
Respiratory Block

6 Anaphylactic shock

Objectives :

1. Perceive the differences between anaphylactic shock and other types of shock .
 2. Recognize its nature, causes & characteristics.
 3. Specify its diagnostic features.
 4. Identify its standard emergency management protocol.
 5. Justify the mechanism of action and method of administration of each of the different used drugs to limit its morbid outcomes.
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Color index:

Red: important

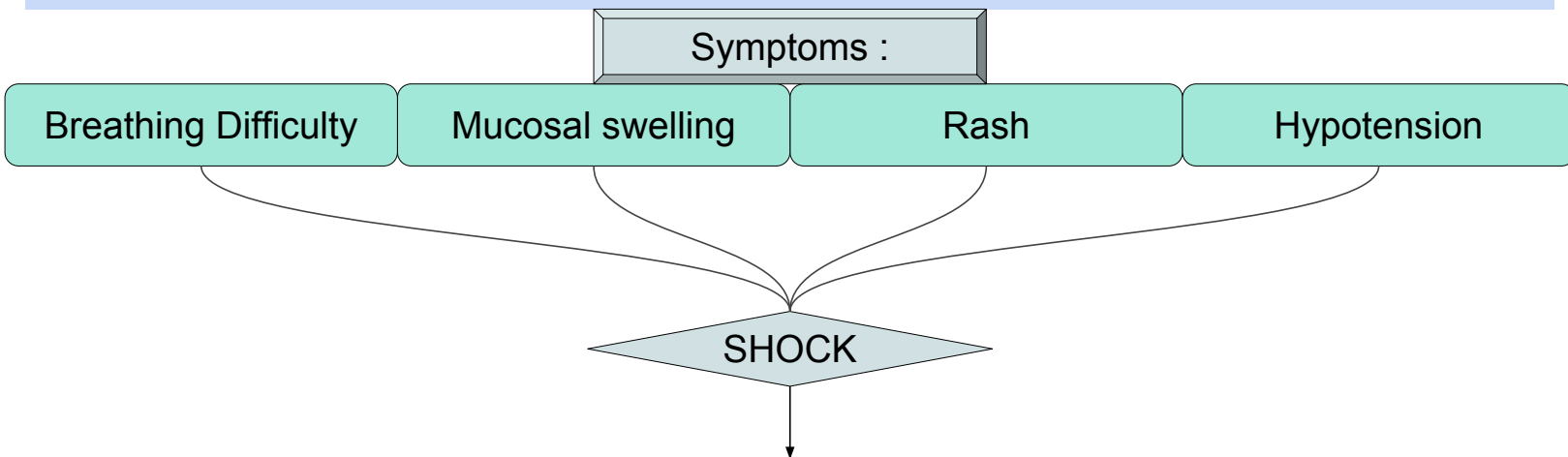
Grey: Notes or extra information

green: dr's note



Anaphylaxis

Anaphylaxis Is a sudden, severe hypersensitivity reaction affecting the whole body (generalized or systemic) in response to allergen.



ANAPHYLACTIC SHOCK :

A life-threatening allergic reaction that causes shock (hypoperfusion) and airway swelling. "Anaphylactic shock" is a term that specifically refers to an episode of anaphylaxis. histamine is the major causative agent , it does bronchoconstriction and vasodilation by H1 agonist and increase gastric acid secretion H2 agonist.

SHOCK: Generalized circulatory derangement causing multiple organ HYPOPERFUSION [Inadequate oxygen delivery to meet metabolic demands] & strong sympathetic activation.

If the shock is intense or sustained enough, it will lead to irreversible derangements sets then to permanent functional deficit or death

Types of shock

Hypovolemic	Cardiogenic	Obstructive	Distributive
<ul style="list-style-type: none"> • Hemorrhage • Fluid Loss (plasma, ECF) e.g. vomiting , blood loss and that will reduce cardiac output > the body cannot maintain blood pressure 	Inability to contract or pump : Myocardial Infarction	Extra-cardiac Obstruction : <ul style="list-style-type: none"> • Pul. embolism, • cardiac tamponade 	Decreased Peripheral Resistance vasodilation hypotension. As in: <ul style="list-style-type: none"> •septic shock •Neurogenic shock •Anaphylactic shock

ANAPHYLACTIC SHOCK

Immunologic Anaphylaxis (known as ANAPHYLAXIS)

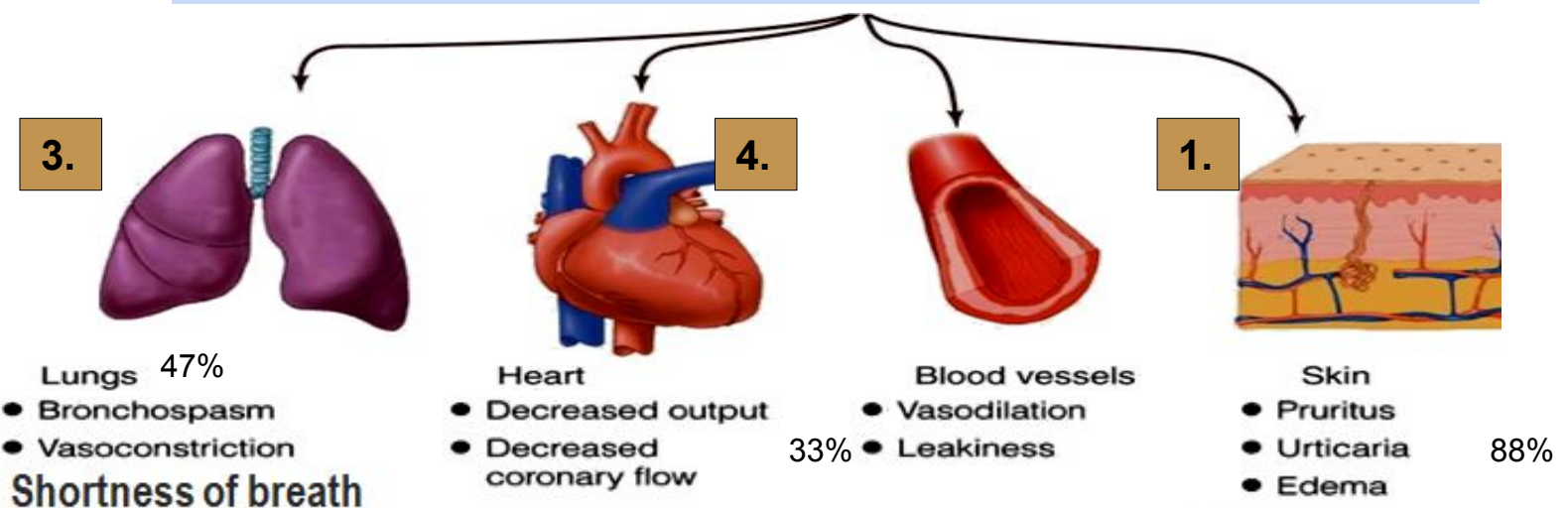
- It belongs to type I hypersensitivity reaction (IgE).
- Occurs after exposure to foreign substances [antigen] such as food, insect or animal venom, drugs, blood products.
- The immune system will then develop antibodies for this antigen and it will remain in the body for a while.
- After a 2nd exposure to the same antigen in previously sensitized persons (antigen-specific ige are present), IgE binds with mast cell causing its degranulation.

Non-Immunologic Anaphylaxis (ANAPHYLACTOID)

- Directly act on mast cells Not IgE-mediated.
- Exogenous substances directly degranulate mast cells. E.g. Radiocontrast dye, Opiates “analgesics”, Depolarizing drugs, Dextrans “antithrombotics”.
- An anaphylactoid reaction can occur following a single, first-time exposure to certain agents in non-sensitized patients.

Because anaphylactic and anaphylactoid reactions produce the same clinical manifestations and are treated exactly the same way, we use the term anaphylaxis to refer to both conditions.

The degranulation of the mast cells will release histamine, Leukotrienes and other inflammatory substances and will lead to:



characters of anaphylactic shock:

- Rapidly developing [5/30 min. can be hours]
- Severe, life-threatening
- Multisystem involvement
- Mortality: due to respiratory (70%) or cardiovascular deficits (25%)

2.	Mucous Swelling	
	Rhinitis	16%
	Angioedema	88%
	Airway	56%
	GIT	30%

ANAPHYLACTIC SHOCK THERAPY PROTOCOL

What you do with someone has anaphylactic shock?

First call the emergency, then start the treatment in this way :



RESCUE

1 Life-threatening problems:
Airway: swelling, hoarseness, stridor
Breathing: rapid breathing, wheeze, fatigue, cyanosis, SpO₂ < 92%, confusion
Circulation: pale, clammy, low blood pressure, faintness, drowsy/coma

1st Line

because rapid IV will cause tachycardia > cardiac arrest

2 Adrenaline (give IM unless experienced with IV adrenaline)
 IM doses of 1:1000 adrenaline (repeat after 5 min if no better)

- Adult: 500 micrograms IM (0.5 mL)
- Child more than 12 years: 500 micrograms IM (0.5 mL)
- Child 6 - 12 years: 300 micrograms IM (0.3 mL)
- Child less than 6 years: 150 micrograms IM (0.15 mL)

Adrenaline IV to be given only by experienced specialists
 Titrate: Adults 50 micrograms; Children 1 microgram/kg

3 IV fluid challenge:
 Adult - 500 – 1000 mL
 Child - crystalloid 20 mL/kg

Stop IV colloid if this might be the cause of anaphylaxis

2nd Line

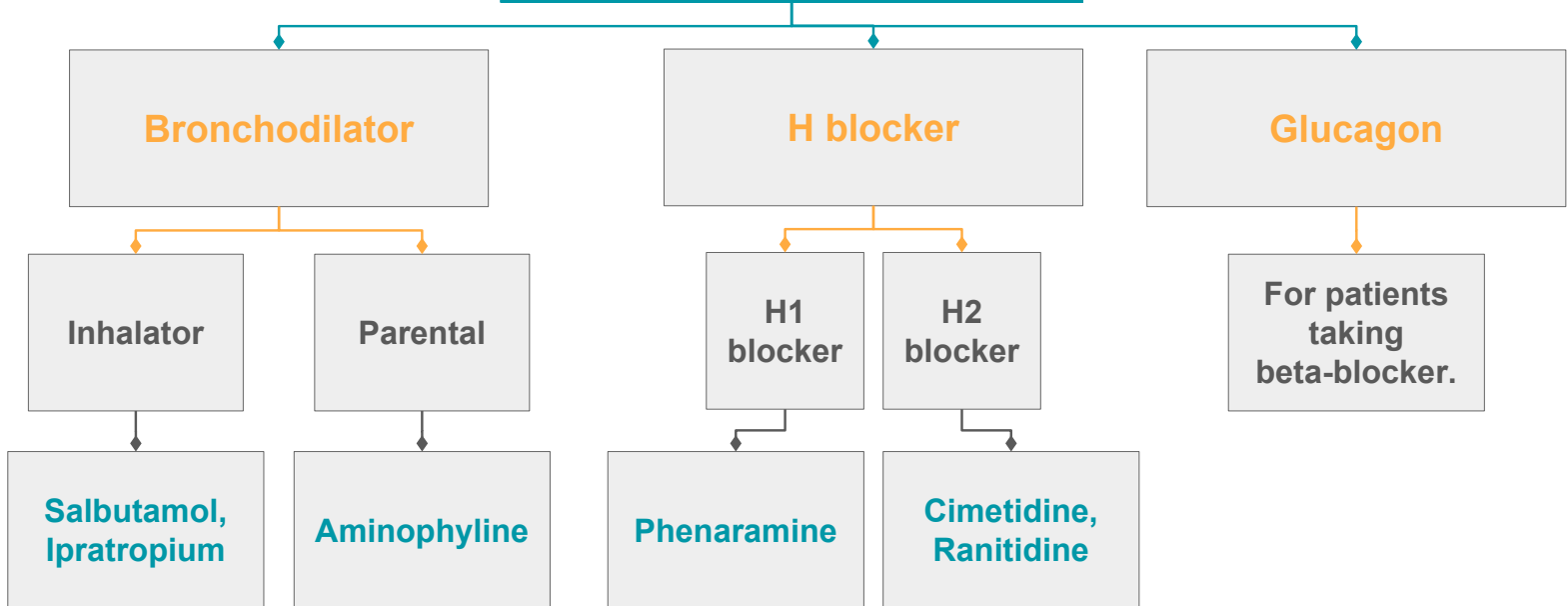
	4 Chlorphenamine (IM or slow IV)	5 Hydrocortisone (IM or slow IV)
Adult or child more than 12 years	10 mg	200 mg
Child 6 - 12 years	5 mg	100 mg
Child 6 months to 6 years	2.5 mg	50 mg
Child less than 6 months	250 micrograms/kg	25 mg

stabilize mast cell and reduce its mediators

better and stronger combination with adrenaline than chlorphenamine. and you shouldn't be afraid of toxicity because the allergy is small term while the toxicity needs long term

Adjuvant to 2nd line

not useful alone



Functions of adjuvant 2nd line:

1. Support the respiratory and circulatory deficits.
2. To prevent further hyper-reaction of immune system.(Biphasic phenomenon*
2nd release of mediators without re-exposure to antigen (in up to 20%)
Clinically evident 3-4h after the initial manifestations clear).
3. To halt the existing hyper-reaction.

* intally the patient has allergic reaction you give him drugs make him stabilized then there's another boost of release because mast cell that is not stabilized. يعني
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ADRENALIN

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1ST LINE

Mechanism: Non selective AD agonist
[a_1 , a_2 , b_1 , b_2]

Actions

As an **a-AD** agonist:

- **Reverses** peripheral vasodilation
- Maintains BP & directs blood flow to major organs
- ↓ Edema, reverse hives, swelling around face & lips & angioedema in nasopharynx & larynx

Physiological antagonist

Attenuates the severity of IgE-mediated allergic reactions. *they do the opposite by another kind of receptor**

DRUG OF CHOICE

Indication

As an **b-AD** agonist:

- **Dilates** bronchial airways
- ↓ Histamine & leukotriene release from mast cells → **B2** effect
- ↑ Force of myocardial contraction → **B1** effect

Contraindications

Rare in a setting of anaphylaxis
Not given > 40 y cardiac patient

** adrenaline has its own receptors and activate sympathetic actions and histamine has its own receptors and the reserve actions of adrenaline*

ADRs

Dysrhythmias

Administration

Best is (IM) route in anaphylaxis. Why?

- Easily accessible
- Greater margin of safety → no Dysrhythmias as with IV
- No need to wait for IV line, if present → given by physician under monitoring

If hypotension persist → start dopamine

Why not noradrenaline?
If Ad didn't work in patients taking b-blockers NA a selective alpha is not going to work

Repeat every 5-10 min as needed
Patients observed for 4-6 hours. Why?
Fear of **biphasic anaphylaxis**

Caution:

Patients taking **b-blockers** either are:
Refractory; as it may antagonize b effects of adrenaline

Rebound hypertension: [unopposed a effect], especially when adrenaline is repeated.

Auto-injectors Kits;

Disposable, prefilled devices → automatically administer a single dose of epinephrine in emergency

CORTICOSTEROI

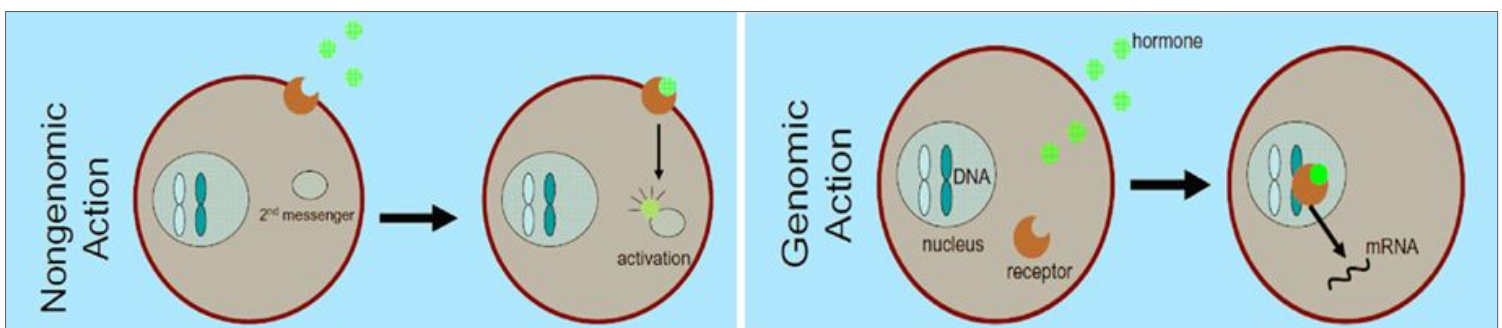
2ND LINE

DS

- It can not be used alone
→ not life saving
- Given slowly IV or IM

- **Reverse hypotension & bronchoconstriction** → ↓ release of inflammatory mediators (anti-chemotactic & mast cell stabilizing effects)
- Decrease mucosal swelling and skin reaction

This is through immediate GCs action on **Membrane-bound receptors** → modulating levels of 2nd messengers → (within seconds or minutes) → **Non-genomic action (genomic action is slow may take hrs - days)**



May help to limit biphasic reactions → ↓ allergic mediators.

H₁ BLOCKERS

2ND LINE

H₂ BLOCKERS

It can not be used alone; not life saving
Given slowly IV or IM (e.g. *pheniramine*)
Though mast cells have already de-granulated, yet these drugs can still help to counteract histamine-mediated vasodilation & bronchoconstriction
May help to limit biphasic reactions by blocking histamine receptors

The significance of H₂ blockers is not established, these drugs are associated with serious adverse drug interactions. Proton pump inhibitor (e.g. *Pantoprazole*) is safer and given once. **not use until the patient has epigastric pain we use it to stop hyperacidity.**

ANAPHYLACTIC SHOCK THERAPY PROTOCOL

Adjuvant to 2nd line

Adjuvant = Supportive

Bronchodilators: Salbutamol nebulizer / Ipratropium nebulizer / Aminophylline IV

Glucagon: For patients taking b-blockers & with refractory hypotension 1 mg IV q 5 minutes until hypotension resolves

H₂ blocker: Ranitidine 150 mg IV / No cimetidine in elderly, renal/ hepatic failure, or if on b-blockers. *H₂ blocker is given only in epigastric pain.*

Bronchodilators

ors

Inhalational

Parental

- **Salbutamol** → β_2 -AD agonist: short acting, rapid relief onset relax bronchial smooth muscle, may decrease mediators released from mast cells & basophils. It may also inhibit airway microvascular leakage
- **Ipratropium** → Anticholinergic; it has a longer *duration* of action & decreased secretion. However it's less *rapid* in action

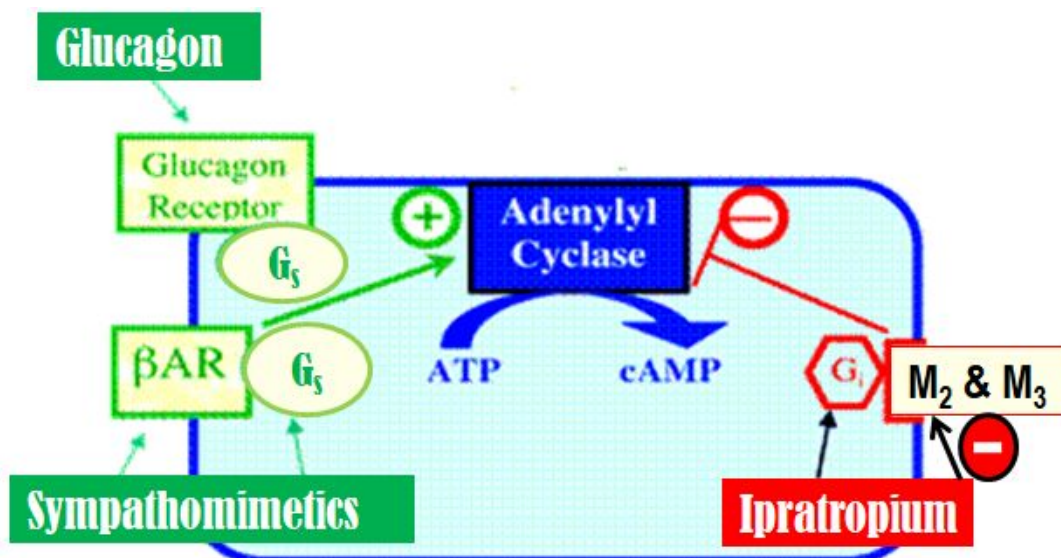
Aminophylline IV may be useful in the treatment of anaphylaxis when inhaled bronchodilators are not effective & bronchospasm is persistent
Given in hospital setting as levels of drug should be **Therapeutically Monitored** (because it has narrow therapeutic index).

GLUCAGON

Drug of choice for severe anaphylaxis in patients taking b-blockers

Has both positive inotropic & chronotropic effects on heart which increase cardiac cyclic AMP, this causes an effect entirely independent of adrenergic receptors, that is why effective in spite of β -adrenergic blockade.

Efficacy of acting on bronchi → heart → no evident bronchodilation.



MCQs

1-A 12-year-old boy who is allergic to peanuts was brought to the emergency room after accidentally consuming peanuts contained in fast food. He is in anaphylactic shock. Which of the following drugs would be most appropriate to treat this patient?

- A. Noradrenaline
- B. Phenylephrine
- C. Dobutamine
- D. Adrenaline

2-what is the drug of choice for cardiogenic and septic shock?

- A. Dopamine
- B. Phenylephrine
- C. Dobutamine
- D. Adrenaline

3-An anaphylactic reaction can be as simple as developing a rash after exposure to an allergen.

- A-True
- B-False

4-A child stung by a bee experiences respiratory distress within minutes and lapses into unconsciousness. This reaction is probably mediated by:

- A. IgE antibody
- B. IgG antibody
- C. Sensitized T cells
- D. Complement
- E. IgM antibody

5- A child disturbs a wasp nest, is stung repeatedly, and goes into shock within minutes, manifesting respiratory failure and vascular collapse. This is MOST likely due to;

- A. Systemic anaphylaxis
- B. Serum sickness
- C. An Arthus reaction
- D. Cytotoxic hypersensitivity

6-Symptoms of anaphylaxis can occur:

- A- Shortly after coming in contact with an allergen
- B- Hours after coming in contact with an allergen
- C- All of above

SAQ

1. Why noradrenaline is used to treat shock?
2. A 7-year-old boy with a previous history of bee sting allergy is brought to the emergency department after being stung by 3 bees.
 - a. Which are the probable signs of the anaphylactic reaction to bee stings?
 - b. If this child has signs of anaphylaxis, what is the treatment of choice?
3. A 60-year-old immigrant from Latin America was told she had hypertension and should be taking antihypertensive medication. She decides to take an herbal medication from an online "holistic pharmacy." One week after starting the medication, she is found unconscious in her apartment. In the emergency department, her blood pressure is 60/40 mm Hg and heart rate is 40 bpm. Respirations are 20/min; pupils are slightly constricted. Bowel sounds are present. Which of the following would be the most effective cardiovascular stimulant?
- 4- The most important intervention for a patient experiencing shock is assessing:
- 5- What is an additional therapeutic goal of anaphylactic shock?

MCQs Answers

1. D

2. A

3. B

"Anaphylaxis typically involves more than one symptom in more than one part of the body at the same time"

4. A

5. A

6. C

SAQs Answers

1. Noradrenaline is used to treat shock, because it increases vascular resistance and, therefore, increases blood pressure. It has no other clinically significant uses.

2. a. Bronchospasm, tachycardia, hypotension, laryngeal Edema.

b. Adrenaline

1. Noradrenaline (Norepinephrine).

2. Blood pressure

3. prevent or stop the hypersensitive inflammatory response.

Good Luck & Thank you !

Team members
Yazeed abdullah alkhayyal
Mohammed alnajeim
Bader Altamimi
Omar alyabis
Ahmed Lateef Alanzi
faisal alhotan Abdulhakim Alonaiq

Team Leaders
Rahaf AlShammari
Yazeed AlHarbi