

WHAT IS ANAPHYLAXIS?

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Anaphylaxis is a severe, life-threatening systemic reaction affecting all ages. The clinical syndrome may involve multiple target organs, including skin, respiratory, gastrointestinal and cardiovascular systems. The underlying mechanism is the presence of biologically active mediators released from mast cells or basophils. In a classic IgE-mediated reaction from previously sensitised mast cells or basophils, anaphylactic reaction is the preferred term. Degranulation of mast cells or basophils may occur by non-IgE-mediated mechanisms – these reactions are termed anaphylactoid. Clinically it is not possible to distinguish the two and treatments for both are identical.

Common causes

- Foods: especially nuts, some kinds of fruit, seafood, egg.
- Drugs: especially penicillin, anaesthetic agents, radiocontrast media, aspirin and other NSAIDs.
- Latex: gloves, catheters and other medical/dental products. Sufferers are usually health care workers with a prolonged occupational exposure to latex. Bananas, avocados, kiwi, figs and other fruit/vegetables (e.g. potatoes) may also cause anaphylaxis due to proteins that cross-react with latex.
- Venom: bee/wasp stings.
- Idiopathic/unknown.

Subjective symptoms

- **Common** – itchy mouth/palate; generalised warmth/flushing; tingling/pruritus of skin (soles/palms, lips); sensation of lump in throat,

hoarseness, dysphasia; wheeze, shortness of breath; sense of impending doom.

- **Less common** – cardiovascular (syncope, palpitations); abdominal (bloating, nausea, vomiting); upper respiratory (nasal congestion, rhinorrhoea, sneezing).

Clinical manifestations

• **Upper airway obstruction (laryngeal oedema) – with increasing severity:**

- swollen lips, tongue, uvula
- hoarseness
- inspiratory stridor
- total closure

• **Lower airway obstruction (bronchospasm) – with increasing severity:**

- cough
- wheeze
- tachypnoea
- dyspnoea
- hypoxia
- cyanosis respiratory arrest

• **Vascular collapse (shock) – with increasing severity:**

- increased capillary permeability
- generalised vasodilation
- ± urticarial wheals
- hypotension
- shock

In one large series of fatal reactions, 70% of deaths were from respiratory causes and 24% from cardiovascular causes. Death may occur within minutes of the onset of symptoms.

The more rapidly anaphylaxis develops, the more likely the reaction is to be severe and potentially life threatening. Prompt recognition of signs and symptoms is critical. If there is any doubt, it is generally better to administer adrenaline.

Generally, the later symptoms begin after exposure to causative agents, the less severe the ensuing reaction.

Adrenaline

Prompt injection of adrenaline is the cornerstone of systemic anaphylaxis treatment. Adrenaline stimulates α -adrenoceptors and increases peripheral

vascular resistance, thus improving blood pressure and coronary perfusion, reversing peripheral vasodilation, and decreasing angioedema.

Stimulation of β_1 -adrenoceptors has both positive inotropic and chronotropic cardiac effects. Stimulation of β_2 -receptors causes bronchodilation and increases intracellular cyclic adenosine monophosphate production in mast cells and basophils, reducing release of inflammatory mediators.

Table I lists the adrenaline dosage for anaphylaxis. Adrenaline should be given via deep intramuscular injection (IMI).

Table I. Anaphylaxis: adrenaline dosage

Age	Dose of adrenaline (1/1 000, 1mg/ml)
Under 1 year	0.05 ml
1 year	0.1 ml
2 years	0.2 ml
3 - 4 years	0.3 ml
5 years	0.4 ml
6 - 10 years	0.5 ml
Adult	0.5 - 1.0 ml*

* The lower dose should be given to children over 10 years of slight build and to the elderly.

Why deep IMI?

Studies by Simons *et al.*³ have shown that peak plasma concentrations of adrenaline were significantly higher ($p < 0.01$) after adrenaline was injected intramuscularly into the thigh, than after intramuscular or subcutaneous injection into the upper arm.

Despite coaching on inhalation techniques, plasma adrenaline concentrations are not significantly increased after inhalation of adrenaline, and these inhalants are no longer available.

In South Africa prefilled auto-injectable syringes are expensive. They do not allow for repeated injections of adren-

aline or dose titration according to body weight, and the needles are too short for deep IMI administration.

An emergency kit, consisting of a small rigid plastic box containing 2 x 1 ml syringes, 2 needles and 2 amps of adrenaline, promethazine tablets, and a label with individual patient details, emergency contact numbers and personalised adrenaline dose (in ml) is a cost-effective alternative.

Patients are instructed to inject straight through their clothing into the upper thigh and should spend 20 minutes with a nursing sister to receive instructions on administration.

Treatment

All the As:

- **Ask** about allergies
- **Advanced** directives: protocol, equipment, skills/training
- **Accurate** assessment: serious/non-life-threatening
- **Airway** protection: position, oxygen, ET tube, cricothyroidotomy
- **Administer** fluids
- **Antihistamine:** promethazine 25 - 50 mg deep IMI or slow IV (children: titrate according to body weight)
- **Adrenergic** agents
- **Anticholinergic** agents
- **Adrenocorticosteroids:** anaphylaxis has a biphasic or delayed reaction in a small percentage of patients, so monitor for possible late-phase reaction.

Summary

Anaphylaxis is a severe life-threatening reaction that can affect all age groups. The severity of previous reactions does not predict the severity of subsequent reactions. Deep intramuscular adrenaline is the first-line treatment for anaphylaxis. Early use of adrenaline in anaphylaxis is associated with improved outcomes. Adrenaline cannot help you if you do not have it with you.

Further reading available on request.