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Review article

Anaphylaxis vulnerable groups

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Age groups vulnerable to serious attacks of anaphylaxis include infants, teenagers, pregnant women, and the elderly. Concomitant diseases, such as severe or uncontrolled asthma, cardiovascular disease, mastocytosis or clonal mast cell disorders and the concurrent use of some medications such as beta adrenergic blockers and angiotensin-converting enzyme (ACE) inhibitors increase the risk of severe or fatal anaphylaxis.[1,2] Also, defects in mediator degradation pathways might predispose to severe or fatal episodes resulting in elevated baseline levels of tryptase, histamine, bradykinin (due to low serum ACE activity), and platelet-activating factor (PAF) due to low serum PAF acetyl hydrolase activity.[3,4]

Cofactors that amplify or augment anaphylaxis include Exercise-induced anaphylaxis, concomitant ingestion of ethanol or a NSAID that enhances intestinal permeability and allergen absorption, acute upper respiratory tract or other infections, fever, emotional stress, travel or other disruption of routine, and premenstrual status.[1,5,6]

Anaphylaxis in infants

Although anaphylaxis can be difficult to diagnose in infants, most case series of patients with anaphylaxis, published from different countries, include infants, one as young as two weeks of age.[7,8]

Most infants with anaphylaxis are atopic and most episodes are triggered by food. Less common triggers include medications (e.g. b-lactam antibiotics), natural rubber latex (including nipples, pacifiers, and toys), insect stings, inhalant allergens, vaccinations, and non-immune triggers such as cold exposure. Idiopathic anaphylaxis has been reported in infants.[9,10]

Common foods are cow's milk (about 40%) and hen's egg, but any food can be a trigger, including those presumed innocuous (e.g. cow's milk substitutes and hypoallergenic formulas).[11-13] In a population-based sample, more than 10% of one-year-olds had oral challenge-proven clinical reactivity to uncooked egg, peanut, or sesame.[14]

Anaphylaxis following immunization is a rare event; An incidence of 0.2-1 per million doses was estimated.[15,16] An estimate of 1 per 100 000 after MMR vaccination (over a 14 year period) was reported.[17] In children receiving combination vaccines, it is sometimes impossible to attribute risk to a single vaccine or component.[18] Some of the vaccine-related reactions may be related to latex exposure during the administration of the vaccine.[9,19]

In infancy, anaphylaxis can be difficult to recognize; infants cannot describe their symptoms. Some signs of anaphylaxis such as flushing and dysphonia after crying, spitting up after feeding, and incontinence are normal daily events. Healthy infants have lower blood pressure and higher resting heart rate than older children. Serum tryptase is commonly normal in anaphylactic episodes caused by food allergy.[8,11]

In the treatment of anaphylaxis in infants, extreme care should be taken in calculating and drawing up the epinephrine dose, which is 0.01 mg/kg of a 1:1,000 (1 mg/ml) solution; the correct dose for a 5 kg infant is 0.05 mg! No epinephrine autoinjector currently available provides a dose of <0.15 mg.[11,20,21] The onset of action of oral H1-antihistamines takes at least 1 to 2 hr. First generation H_1-antihistamines potentially cause sedation that can impede the recognition of anaphylaxis, and can also lead to respiratory arrest in Infants.[22-24]

At-risk infants should wear accurate medical identification such as a T-shirt or Velcro patch on clothes with a specific alert message, for example, ''Do not give cow's milk to this baby'' Medical identification bracelets made of cloth are available for older infants.[25]

Anaphylaxis in pregnancy

Anaphylaxis in pregnancy places both mother and baby at increased risk of fatality or hypoxic/ischemic encephalopathy.[26] Late fetal demise and hypoxic-ischemic neurologic injury after previously normal development was reported due to in utero anaphylaxis to food antigens that

cross the placenta. Indirect evidence for fetal production of specific IgE is the high percentage of food reactions that occur on the first postnatal exposure.[27]

During the first, second, and third trimesters, triggers of anaphylaxis are similar to those in non-pregnant women. During labor and delivery, iatrogenic interventions such as oxytocin, antimicrobials and latex are common triggers.[26] Symptoms and signs of anaphylaxis during pregnancy include low back pain, uterine cramps, fetal distress, preterm labor, and vulval and/or vaginal itching.[28]

Medical management of anaphylaxis during pregnancy is similar to management in the non-pregnant patient. Positioning of the patient should be semi-recumbent on the left side to prevent compression of inferior vena cava by the gravid uterus. Systolic BP should be kept $\geq$ 90 mm Hg to ensure placental perfusion. When CPR is indicated at full term, continuous chest compressions can be difficult. Regular fetal heart monitoring is recommended if anaphylaxis occurs at more than 24 weeks pregnant. Fetal distress: correcting maternal hypoxia and/or hypotension. If the distress persists, emergency CS should be considered.[2]

Anaphylaxis in adolescents

A high proportion of deaths from food allergy involve teenagers and young adults. Professionals who work with adolescents in chronic disease clinics know how difficult it is for them to adjust to changes necessary to cope with their illness. However, they seem to perform fairly well in carrying on with normal lives, in spite of a potentially life-threatening disease.[29,30]

Teens are vulnerable to anaphylaxis recurrences because of risk-taking behaviors as they transit between parental control and autonomous decision-making. They fail to avoid their trigger(s) and some refuse to carry epinephrine autoinjectors. Others even ignore the risks.[1,31,32] Food allergic adolescents are motivated by the psychological impact of their condition, which often makes them feel different to their peers and may result in bullying. Involvement of close friends and lay organizations may support appropriate management.[33]

Anaphylaxis in the elderly

In patients with anaphylaxis who are more than 50 years old, typical triggers are stinging insect venoms, medications, and 'unknown'.[1] In a 10-year retrospective study, shock was documented in 41% of 294 patients with anaphylaxis, typically in elderly patients after exposure to radiocontrast media or drugs.[34]

During anaphylaxis, histamine, leukotrienes, PAF, and other mediators released from cardiac mast cells contribute to vasoconstriction and coronary artery spasm. Anaphylaxis can present as an acute coronary syndrome (angina myocardial infarction, arrhythmias) before, or in the absence of, epinephrine injection.[35-37] Kounis Syndrome (acute coronary syndromes induced by mast cell activation during allergic and anaphylactic reactions), was first reported in patients who had no previous coronary heart disease.[38,39] Episodes of Kounis syndrome were reported during anaphylactic reactions to drugs such as diclofenac sodium, beta lactam antibiotics.[40,41]

Management of anaphylaxis in the elderly can be complicated by concomitant cardiovascular disease and limited cardiac reserve, and by concurrent medications such as beta adrenergic blockers. Concerns about the potential adverse cardiac effects need to be weighed against concerns about the cardiac complications of untreated anaphylaxis.[1,42]

REFERENCES

1. **Simons FE, Ardusso LR, Bilò MB, El-Gamal YM, Ledford DK, Ring J, Sanchez-Borges M, Senna GE, Sheikh A, Thong BY;** World Allergy Organization. World allergy organization guidelines for the assessment and management of anaphylaxis. World Allergy Organ J 2011;4(2):13-37.
2. **Simons FE, Ardusso LR, Dimov V, Ebisawa M, El-Gamal YM, Lockey RF, Sanchez-Borges M, Senna GE, Sheikh A, Thong BY, Worm M;** World Allergy Organization. World Allergy Organization Anaphylaxis Guidelines: 2013 update of the evidence base. Int Arch Allergy Immunol 2013;162:193-204.
3. **Schwartz LB.** Diagnostic value of tryptase in anaphylaxis and mastocytosis. Immunol Allergy Clin North Am 2006;26:451-63..
4. **Vadas P, Gold M, Perelman B, Liss GM, Lack G, Blyth T, et al.** Platelet-activating factor, PAF acetylhydrolase and severe anaphylaxis. N Engl J Med 2008;358(1):28-35.
5. **Matsuo H, Kaneko S, Tsujino Y, Honda S, Kohno K, Takahashi H, et al.** Effects of non-steroidal anti-inflammatory drugs (NSAIDs) on serum allergen levels after wheat ingestion. J Dermatol Sci 2009;53:241-3.

6. **Robson-Ansley P, Du Toit GD.** Pathophysiology, diagnosis and management of exercise-induced anaphylaxis. Curr Opin Allergy Clin Immunol 2010;10:312-7.
7. **Hoffer V, Scheuerman O, Marcus N, Levy Y, Segal N, Lagovsky I, et al.** Anaphylaxis in Israel: experience with 92 hospitalized children. Pediatr Allergy Immunol 2011;22:172-7.
8. **Simons FE, Ardusso LR, Bilò MB, Dimov V, Ebisawa M, El-Gamal YM, Ledford DK, Lockey RF, Ring J, Sanchez-Borges M, Senna GE, Sheikh A, Thong BY, Worm M;** World Allergy Organization. 2012 Update: World Allergy Organization Guidelines for the assessment and management of anaphylaxis. Curr Opin Allergy Clin Immunol 2012;12:389-99.
9. **Kimata H.** Latex allergy in infants younger than 1 year. Clin Exp Allergy 2004;34:1910-5.
10. **Hogan MB, Kelly MA, Wilson NW.** Idiopathic anaphylaxis in children. Ann Allergy Asthma Immunol 1998;81:140-2.
11. **Simons FE.** Anaphylaxis in infants: can recognition and management be improved? J Allergy Clin Immunol 2007;120:537-40.
12. **Rudders SA, Banerji A, Clark S, Camargo CA Jr.** Age-related differences in the clinical presentation of food-induced anaphylaxis. J Pediatr 2011;158(2):326-8.
13. **Levin ME, Motala C, Lopata AL.** Anaphylaxis in a milk-allergic child after ingestion of soy formula cross-contaminated with cow's milk protein. Pediatrics 2005;116:1223-5.
14. **Osborne NJ, Koplin JJ, Martin PE, Gurrin LC, Lowe AJ, Matheson MC, Ponsonby AL, Wake M, Tang ML, Dharmage SC, Allen KJ;** HealthNuts Investigators. Predetermined challenge eligibility and cessation criteria for oral food challenges in the HealthNuts population-based study of infants. J Allergy Clin Immunol 2011; 127:668–76.
15. Department of Health. Vaccine safety and the management of adverse events following immunisation. Immunisation against infectious disease. London: Department of Health, 2006:53–64.
16. **Zhou W, Pool V, Iskander JK, English-Bullard R, Ball R, Wise RP, et al.** Surveillance for safety after immunization: Vaccine Adverse Event Reporting System (VAERS)--United States, 1991-2001. MMWR Surveill Summ 2003;52:1-24.
17. **Patja A, Mäkinen-Kiljunen S, Davidkin I, Paunio M, Peltola H.** Allergic reactions to measles-mumps-rubella vaccination. Pediatrics 2001;107:e27.
18. **Erlewyn-Lajeunesse M, Bonhoeffer J, Ruggeberg JU, Heath PT.** J Clin Pathol 2007;60:737-9.
19. **Dosanjh A.** Infant anaphylaxis: the importance of early recognition. J Asthma Allergy 2013;6:103-7.
20. **Simons FE.** First-aid treatment of anaphylaxis to food: focus on epinephrine. J Allergy Clin Immunol 2004;113:837-44.
21. **Simons FER, Peterson S, Black CD.** Epinephrine dispensing for the out-of-hospital treatment of anaphylaxis in infants and children: a population-based study. Ann Allergy Asthma Immunol 2001;86:622-6.
22. Simons FE. Advances in H1-antihistamines. N Engl J Med 2004;351:2203-17.
23. **Sheikh A, ten Broek Vm, Brown SG, Simons FE.** H1-antihistamines for the treatment of anaphylaxis with and without shock. Cochrane Database Syst Rev 2007;1:CD006160.
24. **Starke PR, Weaver J, Chowdhury BA.** Boxed warning added to promethazine labeling for pediatric use. N Engl J Med 2005;352:2653.
25. **Simons FE.** Anaphylaxis, killer allergy: long-term management in the community. J Allergy Clin Immunol 2006;117:367-77.
26. **MacGinnitie A.** In utero anaphylaxis. Med Hypotheses 2011;76(1):70-2.
27. **Chaudhuri K, Gonzales J, Jesurun CA, Ambat MT, Mandal-Chaudhuri S.** Anaphylactic shock in pregnancy: a case study and review of the literature. Int J Obstet Anesth 2008;17:350-7.
28. **Simons FE, Schatz M.** Anaphylaxis during pregnancy. J Allergy Clin Immunol 2012;130:597-606.
29. **Lockey R.** Adolescents and anaphylaxis. Prim Care Respir J 2012;21(4):365-6.
30. **Gallagher M, Worth A, Cunningham-Burley S, Sheikh A.** Strategies for living with the risk of anaphylaxis in adolescence: qualitative study of young people and their parents. Prim Care Respir J 2012;21(4):392-7.
31. **Sampson HA, Muñoz-Furlong A, Bock SA, Schmitt C, Bass R, Chowdhury BA, Decker WW, Furlong TJ, Galli SJ, Golden DB, Gruchalla RS, Harlor AD Jr, Hepner DL, Howarth M, Kaplan AP, Levy JH, Lewis LM, Lieberman PL, Metcalfe DD, Murphy R, Pollart SM, Pumphrey RS, Rosenwasser LJ, Simons FE, Wood JP, Camargo CA Jr.** Symposium on the definition and management of anaphylaxis: summary report. J Allergy Clin Immunol 2005;115:584-91.

32. **Flokstra-de Blok BMJ, Doriene van Ginkel C, Roerdink EM, Kroeze MA, Stel AA, et al.** Extremely low prevalence of epinephrine autoinjectors in high-risk food-allergic adolescents in Dutch high schools. Pediatr Allergy Immunol 2011; 22:374-7.

33. **Marrs T, Lack G.** Why do few food-allergic adolescents treat anaphylaxis with adrenaline? Reviewing a pressing issue. Pediatr Allergy Immunol 2013;24(3):222-9.

34. **Park HJ, Kim SH.** Factors associated with shock in anaphylaxis. Am J Emerg Med 2012;30:1674-8.

35. **Simons FE, Ardusso LR, Bilò MB, El-Gamal YM, Ledford DK, Ring J, Sanchez-Borges M, Senna GE, Sheikh A, Thong BY;** World Allergy Organization. World Allergy Organization anaphylaxis guidelines: summary. J Allergy Clin Immunol 2011;127(3):587-93.

36. **Mueller UR.** Cardiovascular disease and anaphylaxis. Curr Opin Allergy Clin Immunol 2007;7:337-41.

37. **Triggiani M, Patella V, Staiano RI, Granata F, Marone G.** Allergy and the cardiovascular system. Clin Exp Immunol 2008;153(Suppl 1):7-11.

38. **Kounis NG, Zavras GM.** Histamine-induced coronary artery spasm: the concept of allergic angina. Br J Clin Pract 1991;45:121-8.

39. **Kounis NG.** Kounis syndrome (allergic angina and allergic myocardial infarction): a natural paradigm? Int J Cardiol 2006;110:7-14.

40. **Tiwari AK, Tomar GS, Ganguly CS, Kapoor MC.** Kounis syndrome resulting from anaphylaxis to diclofenac. Indian J Anaesth 2013;57(3):282-4.

41. **Ridella M, Bagdure S, Nugent K, Cevik C.** Kounis syndrome following beta-lactam antibiotic use: review of literature. Inflamm Allergy Drug Targets 2009;8:11-6.

42. **Kemp SF, Lockey RF, Simons FE;** World Allergy Organization ad hoc Committee on Epinephrine in Anaphylaxis. Allergy 2008;63:1061-70.