

## H43 Anaphylactic Death: A New Forensic Workflow for Diagnosis

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**Learning Overview:** The goal of this presentation is to suggest that through the use of the blood tryptase concentration together with the immunohistochemical investigation for anti-tryptase antibody in the lung, glottis, and skin samples (at the site of administration of the medication and contrast medium), it is possible to realize a diagnostic workflow as a gold standard of anaphylactic death.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by describing the necessity of proposing a diagnostic workflow as a gold standard in the diagnosis of an anaphylactic death.

**Background:** The term “anaphylaxis” was introduced in 1902 by Portier and Richet and referred to a serious, generalized, or systemic allergic or hypersensitivity reaction.<sup>1,2</sup> It can be a life-threatening or fatal clinical emergency with airway and circulatory impairments.<sup>3</sup> It is usually associated with skin and mucosal alteration (widespread hives, pruritus, swollen lips, tongue, uvula) and gastrointestinal disorders (vomiting, diarrhea, abdominal cramps).<sup>4</sup> In particular, anaphylaxis is due to a systemic reaction mediated by vasoactive amines released from mast cells and basophils sensitized by Immunoglobulin E (IgE). Conversely, anaphylactic shock is an anaphylactic reaction characterized by critical organ hypoperfusion after exposure to a previously encountered antigen.<sup>5</sup>

**Materials and Methods:** Eleven autopsy cases of anaphylactic death that occurred between 2005 and 2017 were investigated by the Departments of Forensic Pathology of the Universities of Foggia and Catania, Italy. Death scene investigation and autopsy reports, together with the information gathered from the police from the 11 cases of anaphylactic death were reviewed. Cases with weak or deficient information about the manner of death were excluded. Decomposed bodies were also excluded from the study. All procedures performed in the study were in accordance with the ethical standards of the institution and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Informed consent was obtained from the relatives. Seven autopsies were carried out on males and four on females. Of the 11 cases, one had a history of asthma, one of food ingestion, two of oral administration of medications, six did not refer to any allergy history, and one subject was unknown. All the cases (100%) showed pulmonary congestion and edema; 7/11 (64%) of the cases had pharyngeal/laryngeal edema and mucus plugging in the airway; only one case (9%) had a skin reaction noted during the external examination. Serum tryptase concentration was measured in ten cases, mean value  $133.5\mu\text{g/l} \pm 177.9$ . Immunohistochemical staining for anti-tryptase antibody on samples of lungs, pharynx/larynx, and skin samples at medication injection sites revealed that all cases (100%) showed strong immunopositivity for anti-tryptase antibody on lung samples; three cases (30%) displayed strong immunopositivity for anti-tryptase antibodies on the pharynx/larynx samples; and in eight of the cases (80%), there was strong immunopositivity for anti-tryptase antibodies on the skin samples at the injection sites.

Currently, there is no specific forensic workflow in cases of death from anaphylactic shock. A systematic approach would allow forensic pathologists to arrive at a confident diagnosis of death from anaphylactic shock. In conclusion, a blood tryptase level ( $> 40\mu\text{g/l}$ ) together with strong positivity of anti-tryptase antibody immunohistochemical staining may represent reliable parameters in the determination of anaphylactic death with the accuracy needed for forensic purposes. The latter parameter may be particularly useful in the absence of a patient’s clinical or medical history. Thus, a diagnostic workflow as a gold standard in the diagnosis of anaphylactic death is proposed, with the evaluation of blood tryptase level in combination with immunohistochemical anti-tryptase staining.

### Reference(s):

1. Portier, M.M. and Richet, C. (1902). De l’action anaphylactique de certains venins. *Comptesrendus hebdomadaires des séances et mémoires de la société de Biologie*, séance du 15 février.
2. Simons, F.E.R., Arduso, L.R., Bilò, M.B., Cardona, V., Ebisawa, M., El-Gamal, Y.M., and Sanchez-Borges, M. (2014). International consensus on (ICON) anaphylaxis. *World Allergy Organization Journal*, 7(1), 1.
3. Muraro, A., Roberts, G., Worm, M., Bilò, M.B., Brockow, K., Fernández Rivas, M., and Bindslev-Jensen, C. (2014). Anaphylaxis: guidelines from the European Academy of Allergy and Clinical Immunology. *Allergy*, 69(8), 1026-1045.
4. Simons, F.E.R., Arduso, L.R., Bilò, M.B., El-Gamal, Y.M., Ledford, D.K., Ring, J., and Thong, B.Y. (2011). World Allergy Organization anaphylaxis guidelines: Summary. *Journal of Allergy and Clinical Immunology*, 127(3), 587-593.
5. Sampson, H.A., Muñoz-Furlong, A., Campbell, R.L., Adkinson, Jr, N.F., Bock, S.A., Branum, A., and Gidudu, J. (2006). Second symposium on the definition and management of anaphylaxis: summary report—Second National Institute of Allergy and Infectious Disease/Food Allergy and Anaphylaxis Network symposium. *Journal of Allergy and Clinical Immunology*, 117(2), 391-397.

### Anaphylactic Death, Diagnostic Workflow, Toxicological Investigation