



# Giving a Good Needle: Resident Guide to Decreasing Injection Pain

Roman Bronfenbrener, MD

*Residency is a time when we set a foundation for how we will practice dermatology in the future. Perfecting good injection technique early in one's career can boost patient perception of the provider and help keep a schedule running smoothly. This resident guide focuses on ways we can give better injections by highlighting useful pearls to master this commonplace procedure.*

*Cutis. 2014;93:E13-E15.*

Think back to a busy day and try to recall how many biopsies you performed. Chances are during that time you administered several dozen injections for various indications. Although we have become accustomed to performing injections through repetition, it may be the focus of many patient visits and may be the basis on which a patient judges his/her physician. There are various techniques and products available that can help decrease the physical and psychological burden of injections for patients, some that should be incorporated into a resident's repertoire to be perfected before becoming an attending.

## Factors Related to Anesthetics

The most frequently used local anesthetic in dermatology clinics is lidocaine (1% or 2%) combined with epinephrine 1:100,000. This premixed formulation

relieves the burden of mixing for nurses; however, its low pH (4.2) contributes to stinging and burning with infiltration.<sup>1</sup> Buffering with sodium bicarbonate 8.4% in a 9:1 ratio (9 parts lidocaine-epinephrine to 1 part bicarbonate) more closely matches the neutral pH in human tissues and decreases injection pain.<sup>2</sup> Alkalinizing the anesthetic mixture also decreases the time of onset of its effects, as higher pH solutions convert lidocaine into its active unionized form. However, buffering the anesthetic does have the drawback of decreasing its shelf life, and many clinics no longer store buffered solutions for fear of spoilage. It can be useful to prepare a freshly buffered mixture prior to injecting a particularly needlephobic patient or when injecting in a difficult anatomic location.

In keeping with the philosophy that infiltrating with a solution that closely mimics physiologic parameters minimizes discomfort, a recent meta-analysis found that warming the anesthetic prior to injection led to less pain.<sup>3</sup> In my experience, I have found that rolling the syringe between my hands prior to injection also decreases the patient's sensation of "feeling the anesthetic going in."

## Preinjection Preparation

Properly positioning the patient is paramount to safe injection. Murphy's Law should be anticipated, not discovered. A few moments spent adjusting the chair and lighting can pay dividends if a patient suddenly has a vasovagal episode. Unfortunately, it is difficult to predict which patients are prone to such attacks, as even a patient who may spend hours playing football in the summer heat could collapse at the sight of a needle. Aside from proper positioning of the patient, the biopsy tray should not be in the patient's direct line of sight. Even those who tolerate the anesthesia well may become distraught at the sight of bloody gauze.

From the Department of Dermatology, State University of New York, Stony Brook.

The author reports no conflict of interest.

Correspondence: Roman Bronfenbrener, MD, 181 N Belle Mead Rd, Ste 5, East Setauket, NY 11733  
(roman.bronfenbrener@stonybrookmedicine.edu).

There are several options for topical anesthesia to decrease injection pain. Cream or gel preparations (ie, eutectic mixture of lidocaine and prilocaine, lidocaine cream, tetracaine gel) generally are cumbersome in a busy clinic setting, as they require at least 30 minutes of contact before anesthesia is achieved; a longer duration of exposure provides further anesthetization and may improve patient outcomes.<sup>4</sup> However, these formulations may be useful in planned procedures. I have found much utility in utilizing ethyl chloride vapocoolant spray as a numbing agent with an immediate onset of action, a feature that makes this product useful in busy clinics.<sup>5</sup> Ice is another excellent local coolant and is readily available in most offices at a negligible cost. Placing the ice in aluminum foil instead of a glove delivers more rapid cooling, and the ice is safe to use on areas where vapocoolant spray may be inconvenient or contraindicated, such as around the eyes, nose, ears, or mouth. Holding the ice in place for approximately 10 seconds prior to injection numbs superficial nerve endings and facilitates painless needle insertion.<sup>6</sup>

### **Injection Technique**

Injection technique is arguably the most important factor in minimizing pain for patients and ensuring effective anesthesia in the field. It also is the factor that a patient will either praise or blame, depending on their perception of the injection.

An important point is that the initial injection should be done perpendicular to the skin. The superficial skin has the highest concentration of nerve endings, which branch repeatedly from larger stems in the deeper dermis and subcutaneous fat. Tangential injections disrupt a relatively larger number of nerve endings as the needle tracks through more superficial skin. By injecting perpendicularly, you minimize damage done during the needle's plunge.<sup>2</sup>

Anesthetic should initially be deposited into the subcutaneous fat and continued as the needle is withdrawn. Injection directly into the dense dermis leads to pain with hydrodissection, while deeper placement is less painful due to the malleability of fat and a decreased concentration of nerve endings.<sup>7</sup>

Subsequent injections should be strategically placed. Ideally, the initial injection should be the only one that the patient feels, with widening of the anesthetic field achieved by slowly infiltrating lidocaine through skin that is already numb. The needle should be inserted into the wheal and advanced slowly with continuous pressure on the plunger; special attention should be paid to avoid advancing the needle tip past the leading edge of the wheal and into skin with intact sensation (areas of skin that have not yet been numbed by anesthesia and therefore are

still capable of sensing pain from injection).<sup>8</sup> This method of delivering anesthesia with only one initial prick experienced by the patient has been coined the "hole-in-one" technique and has proven to be not only efficacious in minimizing injection discomfort but also easy to learn, even for amateur injectors.<sup>9</sup>

### **Distraction Techniques**

Although patients should be made aware of the injection sites and reasonable expectations should be set, distraction techniques are easy to implement and can be valuable in directing the patient's focus away from the anticipated injection. A patient's clothing, jewelry, and body art; reading material; and the weather are examples of topics that can be discussed as "talkesthesia." For younger patients, various distraction techniques have been developed, ranging from basic distraction with stickers or toys to increasingly sophisticated methods such as virtual reality glasses worn during the procedure.<sup>10</sup> In actual practice, I prefer to use available technology that is inexpensive and already familiar to the child; for instance, allowing children to watch their favorite short Web videos or play a video game during the procedure, as long as the biopsy site allows it, is an ideal adjunct to proper topical anesthesia and good injection technique. For adults, quickly plugging in their favorite musical artist to an Internet radio application also can alleviate anxiety.

Several distraction techniques also can be administered directly at the injection site based on the gate control theory of pain. Tactile stimuli delivered proximal to the injection site creates sensory "noise" at the level of the spinal cord, masking the noxious sensation carried on unmyelinated C fibers.<sup>7</sup> If you have ever hit your head on an open cabinet, for instance, the instinctual desire to immediately rub the area to reduce the pain functions on this same premise. Various tactics may be employed, including stretching or pinching the skin, rubbing, and tapping; however, I find that the major limitation to many of these methods is performing them safely. An inadvertent stick may be more likely if your fingers are dancing in the path of the needle. Generally, I like to rub the skin about 3- to 5-cm proximal to the injection site with the index finger of the supporting hand as the needle is inserted and continue while the deposit of anesthetic is placed. A potentially safer option is a small handheld massager, though concerns about sterility and durability with autoclaving may limit its use to select patients.<sup>11</sup>

### **Special Patient Considerations**

Although we do our best to control the operator-dependent aspects of injection pain, patient factors

also can complicate the administration of adequate anesthesia and occasionally can lead to unintended surprises. Patients with red hair whose characteristic locks are the result of mutations in the melanocortin 1 receptor have been identified as being resistant to the effects of local anesthesia, putatively related to the role of melanocortin 1 receptor in pain modulation.<sup>12</sup> This discovery highlights the fact that there likely are numerous undiscovered mutations that cause resistance to anesthetic agents. It further underscores the need to ensure adequate numbing by testing the patient's level of sensation prior to beginning any procedure.

### Conclusion

By keeping your patient's comfort in mind, you will not only enhance their confidence in you as their physician but will also encourage good follow-up care and adherence to any prescribed protocols. In the future, needleless injection devices and more rapid topical anesthesia may further decrease pain associated with dermatologic procedures.<sup>13</sup>

### REFERENCES

1. Frank SG, Lalonde DH. How acidic is the lidocaine we are injecting, and how much bicarbonate should we add? *Can J Plast Surg.* 2012;20:71-73.
2. Zilinsky I, Bar-Meir E, Zaslansky R, et al. Ten commandments for minimal pain during administration of local anesthetics. *J Drugs Dermatol.* 2005;4:212-216.
3. Hogan ME, vanderVaart S, Perampaladas K, et al. Systematic review and meta-analysis of the effect of warming local anesthetics on injection pain. *Ann Emerg Med.* 2011;58:86-98.
4. Smith DP, Gjellum M. The efficacy of LMX versus EMLA for pain relief in boys undergoing office meatotomy. *J Urol.* 2004;172:1760-1761.
5. Farion KJ, Splinter KL, Newhook K, et al. The effect of vapocoolant spray on pain due to intravenous cannulation in children: a randomized controlled trial. *CMAJ.* 2008;179:31-36.
6. Dixit S, Lowe P, Fischer G, et al. Ice anaesthesia in procedural dermatology. *Australas J Dermatol.* 2013;54:273-276.
7. Strazar AR, Leynes PG, Lalonde DH. Minimizing the pain of local anesthesia injection. *Plast Reconstr Surg.* 2013;132:675-684.
8. Lalonde DH. "Hole-in-one" local anesthesia for wide-awake carpal tunnel surgery. *Plast Reconstr Surg.* 2010;126:1642-1644.
9. Farhangkhoe H, Lalonde J, Lalonde DH. Teaching medical students and residents how to inject local anesthesia almost painlessly. *Can J Plast Surg.* 2012;20:169-172.
10. Koller D, Goldman RD. Distraction techniques for children undergoing procedures: a critical review of pediatric research. *J Pediatr Nurs.* 2012;27:652-681.
11. Nanitsos E, Vartuli R, Forte A, et al. The effect of vibration on pain during local anaesthesia injections. *Aust Dent J.* 2009;54:94-100.
12. Liem EB, Joiner TV, Tsueda K, et al. Increased sensitivity to thermal pain and reduced subcutaneous lidocaine efficacy in redheads. *Anesthesiol.* 2005;102:509-514.
13. Patakfalvi L, Benohanian A. Needle-free anesthesia, a promising option for the needle phobic patient. *Br J Dermatol.* 2014;170:1191-1192.