

PRACTICAL APPLICATION

Limited dilute lidocaine anesthesia: A useful technique with many practical applications

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Email: jeremygreenmd@gmail.com**Abstract****Background:** Limited dilute lidocaine infiltration facilitates a comfortable procedure and a rapid recovery process following a novel intervention for reduction of cellulite. Infiltration of dilute lidocaine has many other practical applications in dermatologic surgery.**Objectives:** This article describes a safe, effective technique for local infiltration of limited volume dilute lidocaine anesthesia in a cellulite reduction procedure.**Methods:** The limited dilute lidocaine technique was utilized in studies of a novel device designed to reduce the appearance of cellulite by focal release of fibrous septa in a minimally invasive procedure. No sedation was used. A small (27- to 30-gauge) needle was used to deliver anesthesia to the entry sites. Then, a 20-gauge spinal needle was tunneled under the skin in the superficial plane to manually deliver anesthetic along the advancement pathway of the device and marked cellulite targets.**Results:** During the initial studies, the mean delivered anesthesia volume was 357.2 ml (range, 250–525 ml) or 18.7 mg/kg (range, 11.1–28.4 mg/kg). The mean anesthesia time was 16 min (range, 8–32 min). The mean number of cellulite depressions treated was 19.8 (range, 11–34). Adverse events were closely monitored, and there were no signs of toxicity in any study patients. There were very low levels of discomfort; all patients reported the procedure was tolerable. This technique facilitates a time-efficient procedure and minimizes weeping of excess fluid during recovery.**Conclusions:** When administered with care and skill, the limited dilute anesthesia technique is a safe, effective approach for local anesthesia with many practical applications in dermatologic surgery.**KEYWORDS**

cellulite device, cellulite reduction, dilute lidocaine, limited dilute lidocaine, local anesthesia

1 | INTRODUCTION

Local anesthesia via infiltration of a diluted mixture of lidocaine, epinephrine, sodium bicarbonate, and saline is a safe, effective technique with many practical applications in dermatologic surgery. Lidocaine, developed in the 1940s in Sweden,¹ is one of the most

widely used local anesthetics; it binds to voltage-gated sodium channels preventing the flow of sodium ions through the channel pore, thus inhibiting neuronal action potentials.² Epinephrine is frequently added as a vasoconstrictive agent that also extends anesthesia duration and reduces systemic absorption, minimizing systemic effects.³ In rare instances, lidocaine and/or epinephrine may be associated

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with adverse events, but both are generally well tolerated.⁴ The maximum recommended dose for a lidocaine injection with epinephrine is 7 mg/kg.⁴ However, dilute infiltrations for liposuction have been used safely up to 35 mg/kg.⁵ Preliminary estimates for maximum safe dosages of dilute infiltrations without liposuction of up to 28 mg/kg have also been reported as safe.⁶

TABLE 1 Comparison of limited dilute lidocaine and tumescent solution formulations

Limited dilute lidocaine solution formulation	Tumescent solution formulation ⁴
50 ml 2% Lidocaine	50 ml 1% Lidocaine
250 ml Sodium Chloride (NaCl) 0.9%	1000 ml Sodium Chloride 0.9%
1 ml Epinephrine	1 ml Epinephrine
12 ml Sodium Bicarbonate (NaHCO ₃)	12.5 ml Sodium Bicarbonate (NaHCO ₃)
Final Concentration: 0.32% Lidocaine	Final Concentration: 0.09% Lidocaine

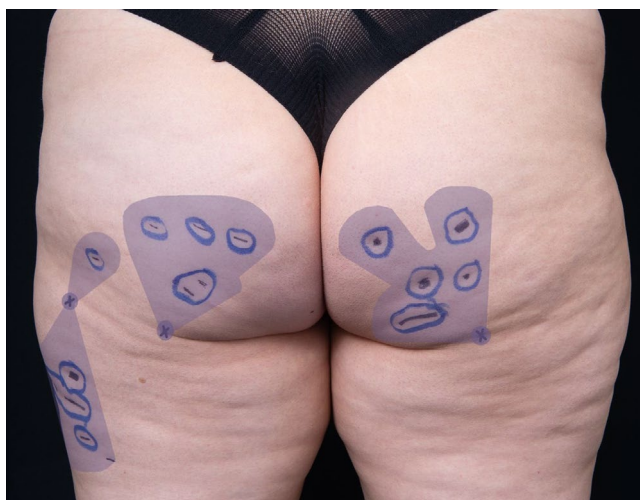


FIGURE 1 Limited dilute lidocaine entry sites are marked with an "X." Cellulite depressions are marked with black surgical marker as a circle or as a dash. The 8 mm margins are drawn around the cellulite depressions with red surgical marker. The anesthesia delivery area is shaded in purple

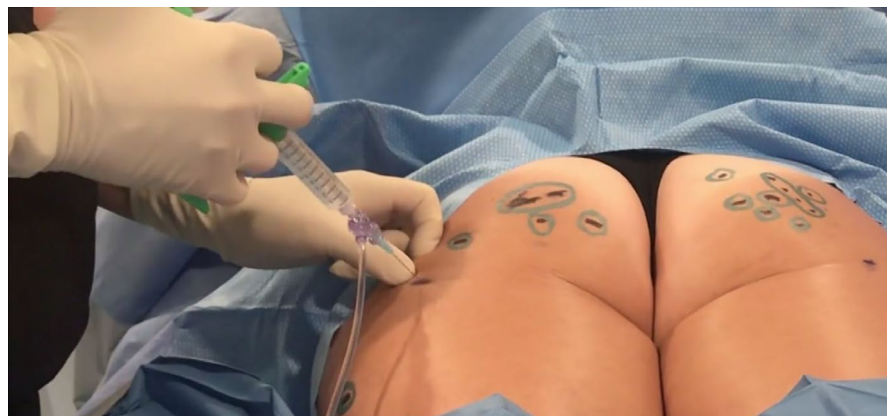


FIGURE 2 Small (27- to 30-gauge) needle used to deliver anesthesia to the entry sites

2 | METHODS AND RESULTS

Limited dilute lidocaine infiltration facilitates a comfortable procedure and a rapid recovery process. It should be noted that the limited dilute anesthesia technique differs from the "tumescent" technique⁴ in that a lower volume of more concentrated solution is used, which eliminates the need for a peristaltic pump. In addition, the lower volume of solution results in minimal tissue distortion, facilitating visualization. The differences in the formulations for the limited dilute lidocaine infiltration technique and the tumescent technique are provided in Table 1.

The limited dilute lidocaine technique was utilized in studies of a novel device (Revelle Aesthetics, Mountain View, CA) designed to reduce the appearance of cellulite by focal release of fibrous septa in a minimally invasive procedure (Figure 1, Video S1). No sedation was used for this application. A small (27- to 30-gauge) needle was used to deliver anesthesia to the entry sites (Figure 2). Then, a 20-gauge spinal needle (3.5" to 6" in length) (Figure 3) was tunneled under the skin in the superficial plane to deliver anesthetic along the advancement pathway of the device and marked cellulite targets (Figure 4). Anesthetic was also delivered at least 1.5" (35 mm) past the marked targets (Figure 5) to prevent discomfort from advancing the distal tip of the device. Anesthesia was delivered thoroughly at the marked cellulite depressions to minimize potential pain from tensioning septa that support nerve bundles or connect to the deep fascia.

During the initial studies with the cellulite reduction device, the mean delivered anesthesia volume was 357.2 ml (range, 250–525 ml) or 18.7 mg/kg (range, 11.1–28.4 mg/kg). The mean anesthesia time was 16 min (range, 8–32 min). The mean number of cellulite depressions treated was 19.8 (range, 11–34). Adverse events were closely monitored, and there were no signs of toxicity in any study patients. There were very low levels of discomfort; all patients reported the procedure was tolerable. The patient may feel a quick, sharp pain occasionally. In these instances, additional anesthesia can be applied with a short needle delivered from the remainder of the pre-mixed bag.

The limited dilute lidocaine anesthesia technique facilitates a time-efficient procedure and minimizes leakage of excess fluid during recovery. When using larger volumes for the tumescent technique, appropriate drainage often requires facilitation by "adits" (punch holes) and/or management with absorptive compression pads.⁷ The lower volume of fluid used for the dilute lidocaine anesthesia technique obviates the need for these interventions.

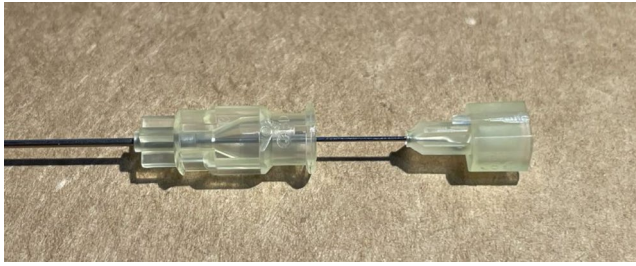


FIGURE 3 Quincke (BD, Manufacturer Part No. 405211, 20-gauge \times 6"; also available as Part No. 405182, 20-gauge \times 3.5") spinal needle and stylet disassembly



FIGURE 4 Multi-Ad Fluid Dispensing System (B Braun, Manufacturer Part No. 513506) and Quincke (BD, (Manufacturer Part No. 405211, 20-gauge \times 6") spinal needle assembly



FIGURE 5 Limited dilute anesthesia technique prior to a cellulite reduction procedure. Anesthetic is delivered at least 1.5" (35 mm) past the marked targets to prevent discomfort from advancing the distal tip of the device

3 | DISCUSSION

The dilute lidocaine anesthesia technique has many potential applications in dermatologic surgery in the superficial as well as deeper planes. In addition to the septal-release device for cellulite reduction, other potential uses include Mohs surgery, resurfacing procedures of the face, and laser procedures, including tattoo removal.

While limited dilute lidocaine anesthesia is generally safe and well tolerated, continual observation of qualitative clinical signs should be maintained. Any acute onset symptoms of restlessness, anxiety, tinnitus, dizziness, blurred vision, tremors, depression, or drowsiness may be early warning signs of central nervous system toxicity.³

For the septal-release device described herein, the approach is in the superficial plane while other applications may be deeper. As mentioned, the benefits of this technique, especially as compared to the tumescent technique, include less weeping and discomfort during recovery, the avoidance of tissue distension which can hinder visualization of anatomy and cause volume distortion, and the ability to administer manually without special equipment (e.g., a peristaltic pump).

4 | CONCLUSION

When administered with care and skill, the limited dilute anesthesia technique is a safe, effective approach for local anesthesia in cellulite reduction with many additional practical applications in dermatologic surgery.

ETHICAL STATEMENT

The authors confirm they have adhered to the ethical policies of the journal as noted in the author guidelines, and all procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or ethical committee and with the Helsinki Declaration and its later amendments or comparable ethical standards.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

Additional supporting information may be found in the online version of the article at the publisher's website.

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