Anaphylactic Shock (Anaphylaxis) — Symptoms and Treatment

See online here

The typical situation of an anaphylactic emergency: as an emergency physician you are called to a child who was stung by a wasp while playing in a swimming pool. When you arrive, the little patient is barely conscious, the skin is red and covered with welts. The carotid pulse is barely palpable. The connected ECG shows a tachycardia of 180/min. In addition, you recognize strong wheezing and humming in all lung sections. The diagnosis of anaphylactic shock is made quickly. But how do you react properly in this situation? And what are the causes of this disease? Answers can be found here.

Instant Recall: Type-I-Immediate-Type

Allergies are divided into four different types according to *Coombs and Gell*:

- Immediate-type allergic reaction
- Cytotoxic-type allergic reaction
- Immune complex-type allergic reaction
- Delayed-type allergic reaction

Anaphylactic shock belongs to the type 1 hypersensitivity: immediate-type

allergy. Anaphylaxis is caused typically by:

- Food exposures (including nuts, eggs, soy, etc.)
- Insecticides
- Medication (metamizole, penicillin, NSAR)
- Infections
- Inhalation (pollen, latex, etc.)

The complex immunological reaction proceeds quickly. A **"first exposure" with the antigen occurs prior to an allergic reaction.** The IgE-antibodies, which bind mast cells to surfaces, play an important role in this reaction. Once there is a **second exposure** to the same or similar allergen, the **bound IgE-antibodies** interlink with each other and **lead to degranulation** of mast cells. This leads to the release of inflammatory mediators, especially histamine and prostaglandins, followed by vascular dilatation (which leads to a drop in **blood pressure**) and increase the permeability of the vessels (which leads to swelling).

Anaphylactic shock is the most severe form of the type 1 reaction. This leads to redistribution of blood volume in the peripheral circulation (distributive shock), with the reduced venous return and reduced cardiac output. This leads to decreased tissue perfusion and tissue hypoxia.

Anaphylactic Symptoms

Symptoms	The release of histamine causes…
Bronchospasm, colic and rhinitis, conjunctivitis, bronchial asthma	Peripheral vasodilation and increased vascular permeability
Erythema	Accumulation of blood in the capillary bed
Edema, pulmonary edema	Fluid shift into the stroma
Pruritus	Urticaria
Flushing, dizziness, exanthema → hypotension, laryngeal edema, bronchospasm with dyspnea, tachycardia, altered mental status → circulatory failure with multiple organ failures!	Hypovolemia, hypoxia, vasodilation

Acute Therapy of Anaphylaxis

Treatment of anaphylactic shock includes:

- Recognize the condition early (this is critical).
- Remove or discontinue (in the case of medication or other agents) the offending allergen.
- Administer **oxygen** via face mask.
- Obtain adequate (i.e. large bore) venous access as soon as possible (needed to administer medications).
- **Corticosteroids** (e.g. prednisolone), and **H1- and H2- antihistamines intravenously** (high doses).
- **Epinephrine** (i.m. or i.v.)- patients may not have easy venous access when in shock.
- Intravenous **crystalloids** to maintain volume.
- Fast-acting inhaled **β_2-sympathomimetic.**
- Recognize that a GCS- score of < 8 requires **endotracheal intubation** for airway protection and oxygenation.

In Order to Avoid a Shock...

Desensitization: the specific immunotherapy (SIT) can be used for prophylactic sensitization to specific allergens, e.g. bee or wasp venom and certain types of pollen. A steady increase of the injected (subcutaneous or sublingual) antigen in minimal dosage can achieve a physiological rather than an excessive IgE-antibody-production. Especially younger patients with a monovalent allergy benefit from desensitization therapy.

Emergency-kit: Patients should learn to use and carry on them at all times, an emergency kit, including H_1-antihistamine, glucocorticoid, and epinephrine.

Breast milk diet: reduction of developing atopic predisposition by exclusive breastfeeding during the first 4—6 months.

Stimulating climate: in the event of pollen allergies, relocation is an extreme form of prophylaxis.

References

Anaphylaxis and Anaphylactic Shock. (n.d.). *Acute Medicine,*519-522. doi:10.1002/9780470691885.ch81

Simons, F. E. (2011). Anaphylaxis pathogenesis and treatment. *Allergy,66*, 31-34. doi:10.1111/j.1398-9995.2011.02629.x

Notes