

One Hundred Years Later, I Can Still Make Your Heart Stop and Your Legs Weak: The Relationship Between Regional Anesthesia and Local Anesthetic Toxicity

The association between regional anesthesia and local anesthetic systemic toxicity and neurotoxicity is well established. However, as with all relationships, the roles and concerns have evolved over time. Initial descriptions focused on systemic toxicity, most likely because of the popularity of infiltrative and peripheral techniques which required large doses and/or concentrations of local anesthetics.¹ Advances in local anesthetic synthesis, neural blockade techniques, and regional anesthesia equipment technology have often been linked to reports of serious complications. For example, the long-acting amides allowed prolonged anesthesia and analgesia but were associated with cardiac arrest after intravascular injection.² Likewise, cases of cauda equina syndrome followed the introduction of spinal microcatheters.³ The ensuing laboratory studies, clinical investigations, and postmarketing surveillance that were performed to evaluate the increased frequency of a previously rare event often yielded conflicting conclusions and recommendations. As a result, it is difficult to determine if the subsequent decrease in the complication was a result of altered clinical practice or avoidance of the associated technique.

Recognizing the need to summarize and update this often controversial area of regional anesthetic practice, the American Society of Regional Anesthesia and Pain Medicine convened a "Conference on Local Anesthetic Toxicity," which was held November 17-18, 2001, in Miami. This symposium was an invited colloquium of acknowledged international researchers who were brought together to share ideas and advances in their area of expertise with other conferees, who by definition had more than a passing interest in local anesthetic toxicity. After this one and a half day conference, then Editor-in-Chief David L. Brown, MD, invited several presenters to submit manuscripts to be considered for publication in *Regional Anesthesia and Pain Medicine*. Each article underwent peer review, in addition to editorial oversight from Drs. Brown and Neal. The first 6 articles of the current issue of *Regional Anesthesia and Pain Medicine* are representative topics from the conference, and essentially represent a special supplement within this issue.⁴⁻⁹ Future issues of the journal will include more work from Local Anesthetic Toxicity Conference presenters.

Readers of *Regional Anesthesia and Pain Medicine* should be aware of the process by which special articles such as these are selected and reviewed because there are subtle differences as compared with standard original or review articles. It is important to realize that some articles contain more opinion than would be accepted in the normal peer-review process. This is both necessary and as it should be. As recognized experts, many of the authors are offering their learned

and best opinion based on experience and interpretation of what is often conflicting or limited science. The authors have conscientiously attempted to make you aware of instances in which they are offering their opinion or judgment, rather than scientifically proven facts. Parenthetically, those opinions may not always have gone unchallenged by other participants at the conference and in no way should be construed to represent a consensus of the attendees.

Notable controversies remain, and undoubtedly new ones will surface. For example, the recent popularity of peripheral blocks, which often involve administration of large doses and volumes of local anesthetics, may represent the greatest challenge to patient safety.¹⁰ Establishment of a maximum local anesthetic dose based on patient factors, site of injection, and use of adjuvants would be truly useful to the clinician. Furthermore, with increased utilization of continuous catheter techniques, including outpatient applications, accumulation of local anesthetics and their metabolites over time must be considered.¹¹ Mechanisms to prevent and detect local anesthetic toxicity related to an “at-home” infusion are essential.

We hope that you will find these articles educational and thought provoking. They represent the first 100 years’ knowledge and experience in defining the frequency, risk factors, treatment, and prognosis associated with local anesthetic toxicity. The next 100 years are even more promising. Innovations in resuscitation will allow reversibility of toxic effects, whereas *in vitro* and *in vivo* evaluations will define the cellular mechanisms of toxicity. As a result, the new “stabilized” relationship between regional anesthesia and local anesthetic toxicity will decrease the likelihood of dangerous calcium-mitochondrial liaisons and fatal sodium channel attractions.

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References

1. Labat G. *Regional Anesthesia: Its Technic and Clinical Application*. Philadelphia: W.B. Saunders; 1922:1-34.
2. Albright GA. Cardiac arrest following regional anesthesia with etidocaine or bupivacaine. *Anesthesiology* 1979;51:285-287.
3. Rigler ML, Drasner K, Krejcie TC, Yelich SJ, T. SF, DeFontes J, Bohner D. Cauda equina syndrome after continuous spinal anesthesia. *Anesth Analg* 1991;72:275-281.
4. Drasner K. Local anesthetic toxicity: Clinical injury and strategies that may minimize risk. *Reg Anesth Pain Med* 2002;27:576-580.
5. Heavner JE. Cardiac toxicity of local anesthetics in the intact isolated heart model: a review. *Reg Anesth Pain Med* 2002;27:545-555.
6. Horlocker TT, Wedel DJ. Local anesthetic toxicity: Does product labeling reflect actual risk? *Reg Anesth Pain Med* 2002;27:562-567.
7. Mulroy MF. Systemic toxicity and cardiotoxicity from local anesthetics: Incidence and preventive measures. *Reg Anesth Pain Med* 2002;27:556-561.
8. Pollock JE. Transient neurologic symptoms: Etiology, risk factors, and management. *Reg Anesth Pain Med* 2002;27:581-586.
9. Weinberg G. Current concepts in resuscitation of patients with local anesthetic cardiac toxicity. *Reg Anesth Pain Med* 2002;27:568-575.
10. Auroy Y, Narchi P, Messiah A, Litt L, Rouvier B, Samii K. Serious complications related to regional anesthesia. Results of a prospective survey in France. *Anesthesiology* 1997; 87:479-486.
11. Pere P, Tuominen M, Rosenberg PH. Cumulation of bupivacaine, desbutylbupivacaine and 4-hydroxybupivacaine during and after continuous brachial plexus block. *Acta Anaesthesiol Scand* 1991;35:647-650.