Buffering Anesthetic Carpules

A doc’s creative experiment leads to a discussion on the best way to buffer anesthesia

Introduction

As a new dentist, I make first impressions all the time. I’d hate to be remembered as the new guy who gives painful shots, so I’ve given extensive effort to improve in that field. Buffered anesthetics seem like a good idea for the following reasons:

1. Traditional LA with epinephrine contain acidic stabilizers that bring the pH down, sometimes to the same level as lemon juice … ouch!
2. An anesthetic buffered to physiologic pH has less sting.
3. Neutral pH anesthetics cross the nerve membrane much quicker than acidified LA.
4. Sodium bicarbonate, used as the buffer, reacts to form CO₂, which is an anesthetic potentiator.

Take-home message: buffering dental LA lets you give a less painful, quicker-acting shot using less anesthetic. With all that in mind, I decided to perform a few tests on myself.

First, I bought a Mettler Toledo pH meter with micro probe, accurate to the hundredths of a pH, to measure our anesthetics, buffered and non-buffered.

Injectable 8.4 percent sodium bicarbonate (single-use vial—I’m still searching for a multi-use vial).

Here are the pH values I came up with for various LAs.

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Lidocaine 2 percent epi 1:100,000 was selected for the experiment.

In order to buffer the lidocaine, I squirted out approximately 5 percent of the carpule (~0.09cc).

After drawing up sodium bicarbonate into the carpule, the new pH was measured at 7.01.

With the help of my father, Dr. Jim, I received a simultaneous infiltration of a quarter carp above #7 and #10 (At the time, I didn’t know which side was buffered lido and which was normal lido).

Conclusion

Results: Within 10 seconds, I identified injection site #10 correctly as the buffered LA; #9, #10 and #11 achieved profound numbness with only a quarter carp after about a minute. Comparatively, site #7 had minimal numbing effect. I experienced about the same amount of pain from each injection (from initial penetration and bolus deposition).

Anecdotal conclusions: Buffered anesthetic will greatly decrease the onset of local anesthetic.

Further study: I would like to repeat this experiment for a block, although it would be more
difficult to perform an IA block bilaterally with any confidence of repeatability. I would assume, though, that a buffered LA would more readily cross the nerve membrane, resulting in fewer IA blocks missed.

Other thoughts: Onset by Onpharma is a product that easily lets the clinician buffer local anesthetic chairside. I find it expensive, though, with estimates ranging from $5–7 per injection. This cost may be recovered in time saved from waiting for an injection to work. Perhaps a less expensive method, like the one explored in this experiment, is possible.

Thanks for reading. I would appreciate your comments and thoughts on buffered LA’s. –Ben Cope DDS El Dorado Hills, CA

Disclosure: This experiment needs refinement before implementing into my everyday practice. I have no financial interest in any of the products used.

Cool experiment. I can tell you that I’ve been buffering for a good while using the large 50ml vials that you showed above and it works very well. I actually did it with an IA block on my OS when he needed some fills—I figured if anyone would know profound anesthesia, it’s him.

We timed it and he had profound mandibular anesthesia at 1 minute. I mix it in the same 1:10 ratio that the Onset protocol calls for: 0.18ml of bicarb per carpule. Using 1cc allergy shot syringes makes it very easy to measure and dispense the correct amount.

Going to run and hide before the Onset posse shows up.

Cory, can you explain some details? You use a single-dose vial multiple times? You draw the bicarbonate into the allergy syringe—now, how do you get it into the patient?

Using a new 1cc allergy syringe each day, I alcohol-wipe the bottle and draw up 90ml of the bicarb solution… just recap the syringe and keep in my pocket. This is enough to buffer 5 carpules of anesthetic. I only buffer for IA blocks and so this usually gets me through a day.

Just before I numb, I’ll stick the allergy syringe tip into the carpule and inject .18ml of bicarb… it will almost back the stopper out but not quite. Place the carpule in the dental syringe and it’s ready to inject.
Are there any legal issues with do-it-yourself compounding? Is adding this to the lido considered compounding? Someone mentioned on a different thread that this was considered compounding. Does anyone know about that? I'd really like to try this too.

The onset of anesthesia is routinely about a minute and it's more profound than non-buffered anesthesia. Go check out the science behind it on Onpharma's website, which is the commercial version of this. It is a great product and I'd use it if there were concerns about compounding, etc. I don't know the answer to specific legalities but in my redneck mind, I'm doing the exact same thing with the exact same solution so I'm unsure how it could be a problem.

Good question. I'm in the litigious lawyer-haven of California, so I definitely want to be legal on all of this, as well as being safe for the patient. I would imagine the California Dental Association would be the place to go?

This is totally within the realm and scope of dentistry as long as you have done due-diligence research in the chemistry, pharmacokinetics, safety and infection control, etc. Mixing drugs for immediate use is done often. Adding an antibiotic to an IV bag comes to mind. This is compounding, but for in-office use. Compounding and distribution to others (colleagues, etc.) is where a problem may arise. You are then acting as a dispensing/compounding pharmacy. In most jurisdictions this would require a pharmacy license. Hope this helps.

Michael, thank you so much for the educated perspective on this. I have a leg up on most of you because I did spend one semester in pharmacy school 20 years ago while waiting for my acceptance letter from dental school (and flunked out of the second semester immediately after I received it), but I am not sure it qualifies me to do DD on this.

So, Michael, in your opinion, can adding some bicarbonate as described above and using the solution immediately result in any adverse effects?

We all use OnSet by OnPharma to do this. Idiot-proof and works like a dream. Good team over there too.

In my opinion, if your final solution is the same concentration and pH as that of Onpharma, then you should define. Remember that the Onpharmasy system expresses some local anesthetic out of the cartridge before adding sodium bicarbonate solution to replace that volume.

Henry Schein for the anesthetic and buffer, Dentsply for the needle … I recently found a much cheaper, smaller buffer vial I will post on soon.

to help avoid tissue necrosis. Definitely will be trying this. Curious to see how this is charted, too. Hoping someone will post a cheat-sheet on their chart notes.

I just note that the anesthetic was buffered prior to administering. The volume and method of buffering is always the same so I don’t note it every time.

I’m not being a contrarian and have thought of buffering myself, but have to present a few questions.
1. What if there are anesthesia, paresthesia or dysesthesia issues after the use of compounded LA?
2. Do anecdotal experiments on yourself or others to change the effects of LA provide enough scientific support for the process of self-compounding chairside?
3. Does the rationale that “Onset researched it so I can do it” meet standard of care?
4. Are you informing the patient that you are buffering your LA and using it in their care?
5. Are there different buffering levels for different LA’s? Is this affected by different concentrations of LA?
6. How do different vasoconstrictor types/concentrations affect the buffering process?

Great questions. I would be most concerned about the possibly increased paresthesia from an anesthetic that more readily crosses the nerve membrane, therefore increasing the likelihood of some sort of neurotoxicity. I called Onpharma, and they said studies have shown no increase in paresthesia from buffered anesthetics, but of course that was a sales rep. My online search has not come up with any article that says it does or it doesn’t.

Haven’t read any literature one way or the other. I did take a sedation course from Stanley Malamed a couple of years ago in which he spent some time talking about buffered anesthetics. His take was that they are as safe as, or safer than, traditional anesthetics, due to a pH much closer to neutral.

He also made the point that more of the anesthetic is sequestered by the nerve, leaving a lower concentration in the tissues that the body must metabolize (less chance of anesthetic overdose).
Of course, I believe he is also a consultant for Onpharma … I just looked at my old notes from the course; the only literature he cited was his own research regarding the speed of onset and patient preference for buffered.

I’m not being a hammer to ask these questions. My younger brother works for a company that deals in the various stages of bringing a new drug through the FDA and then to market. Histakeisthatanypractionerwouldbelegallyexposediftherewereanyadverseeffects… even if they weren’t related to buffering. Now, that doesn’t mean that the process of buffering is inherently evil, just that if you happened to have an event occur … you’d be in really weak position if sued.

Rance, Onset has FDA approval for dental use with lidocaine, 1:100K epi. That’s the only one I’m aware that it’s approved for.

I’m not sure I understand your risk question. Using this product as FDA approved, how is that any more risky to use then using any other FDA-approved product?

My last few comments are in the context of discussing buffering your own solution on the fly and not in using Onset. Onset has probably taken more than a few years to take their product to market through the FDA process.

There are endless threads, arguments and alarmists on DT about Septocaine issues when giving blocks, even if the increased risks are statistically negligible but of no concern with experimental buffering chairside with our patients?

To the issue of consent, at some point most of us will have anesthetic post-op issues. Is that the best time to inform the patient that you were experimenting with buffering?

I hate to bring the Perry Mason spin to this but it would seem like you’d be setting up any lawyer to own your butt.

Can someone give me a good reason that buffering would ever be a problem? We are talking about taking a fairly acidic liquid that is being injected, and making it neutral before insertion. From a purely scientific point of view, this would make any injection be safer if nothing else.

I agree with Rance. You can scrape together some bread mold and have patients ingest it instead of ABs, or buy a bag of Portland Cement and use it for endo, but if there are any problems I doubt you can rely on research done by Quickrete to back you up.

The practice is probably sound and safe, but it seems to me that so long as Onset is the only formulation out there, I don’t think one can safely rely on it.

I don’t think that’s the same thing, Steve. This is in no way an uncontrolled process with bootleg materials. It’s sterile NaHCO₃ for medical use. I wouldn’t hold my breath for more formulations. There can’t be more formulations of bicarb … it’s just bicarb.

The genius of the Onpharma folks was they developed a dispensing method for this very
basic and highly unprofitable drug. As a result, they can charge you $7 for a carpule's worth of the same material you can blend in a 50ml bottle for a buck … you just have to measure and dispense yourself.

By the way, buffering anesthetics has been around for generations in other fields—just not dentistry. I would think that if there were issues, it would’ve shown up by now.

The difference is that it isn’t a medical product. It hasn’t been packaged in sterile conditions and there isn’t the quality control necessary for medical use.

You’re probably right, but I can also see where Rance’s concerns are coming from. What is bicarb used for, anyway? Is it routinely injected for other procedures? I am sure it gets compounded in the IV bag, but for what?

I fail to see the difference in bicarb from the pharmacy, bottled and dispensed with a syringe, and then numerous sedative and reversal agents that dentists/physicians buy in a bottle and dispense in a syringe. Exact same packaging; exact same dispensing method. How are they different?

Technically speaking, the difference is in the actual compounding. While this is pretty minor compounding, there are many states cracking down on compounding and compounding pharmacies.

There are specific rules and stipulations that go with compounding substances for injections or parenteral use and being in compliance.

While I really, really doubt it would be a problem with bicarb and LA, I like the fact that Onset is FDA approved … cost factor aside. If they wanted to jack you up for compounding a pharmaceutical on your own outside of that FDA approval, that could be a bad one.