Updates in Intraoperative Anaphylaxis

An Essay

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in Anesthesiology

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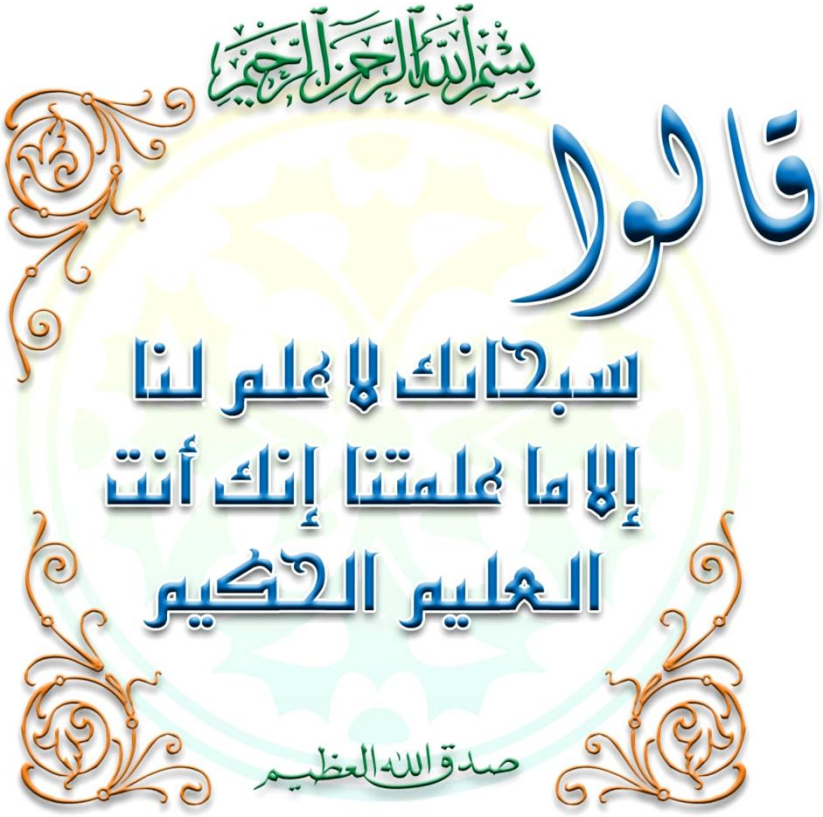

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Candidate

Mohammed Othman Ahmed

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List of Abbreviations

Abbr.	Full-term

11-beta-$PGF_{2\text{-alpha}}$: 11-beta-prostaglandin $F_{2\text{-alpha}}$

ACE : Angiotensin- Converting Enzyme

AMP : Ampicillin

APP : Amino-Peptidase P

ASA : Aspirin

AVP : Arginine Vasopressin

AX : Amoxicillin

C : Complement

CGRP : Calcitonin Gene-Related Peptide

COX : Cyclo-Oxygenase

CYS-LT : Cysteinyl Leukotrienes

DIC : Disseminated Intravascular Coagulation

EAACI : European Academy Of Allergy And Immunology

EDTA : Ethylene Diamine Tetraacetic Acid

ELISA : Enzyme-Linked Immunosorbent Assay

ENDA : European Network For Drug Allergy

ENOS : Endothelial Nitric Oxide Synthase

HCWS : Health Care Workers

HES : Hydroxyethyl Starch

IDT : Intradermal Test

IgE : Immunoglobulin E

IgG : Immunoglobulin G

List of Abbreviations *(Cont.)*

Abbr.	Full-term
IL	: Interleukin
INN	: International Nonproprietary Name
INOS	: Inducible Nitric Oxide Synthase
IV	: Intravenous
LT	: Leukotrienes
LTC_4	: Leukotriene C_4
LTE_4	: leukotriene E_4
MDM	: Minor Determinants Mixture
NMBA	: Neuro Muscular Blocking Agent
NNOS	: Neuronal Nitric Oxide Synthase
NO	: Nitric Oxide
NOS	: Nitric Oxide Synthase
NRL	: Natural Rubber Latex
NSAID	: Nonsteroidal Anti-Inflammatory Drug
OSCS	: Oversulfated Chondroitin Sulfate
PABA	: Para-Aminobenzoic Acid
PAF	: Platlet-Activating Factor
PG	: Prostaglandin
PGD_2	: Prostaglandin D_2
PPL	: Benzylpenicilloyl Poly-L-Lysine
RCM	: Radiocontrast Media
SPT	: Skin Prick Test

List of Abbreviations *(Cont.)*

Abbr.	Full-term
TH2	: T Helper Type 2
TNF	: Tumor Necrosis Factor
VMA	: Vanillylmandelic Acid
WAO	: World Allergy Organization
α1	: Alpha 1
β2	: Beta 2

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Introduction

Anaphylaxis is a severe, whole-body allergic reaction to a chemical that has become an allergen. An allergen is a substance that can cause an allergic reaction. After being exposed to a substance such as bee sting venom, the person's immune system becomes sensitized to it. When the person is exposed to that allergen again, an allergic reaction may occur. Anaphylaxis happens quickly after the exposure. The condition is severe and involves the whole body. Tissues in different parts of the body release histamine and other substances. This causes the airways to tighten and leads to other symptoms. Some drugs (morphine, x-ray dye, aspirin, and others) may cause an anaphylactic-like reaction (anaphylactoid reaction) when people are first exposed to them. These reactions are not the same as the immune system response that occurs with true anaphylaxis. But,the symptoms, risk of complications, and treatment are the same for both types of reactions ***(Lieberman, 2014).***

The incidence during anesthesia ranges from 1 in 4,000 to 1 in 25,000 patients. If not promptly diagnosed and treated, a sudden, severe, or prolonged reaction can lead to cardiovascular collapse resulting in perioperative death. Anaphylaxis is fatal in 3% to 10% of surgical cases. Hypersensitivity to anesthetic drugs remains a substantial hazard for patients at increased risk

because it is difficult to promptly recognize; consequently, the proper treatment may be delayed. In addition, the lack of specific molecular markers for confirmation of anaphylaxis impedes accurate diagnosis ***(Simons, 2010).***

Ideally, all patients experiencing an episode of perioperative anaphylaxis would have undergone an allergologic assessment before further anesthetics. The reality is very different. In many countries, the allergologic assessment is not routinely performed. Identification of at-risk patients is therefore required before any procedure requiring anesthetics which must be conducted in a manner to avoid a suspected drug or agent. Patients who have had previous uninvestigated severe immediate reactions during anesthesia are at increased risk of a recurrence during subsequent anesthetics. Regional anesthesia is preferred whenever possible ***(Harper et al., 2009).***

The clinical symptoms of anaphylaxis drived from the mediators released by the activation of sensitized mast cells and, to a lesser extent, basophils. Anaphylactic reactions are triggered by the cross-linking of the high-affinity IgE receptor by receptor-bound IgE that recognizes antigens such as food, drug, or insect venom antigens. Non-IgE mediated triggers of anaphylaxis include activation of mast cells and eosinophils by immune complexes or cytotoxic transfusion reactions. IgG-mediated

anaphylaxis (or anaphylactoid reactions) can be triggered by high molecular weight iron dextran or monoclonal antibodies such as infliximab. Exposures to hemodialysis membranes or oversulfated chondroitin sulfate-contaminated heparin are associated with complement-mediated anaphylaxis related to the generation of complement protein anaphylatoxins such as C3a and C5a.

A variety of physical factors such as cold, heat or sunlight, drugs such as opiates, and radiocontrast media may trigger anaphylaxis from direct activation of innate immune effector cells (mast cells). Nonsteroidal anti-inflammatory agents can trigger anaphylaxis by altering arachedonic acid metabolism Some agents, such as radiocontrast media, contaminated heparin, etc. may activate multiple pathways that lead to the activation of the contact and complement systems, promote the generation of kinins, and trigger the clinical symptoms of anaphylaxis The mediators may directly contribute to increased airway resistance, fall in PO2, and vasodilation with hypotension seen during anaphylaxis ***(Konings et al., 2013).***

If anaphylaxis is suspected, a rapid assessment for possible causes of the abrupt symptoms should be determined to rule out other diagnoses. For diagnostic purposes, the timing of symptoms should be noted in relation to the previous drugs administered. Whether a drug or latex

is causing the allergic reaction, the trigger should be quickly removed from patient contact and help sought. The administration of antibiotics and blood products should be stopped, anesthetic administration discontinued, and the surgery terminated ***(Murphy et al., 2011).***

Aim of the Work

The aim of this study is to view the latest literature updates in early detection, prevention and management of intraoperative anaphylaxis