Intravenous Lipid Emulsion for Local Anesthetic Toxicity: A Review of the Literature

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ABSTRACT

Introduction: The use of intravenous lipid emulsion (IVLE) has been proposed as a new potential treatment for local anesthetic toxicity. Local anesthetics work through reversible binding at sodium channels, and signs and symptoms of toxicity include central nervous system and cardiovascular effects. Cardiovascular collapse is a potential result of local anesthetic toxicity, and is generally resistant to resuscitation efforts with standard measures.

Discussion: Various animal studies have been published investigating the use of IVLE in local anesthetic toxicity. IVLE has been shown to increase the lethal dose of bupivacaine required, resuscitate animals that underwent local anesthetic-induced cardiovascular collapse, and more quickly reduce the amount of local anesthetic in the myocardium (compared to administration of control solution). Four human case reports utilizing IVLE for presumed local anesthetic toxicity, with varying presentations, are reviewed.

Conclusions: IVLE has shown to be an interesting prospect for local anesthetic toxicity. Human case reports have shown successful resuscitation with use of IVLE, using varying dosing regimens. More studies are needed to determine the optimal dosing regimen, as well as to determine the potential adverse effects of IVLE when used in this setting.

INTRODUCTION

A new potential antidote for local anesthetic (LA) toxicity has been gaining increasing attention in the literature, although this has largely been limited to anesthesia literature. Intravenous lipid emulsion (IVLE) has been reported as rescue therapy for LA toxicity. Both animal studies and limited human case reports have described successful resuscitation with IVLE in the face of presumed or documented LA toxicity. This presents an interesting therapeutic option, particularly in the setting of cardiovascular collapse induced by LAs, which has largely been resistant to standard resuscitation efforts. The purpose of this article is to provide an overview of LAs, their toxicity, and the proposed management of clinical signs and symptoms of LA toxicity with the use of IVLE, utilizing a review of available animal studies and human case reports.

LOCAL ANESTHETICS

Local anesthetic agents are commonly used in various therapeutic modalities [1]. Local anesthesia involves the injection of LA into the skin and subcutaneous tissue, anesthetizing the skin surrounding the injection site. Topical anesthesia involves the application of LA to the skin or mucous membranes, decreasing sensation in the areas of application. Regional anesthesia consists of the injection of LA toward central or peripheral nerve targets, eliciting anesthesia in the regions of the body that are served by the targeted nerves.

Toxicity is related to the structure and mechanism of action of LAs. Local anesthetics have three basic components to their chemical structure: a hydrophilic amine end, a lipophilic aromatic end, and a linkage connecting the two [2]. This linkage can either be an ester, with procaine serving as the prototype, or an amide, with

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