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Systemic Toxicity of Local Anesthetics: A Point to Ponder

Sir,

Local anesthesia is a boon in the medical and dental field involving its great use on a daily basis throughout the globe, but it also carries along potential danger in few cases referred to as systemic toxicity of local anesthesia.[1] Systemic toxic reactions to local anesthetics are manifested by a progressive spectrum of neurological symptoms as blood levels rise. With increasing blood levels of local anesthetics, there is sequencing to motor twitching in the periphery followed by grand mal seizures. These higher blood levels are associated with coma and eventually respiratory arrest. These toxic blood levels, usually unintentional, are possible after intra-arterial, intravenous, or peripheral tissue injections of local anesthetics. Although all local anesthetics carry comparable risk for toxicity, it should be noted that bupivacaine exhibits greater potential for direct cardiac toxicity than other agents.[2] This is thought to be related to the fact that bupivacaine has greater affinity for the inactive and resting sodium channel configurations and dissociates from these channels more slowly. Skeletal muscle toxicity is also a side effect of local anesthetics. Intramuscular injection of these agents causes reversible myonecrosis. The extent of damage is dependent on the dose used, the concentration of the drug used, and whether or not the local anesthetic is applied as a continuous infusion. Bupivacaine seems to induce the most damage, and tetracaine and prilocaine the least.[3] The diagnosis of muscle injury after local anesthetic administration is complex. The signs are not uniform and depend on the site of injection and the regional technique used. With respect to central nervous system (CNS), higher concentrations of local anesthetic affect all neurons, leading to global CNS depression, clinically seen as coma, and the eventual collapse of the cardiovascular system. The mechanism of cardiovascular toxicity depends on the direct as well as indirect effects of the local anesthetic drugs on the myocardium. Direct effects include negative inotropy and delayed conduction of the impulse through the cardiac conduction system. Indirect effects are on the autonomic outflow and the direct effect on the cardiac center in the midbrain.[4] The use of intravenous lipid emulsion (IVLE) has been proposed as a new potential treatment for local anesthetic toxicity.[5] IVLE is an established, effective treatment for local anesthetic-induced cardiovascular collapse. It has been suggested that lipid emulsion may reverse local anesthetic toxicity by extracting lipophilic local anesthetics from aqueous plasma or tissues or by counteracting local anesthetic inhibition of myocardial fatty acid oxygenation.

Refinements in the technical aspects of local anesthetics administration and improved understanding of their pharmacology have increased the safety and the scope of applications of these agents. Nevertheless, potential hazards still accompany their use and a clinician must be aware of the same and their effective management. Improved physician alertness and education, as well as optimized treatment protocols, will notably reduce the rate of morbidity and mortality from local anesthetic toxicity.

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REFERENCES

1. Singh P. An emphasis on the wide usage and important role of local anesthesia in dentistry: A strategic review. Dent Res J (Isfahan) 2012;9:127-32.
2. Berde CB, Strichartz GR. Local anesthetics. In: Miller RD, Eriksson LI, Fleisher LA, Wiener-Kronish JP, Young WL, eds. Miller's Anesthesia. 7th ed. Philadelphia, PA: Elsevier, Churchill Livingstone, 2009.
3. Foster AH, Carlson BM. Myotoxicity of local anesthetics and regeneration of the damaged muscle fibers. Anesth Analg 1980;59:727-36.
4. Mather LE, Chang DH. Cardiotoxicity with modern local anesthetics: Is there a safer choice? Drugs 2001;61:333-42.
5. Foxall G, McCahon R, Lamb J, Hardman JG, Bedforth NM. Levobupivacaine-induced seizures and cardiovascular collapse treated with Intralipid®. Anaesthesia 2007;62:516-8.

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