Critical Review Form

Therapy

Lidocaine Before Endotracheal Intubation: IV or Laryngotracheal? *Anesthesiology* 1981; 55: 578-581

Objectives:

1) To describe the effects of laryngotracheal lidocaine administration on intracranial pressure (ICP);
2) To determine whether ET or IV lidocaine was preferable before endotracheal intubation.

Methods: Twenty-two patients with brain tumors greater than 3 cm diameter by CT (all on steroids and scheduled for craniotomy) from the University of Virginia were randomized to IV or laryngotracheal lidocaine pre-intubation. All received morphine (0.1 mg/kg IM), atropine (0.4 mg IM), and diazepam (0.1 mg/kg PO) one hour prior to arrival in operating room (OR). In OR, arterial and central lines were placed along with a subarachnoid pressure screw. After assessment of baseline ICP, blood pressure, and heart rate, patients received thiopental (3 mg/kg), succinylcholine (1.5 mg/kg), and 50% nitrous oxide. One-minute after induction of anesthesia, eleven patients received laryngotracheal lidocaine through direct visualization with a standard laryngotracheal anesthesia (LTA®) set, while the other eleven received 1.5 mg/kg IV lidocaine (p. 578-579).

Guide		Comments
I.	**Are the results valid?**	
A.	**Did experimental and control groups begin the study with a similar prognosis (answer the questions posed below)?**	
1.	Were patients randomized?	Yes, but method of randomization not discussed.
2.	Was randomization concealed (blinded)?	Presumably single-blinded since the patients were under anesthesia and families not in OR, although the authors do not discuss blinding.
3.	Were patients analyzed in the groups to which they were randomized?	Not stated, but assumed to analyzed within the group to which they were randomized as no cross-over was reported.
4.	Were patients in the treatment and control groups similar with respect to known prognostic factors?	"There was no difference between the groups with respect to age, intracranial compliance, heart rate, mean arterial pressure, and PA_{CO2} before intubation of the trachea." (p. 579) The authors do not report the baseline characteristics of the treatment and control group for review.

B.	**Did experimental and control groups retain a similar prognosis after the study started (answer the questions posed below)?**	
1.	Were patients aware of group allocation?	Presumably no since they were pre-medicated in preparation for neurosurgery.
2.	Were clinicians aware of group allocation?	No blinding stated, so presumably yes.
3.	Were outcome assessors aware of group allocation?	Probably yes, but again, not clearly stated one way or the other.
4.	Was follow-up complete?	Subjects were only followed while in the OR, so no loss to follow-up.
II.	**What are the results (answer the questions posed below)?**	
1.	How large was the treatment effect?	From Figure 1 (p. 579), post lidocaine: LT @ 2 minutes ICP ↑ 13 to 17 mmHg LT @ RSI ICP ↑ 13 to 27 mm Hg whereas IV @ 2 minutes ↓ 13 to 10 mm Hg IV @ RSI ICP ↑ 13 to 16 mm Hg
2.	How precise was the estimate of the treatment effect?	Wider confidence intervals for laryngotracheal (LT) than for IV, but both reasonably narrow and they do not cross (Figure 1, p. 579)
III.	**How can I apply the results to patient care (answer the questions posed below)?**	
1.	Were the study patients similar to my patient?	No—all were brain tumor patients. Although not an entirely unreasonable model for normotensive head injury patients, most multi-trauma patients are neither normotensive nor prepped for surgery.
2.	Were all clinically important outcomes considered?	No! The most important outcome is neurological recovery and mortality, of which ICP is only a surrogate marker.
3.	Are the likely treatment benefits worth the potential harm and costs?	No adverse effects of IV lidocaine were reported at 1.5 mg/kg. Based upon these observations, one should probably avoid using laryngotracheal lidocaine based on the observed elevation in ICP. No clinically significant outcome benefits were assessed or observed from this study.

Limitations

1. Small study of select population in well controlled environment. The results cannot be extrapolated to the ED where we are generally concerned about elevated intracranial pressure in traumatic brain injury with intubating physicians of various skill-level, intubations performed for a variety of indications under often suboptimal conditions, with often tenuous hemodynamic stability.
2. Potential bias if physicians and/or outcome assessors were not blinded to the intervention arm.
3. Randomization not block randomized, hence another potential source of bias.
4. The pre-intubation medication regimen utilized by this study protocol is rarely, if ever, used in EM currently. The results might differ with current RSI regimens.
5. Patient-important outcomes of long-term neurological recovery required rather than surrogate markers of ICP.

Bottom Line

In a small study of 22 brain cancer patients randomized to receive either laryngotracheal (LT) or intravenous (IV) lidocaine three minutes pre-intubation, IV appears to effectively accentuate the elevation in ICP (ΔICP at time of intubation 3 mm Hg versus 14 mm Hg), MAP (24% versus 45%), and HR (ΔHR 15 versus 30) compared with LT. LT lidocaine administration appears to independently elevate ICP even before intubation, an effect which is sustained up to two minutes post-intubation.