



Efficacy Of Epinephrine Test Dose In The Prevention Of Local Anesthetic Systemic Toxicity

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Introduction

- Local anesthetic systemic toxicity (LAST) occurs with an estimated incidence of 0.03% following regional anesthesia, with major neurological and cardiovascular consequences such as seizures, arrhythmias, and cardiac arrest
- The American Society of Regional Anesthesia and Pain Medicine (ASRA) recommends using a pharmacologic marker and/or test dose such as 2.5 – 5.0 mcg/mL epinephrine to identify intravascular injection to prevent LAST; however, literature shows this recommendation is not widely utilized in clinical practice to prevent LAST
- Across the field of anesthesiology, there is wide disagreement as to whether epinephrine is efficacious in preventing LAST
- This study aims to reveal the clinical usage of epinephrine test dose prior to regional anesthesia and its relationship to LAST

Methods

- IRB approval was obtained through the University of Miami
- Data was gathered through a literature search and a survey to the ASRA community. In both cases, information was gathered on the following:
 - Major and minor episodes of LAST after regional anesthesia
 - Epinephrine usage
 - Note: excluded catheters, continuous infusions, stellate ganglion nerve block, infiltration nerve blocks
- Literature Search
 - Two-proportion left-tailed Z-test with $\alpha = 0.05$ comparing the proportion of patients experiencing a LAST episode with an epinephrine test dose versus the proportion of patients experiencing a LAST episode without an epinephrine test dose
- Survey
 - Two-proportion left-tailed Z-test with $\alpha = 0.05$ comparing the proportion of providers with at least one patient with a LAST episode who utilized an epinephrine test dose versus the proportion of providers with at least one patient with a LAST episode not using an epinephrine test dose

Results

LITERATURE DATA

- Out of 37 literature articles, 72 total events of LAST were reported (48 episodes of major LAST, 24 episodes of minor LAST). Their breakdown of epinephrine usage is seen in *Table 1*

Table 1: Epinephrine Usage in Literature Reported LAST

Epinephrine Usage	Percentage of LAST episodes	Number of LAST episodes
Utilized epinephrine	9.72%	7
Did not utilize epinephrine	44.44%	32
Unspecified epinephrine use	45.83%	33

- The proportion of LAST episodes was significantly less in the patients who received an epinephrine test dose, compared to those patients who did not receive an epinephrine test dose ($p\text{-value} < 0.001$)

SURVEY DATA

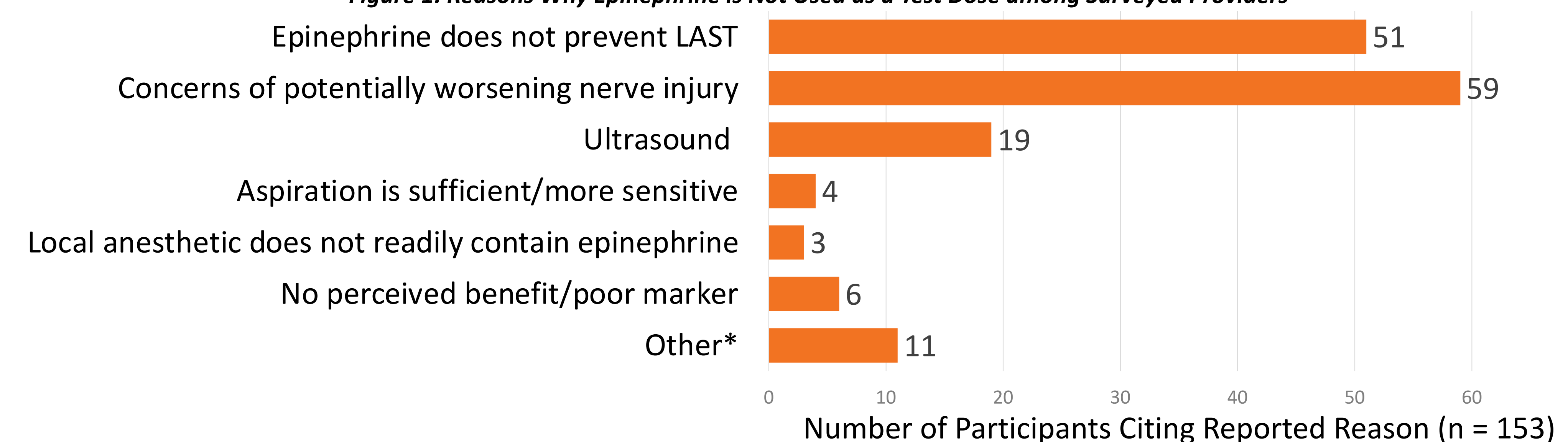
- Among 262 survey responders, only 86 of these individuals reported using epinephrine as an intravascular marker in at least half of their regional nerve blocks
- The proportion of providers with at least one LAST episode in a patient was significantly less among providers who utilized epinephrine compared to the proportion of providers who administered nerve blocks without epinephrine ($p\text{-value} < 0.001$), breakdown of LAST by epinephrine usage is seen in *Table 2*

Table 2: Epinephrine Usage among Surveyed Providers with at Least One Patient Experiencing LAST

	Epinephrine administered (n = 260)	Epinephrine NOT administered (n = 260)
Number of providers with at least one patient experiencing LAST	55	98

- Commonly reported reasons against using epinephrine test dose include concerns of potentially worsening nerve injury and unconvinced that epinephrine prevents LAST (*Figure 1*)

Figure 1: Reasons Why Epinephrine is Not Used as a Test Dose among Surveyed Providers



Conclusions

- Despite ASRA recommendations, >50% of surveyed ASRA members do not routinely use an epinephrine test dose during regional anesthesia to prevent LAST
- The primary reasons offered for epinephrine disuse were lack of confidence in its efficacy, concerns of worsening nerve injury, and the advent of ultrasound
- Literature review of published studies and survey data indicate that the use of a test dose reduces the occurrence of LAST
- We recommend use of an epinephrine test dose during regional anesthesia to mitigate the occurrence of LAST

References

- El-Boghdady, K., A. Pawa, and K.J. Chin, Local anesthetic systemic toxicity: current perspectives. *Local Reg Anesth*, 2018. 11: p. 35-44.
- Gitman, M. and M.J. Barrington, Local Anesthetic Systemic Toxicity: A Review of Recent Case Reports and Registries. *Reg Anesth Pain Med*, 2018. 43(2): p. 124-130.
- Mulroy, M.F. and M.R. Hejtmanek, Prevention of local anesthetic systemic toxicity. *Reg Anesth Pain Med*, 2010. 35(2): p. 177-80.
- Neal, J.M., et al., The Third American Society of Regional Anesthesia and Pain Medicine Practice Advisory on Local Anesthetic Systemic Toxicity: Executive Summary 2017. *Reg Anesth Pain Med*, 2018. 43(2): p. 113-123.
- Vasques, F., et al., A Review of Local Anesthetic Systemic Toxicity Cases Since Publication of the American Society of Regional Anesthesia Recommendations: To Whom It May Concern. *Reg Anesth Pain Med*, 2015. 40(6): p. 698-705.

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