
 - H1-blocker - diphenhydramine 0.5-1 mg/kg IV
 - Steroids: hydrocortisone 0.25-1 g IV, or methylprednisolone 1-2 g IV
 - Epinephrine gtt - start 50-100 ng/kg/min (4-8 mcg/min)
(Epi minidrip - 1 mg in 250 ml NS = 4 mcg/ml; run at 60 microdrips/min = 4 mcg/min; titrate to effect)
 - H2-blockers - not a first-line agent, but not harmful either!
 - Bicarbonate - 0.5-1 mEq/kg IV, as needed

Prevention

- Obtain a careful history:
 - Previous allergic reactions?
 - Atopy or asthma?
 - Food allergies?
- Test dose drugs followed by slow administration
 - reduces anaphylactoid, but not anaphylactic reactions
- Judicious use of blood products
- Use prophylactic steroids and/or H1-blockers (no clear benefit)
- Obtain consultation from an allergist if necessary.

Testing for an Allergy

- Testing may not be necessary if there is a clear temporal association between drug and reaction
- Measurement of serum mast cell tryptase levels can help establish the diagnosis in uncertain cases of anaphylaxis.
- Follow up with an allergist may be useful for establishing a diagnosis (e.g. skin testing)

References

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