Anaphylaxis

Lorenzo Hernandez, MD, MS[a], Sarah Papalia, MD[a], George G.A. Pujalte, MD[b,*]

KEYWORDS

• Anaphylaxis • Shock • IgE • Hypersensitivity • Allergen • Bronchospasm • Angioedema • Epinephrine

KEY POINTS

- Anaphylaxis is an immunoglobulin E–mediated hypersensitivity reaction that can potentially lead to death.
- An increasing incidence is presumed to be related to food processing practices.
- Diagnostic tests lack specificity; thus, it is imperative that a clinical diagnosis be made and treatment initiated as soon as possible.
- The definition requires the involvement of multiple organ systems, which include the respiratory, gastrointestinal, cardiovascular, and central nervous systems.
- The best treatment plan is one of prevention and efforts should be focused on recognition of triggers and implementing personalized action plans.

INTRODUCTION

Anaphylaxis is an acute, shocklike, and potentially fatal state. It occurs owing to the release of bioactive factors from mast cells and basophils and is a response to antigenic sensitivity. Portier and Richet coined the term in 1903[1] after attempts to vaccinate dogs using jelly fish toxin resulted in fatal sensitivity reactions rather than protective properties. The term reflects the antiprophylactic effect, and the concept was found deserving of the Nobel Prize in 1913. Although presentation of the condition varies, dermatologic manifestations are the initial symptom in a majority of adult patients. Children are more likely to present with respiratory symptoms followed by cutaneous symptoms. Other systems commonly affected by anaphylaxis include the cardiovascular, gastrointestinal, and neurologic systems. Diagnostic tests, including serum tryptase and serum-specific immunoglobulin (Ig)E, lack specificity; thus, it is imperative that a clinical diagnosis be made efficiently. Treatment mainstays include epinephrine, antihistamines, fluid resuscitation, and airway management, which must be initiated immediately to minimize morbidity and mortality. Prevention efforts focus on awareness and recognition of triggers and educating patients about the

[a] Department of Family Medicine, Mayo Clinic, 4500 San Pablo Rd, Jacksonville, FL 32224, USA; [b] Department of Family Medicine, Mayo Clinic College of Medicine, Mayo Clinic, 4500 San Pablo Rd, Jacksonville, FL 32224, USA
* Corresponding author.
E-mail address: Pujalte.George@mayo.edu

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implementation of personalized action plans. The incidence of anaphylaxis has significantly increased over the past 10 years, particularly in the pediatric population, a change that is the focus of numerous ongoing studies.

PATHOPHYSIOLOGY OVERVIEW

Like more benign localized atopy such as food allergy and asthma, systemic anaphylactic responses are classified as IgE-mediated hypersensitivity reactions. This type of reaction begins when IgE bound to B-cells makes contact with an antigen, leading to the production of large amounts of antigen-specific IgE, which are clustered on the surface of mast cells and basophils. Subsequent exposure to the antigen leads to the release of immune-modulating factors, such as leukotrienes and histamine, from the primed immune cells.[2] Downstream effects include systemic smooth muscle contraction, vasodilation, and bronchiole constriction, which give way to hypotensive shock and asphyxiation, the main causes of morbidity and mortality.[3] Sympathetic activation with epinephrine directly counteracts these effects by causing smooth muscle relaxation, vasoconstriction, increasing cardiac output, and blocking further degranulation on a biomolecular level by increasing cyclic adenosine monophosphate.[2]

RISK FACTORS

Atopy is the genetic propensity for the development of immediate hypersensitivity reactions and is the single most important risk factor for anaphylaxis. It is believed to be multigenic and has known associations with several genes, including those for cytokines and the IgE receptor, and suspected associations with unidentified genes.[4] Numerous other individual factors have been shown to influence the severity of the reaction (**Table 1**). Medications such as beta-blockers, angiotensin-converting enzyme inhibitors, diuretics, and antihypertensives in aggregate increase the risk for severe reactions owing to compounded hypotension and bronchospasm.

INCIDENCE AND CAUSATIVE AGENTS

Although anaphylaxis is recognized as a relatively common reaction and potentially lethal condition, data are limited regarding the prevalence and characteristics in the

Table 1
Factors increasing risk for anaphylaxis severity and fatality

Risk Factor	Cause of Severity and Fatality
Age	Infants: underdiagnoses, no action plan Pregnancy: antibiotic therapy
Medications	Affect recognition of symptoms: sedatives, hypnotics, recreational drugs
Comorbidities	Asthma, pulmonary disease Mastocytosis Thyroid disease: associated with idiopathic form
Other	Exercise, acute infection, menses, hyperhistaminemia, reduced level of ACE or PAF AH activity

Abbreviations: ACE, angiotensin-converting enzyme; AH, acetylhydrolase; PAF, platelet-activating factor.

Data from Lang DM. Do beta-blockers really enhance the risk of anaphylaxis during immunotherapy? Curr Allergy Asthma Rep 2008;8(1):37–44; and Bonadonna P, Perbellini O, Passalacqua G, et al. Clonal mast cell disorders in patients with systemic reactions to hymenoptera stings and increased serum tryptase levels. J Allergy Clin Immunol 2009;123(3):680–6.