

Reversing the Effects of 2% Lidocaine: A Randomized Controlled Trial

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Dental Anesthesia



- Local anesthesia is a temporary loss of sensation in a specific part of the body
- An important part of out-patient dentistry
 - Each dentist in Canada injects 1800 cartridges per year¹
 - 300 million cartridges in the US yearly²
- Most commonly used anesthetic: 2% Lidocaine, 1:100,000 epinephrine
 - Epinephrine:
 - decreases vascular absorption
 - increases availability of local anesthetic at the nerve membrane

Table 1. Duration of Injectable Local Anesthetics in Minutes

Anesthetic	Maxillary Infiltration		Mandibular Block	
	Pulp	Soft Tissue	Pulp	Soft Tissue
Lidocaine 2% 1:000,000 epi	60	170	85	190
Mepivacaine 3% plain	25	90	40	165
Articaine 4% 1:100,000 epi	60	190	90	230
Prilocaine 4% plain	20	105	55	190
Bupivacaine 0.5% 1:200,000 epi	90	340	240	440

Adapted from Stanley Malamed, Handbook of Local Anesthesia, Fifth Edition

Patient Perspective



- Average dental appointment is **44 minutes** long³
- Soft-tissue anesthesia usually lasts between **3-5 hours** after the dental appointment⁴
 - Lip
 - Cheek
 - Tongue
- Patients report:
 - Difficulties eating/drinking/speaking
 - Altered perception of face
 - Inadvertent soft tissue trauma(13-18%⁵) (*especially pediatric population)

Phentolamine Mesylate



- Has been used >50 years for other medical indications^{4, 6}
- A nonselective competitive alpha-adrenergic antagonist⁴
 - Reduces vasoconstriction
- Pharmacological means of reducing soft-tissue anesthesia
- Dental Use: OraVerse
 - FDA approved 2008⁷
 - Approved in Canada since September 2014
 - Available in a standard carpule similar to a local anesthetic

Literature Review

- **Rutherford et al. (2009)⁸**
 - Systemic toxicity + effects of repeated injections in beagle dogs
 - No SS differences
 - Conclusion: repeated injections of OraVerse are well tolerated in beagle dogs
- **Laviola et al. (2008)⁹**
 - Phase 2 trial
 - N=122
 - 4 anesthetics
 - Recovery time of normal lip sensation
 - PM group = 101 minutes
 - Control group = 150 minutes
 - Adverse effects were similar

- **Tavares et al. (2008)¹⁰**
 - Phase 2 trial on a pediatric population
 - N= 152
 - Recovery time for normal lip sensation ($p < 0.0001$)
 - PM group = 60 minutes
 - Control group = 135 minutes
 - No differences in adverse events, pain, vital signs etc.
- **Hersh et al. (2008)¹¹**
 - Phase 3 trial
 - N= 244
 - SS reduction in soft-tissue anesthesia:
 - Lower Lip:
 - PM group = 70 minutes
 - Control group = 155 minutes
 - Tongue
 - PM group = 60 minutes
 - Control group = 125 minute
 - No differences in adverse events, pain, vital signs etc.
- **Saunders et al. (2011)¹²**
 - Compare use in private practice + patient perception + pattern of use
 - N=390
 - Median time to recovery was 60 minutes vs. 135 minutes
 - 84% of patients said that OraVerse improved their dental experience

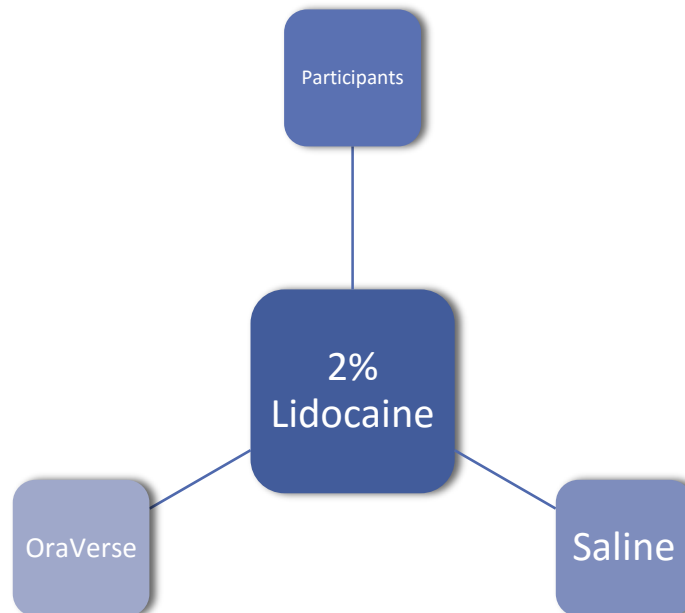


Previous Conclusions

- OraVerse reduces the duration of soft tissue anesthesia
- However, is it the OraVerse that is reducing the duration of soft tissue anesthesia, or is it just a local diluting effect?
 - Inadequate control
 - Sham injections

Purpose

- To evaluate the **difference in time** required for the return of normal soft-tissue **sensation** and **function** in participants who receive an injection of OraVerse versus those who receive an injection of saline



Methodology

- Dental students and dental hygiene students
- Both groups received an IANB using 1.8 ml of 2% Lidocaine, 1:100,000 epinephrine*
- Random assignment
- Anyone who did not achieve profound anaesthesia was withdrawn from study
- Unidentifiable syringes were used to draw up both OraVerse and sterile water
 - Group 1: injection of 1.8 ml OraVerse at the same site
 - Group 2: injection of 1.8 ml sterile physiological water



*as per Anesthetic Lab



ASSESSMENT OF ANESTHESIA

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Date: _____

Participant study ID: _____

Time of first injection: _____

Time of second injection: _____

Instructions:

In order to evaluate the effectiveness of reversing agents for local anesthesia, it is necessary to evaluate the time needed for soft tissues to revert to their normal state. Until the anesthesia is completely gone, it is asked that you evaluate numbness of your soft tissues every 10 minutes by using finger palpation and finger tapping. Please, note the time when your soft tissues feel normal again (no tingling or numbness). You should compare the sensations on the anesthetized side with the side that did not receive the injection.

At the beginning of this observation period please circle the sensation that most applies:

Lower lip: Numb Tingly Normal

Tongue: Numb Tingly Normal

Time at which soft tissues feel normal again:

Lower lip: _____

Tongue: _____

Time at which function feels normal again:

Smiling: _____

Drinking: _____

Speaking: _____

Usefulness:

Was the second injection comfortable? _____

Would you do it again next time you get local anesthesia? _____

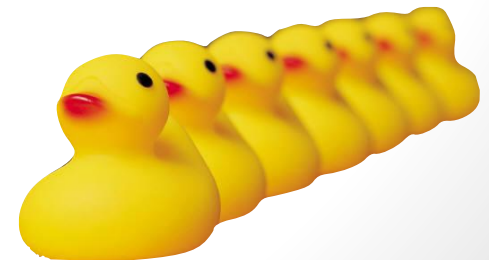
Why? _____

Did you experience any adverse effects? _____

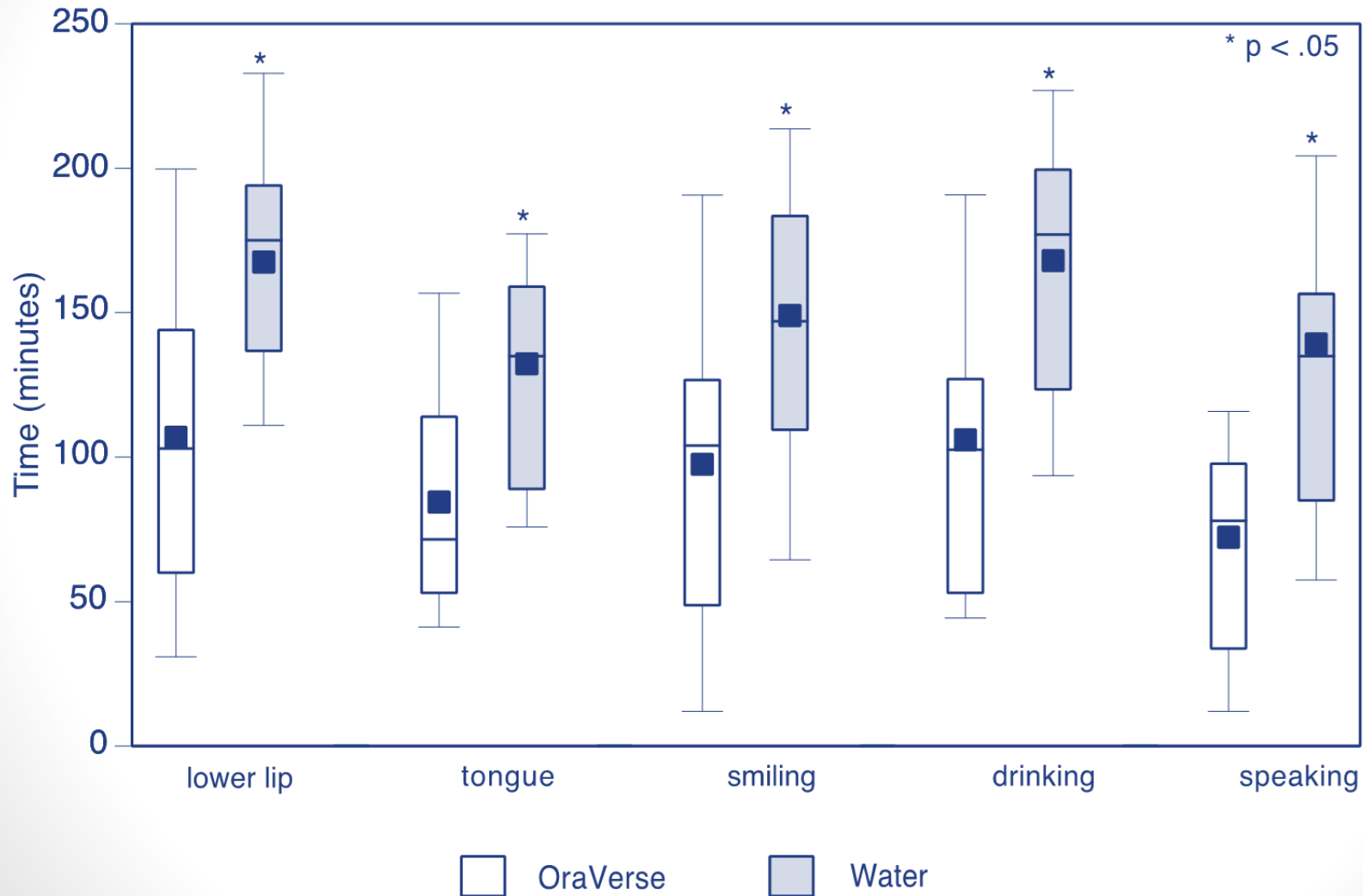
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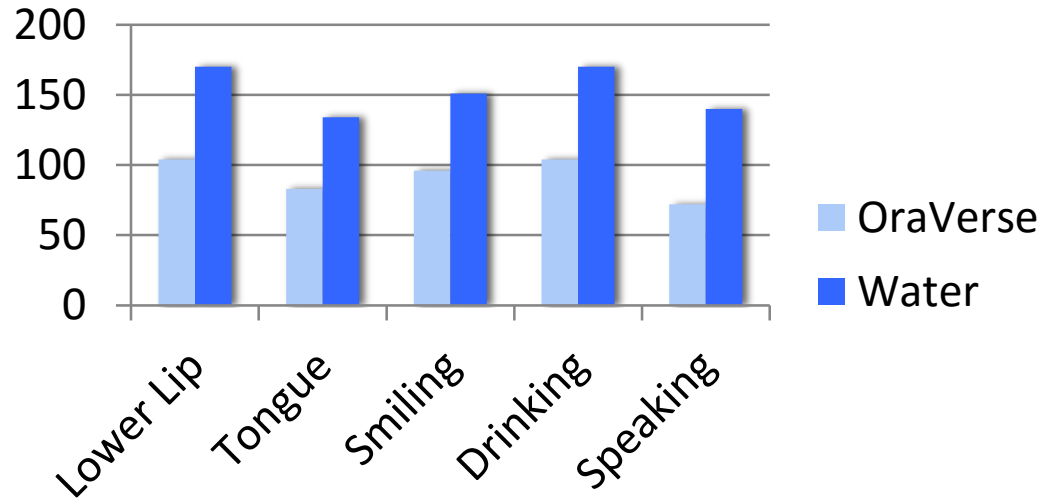
Methodology

- Sample size calculation = 30
- SPSS to do statistical analysis
- ANCOVA to control for time
- Following statistical analysis randomization codes were revealed



Results





N=36	OraVerse	Water	Difference	P-values
Lower Lip	104	170	66	0.001
Tongue	83	134	51	0.004
Smiling	96	151	55	0.02
Drinking	104	170	66	0.01
Speaking	72	140	68	0.012

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Discussion

- Pilot study – first study with a legitimate injection
 - Flood et al. 57 minutes (sensation)
- Results are similar to past studies
 - Laviola et al.
 - 85 minute reduction to recovery of lower lip sensation
 - Hersh et al.
 - 65-85 minutes reduction to normal tongue and lip sensation
 - Saunders et al.
 - Reduction of 60 minutes
- Limitations:
 - No treatment was done on patients
 - Two different groups injected at different times
 - Different needles than in private practice
 - First (and second) injection ever

Conclusion

- OraVerse hastens the return to normal soft tissue sensation and function by approximately one hour



Future Research Opportunities

- Evaluating various anesthetics
 - Articaine 4% 1:100,000 epi
 - Bupivacaine 0.5% 1:200,000 epi

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- Dr. Martha Brilliant
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Thank you!



References

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