

## Dermal tumescent local anesthesia in cutaneous surgery

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**T**umescent local anesthesia was first described by Klein<sup>1</sup> in 1987 when he detailed the infiltration of large volumes of a diluted solution of lidocaine with epinephrine into fat before liposuction. The tumescent technique revolutionized liposuction by eliminating the necessity of general anesthesia or intravenous sedation and the copious bleeding that had been associated with liposuction procedures. Since that time, the use of the tumescent technique has been expanded to include other dermatologic surgical procedures such as hair transplantation, laser surgery, face-lifts, abdominoplasty, brachioplasty, and breast augmentation.<sup>2,3</sup>

The benefits of the tumescent technique detailed by Klein<sup>4</sup> are numerous: optimizing biochemical drug efficacy, targeting drug effects in local tissue compartments, maximizing drug concentration locally, delaying systemic drug absorption, prolonging local and systemic drug effects, decreasing systemic drug toxicity, increasing the safe upper limit of drug dosage, mechanically expanding a targeted compartment, and benefiting from augmented local hydrostatic pressure to reduce bleeding.

In this report, we aim to describe the use of dermal tumescent anesthesia in cutaneous surgical procedures. It is the authors' experience that dermal tumescent anesthesia produces superior local anesthesia by directly injecting larger amounts of diluted anesthetic solution into the dermis, and also a reduced amount of bleeding intraoperatively and postoperatively.

### TECHNIQUE

We routinely use a commercially available solution of 0.5% lidocaine with epinephrine 1:200,000

(Xylocaine) that is buffered 10:1 with 8.4% sodium bicarbonate. A 30-gauge, .5-in needle on a 3-mL syringe is used to inject the anesthetic. Only the tip of the needle is inserted into the papillary dermis at approximately a 30-degree angle. The solution is injected slowly to allow diffusion of anesthesia within the dermis and not increase the intradermal tissue pressure. Care is taken not to inject anesthetic deeper than the dermis (Fig 1).

Initially, one observes a blanching phenomenon as a result of mechanical compression of dermal vessels. Further injection of anesthetic solution leads to the elevation of a bleb and peau d'orange as the anesthetic material swells the dermis locally while diffusing laterally (Fig 2). When injecting within the dermis, as compared with injecting into the subcutaneous tissue, there is an elevated level of resistance that is felt on the syringe plunger.

While injecting the anesthetic solution, every attempt is made to minimize pain by slow injection, using buffered anesthesia, and continual verbal distraction and reassurance to the patient (Table I). Additional needle sticks are minimized as the anesthetic solution readily diffuses through the dermis. When needed to provide a larger area of anesthesia, further injections should be made through already anesthetized areas of skin.

### DISCUSSION

The technique described above for dermal tumescent anesthesia provides the skin surgeon with a temporarily bloodless dermal field and exquisite anesthesia to perform surgical procedures (Fig 3). This procedure for the delivery of local dermal anesthesia is a modification of routinely taught methods of infiltration of local anesthesia into the subcutaneous fat or muscle.

The use of dermal tumescent anesthesia results in lesser amounts of anesthetic solution injected into the dermis compared with when injecting directly into fat to obtain adequate anesthesia. There are several benefits for the surgeon and patient by using this technique. There is immediate mechanical compression of vascular structures even before the effect of epinephrine takes place. This, combined with the

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**Fig 1.** Demonstration of insertion of needle at 30-degree angle to produce dermal tumescent anesthesia.



**Fig 3.** Dermal tumescent anesthesia provides temporarily bloodless field; 10 mL of local anesthetic solution was used for tumescence of each field.



**Fig 2.** Dermal blanching and peau d'orange formation as anesthesia swells dermis locally while diffusing laterally.



**Fig 4.** Five minutes of postoperative pressure rather than electrocautery is often sufficient for complete hemostasis for wounds.

more dilute concentration of epinephrine in the anesthetic solution, is especially important with elderly patients and those who are more sensitive to the cardiac effects of adrenaline. In addition, using reduced concentrations of lidocaine and epinephrine allows one to inject more anesthetic solution to maximize tumescence. It should be noted that when injecting into the dermis, the volume of fluid injected is less than when anesthetic solution is routinely injected into the fat. We routinely inject an average of 10 mL intradermally for a 1-cm tumor.

Increased tissue pressure caused by anesthetic fluid injected into the dermis compresses blood vessels resulting in reduced bleeding during surgical procedures with less need for electrocautery for hemostasis. In fact, it is the authors' experience that after surgical or Mohs micrographic surgical excisions using the dermal tumescent technique, postoperative pressure alone rather than electrocautery is often sufficient for complete hemostasis for wounds (Fig 4). The lack of need to use excessive electrocautery during routine dermatologic surgical procedures reduces operative time, decreases tissue

**Table I.** Tips to reduce pain during dermal tumescence

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1. Inject slowly
  2. Insert only the tip of the needle initially
  3. Use a 30-gauge, .5-in needle on a 3-mL syringe
  4. Use buffered anesthesia
  5. Continually distract the patient with verbal reassurance ("talkesthesia")
  6. Additional injections should be made through already anesthetized areas of skin
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necrosis and eschar formation, and potentially decreases the likelihood of postoperative infections.

It should be noted that in operations below the level of the dermis, such as excision of lipomas that may extend and penetrate more deeply, it is important to follow intradermal injection with subcutaneous infiltration to provide more complete local anesthesia, although solution from dermal injection diffuses into the upper fat for some degree of anesthesia. In addition, for excisional surgeries

requiring extensive undermining in the subcutaneous plane, subcutaneous infiltration beyond the area of initial dermal tumescence site will be necessary. Yet, for excision and closure of lesions that do not penetrate below the level of the subcutaneous fat, intradermal anesthesia is sufficient and beneficial in that a decreased volume of anesthetic solution is not lost into the subcutaneous level without benefit to the patient. Dermal swelling after tumescent injection is lost within minutes, reducing distortion of tissue during closure or repair. Lastly, it is the authors' view that intradermal delivery of local anesthesia leads to a quicker onset and prolonged duration of anesthesia. This is likely a result of the fact that most of the afferent pain fiber nerve endings in the skin are in the papillary dermis and not the subcutaneous fat.

In conclusion, we describe a modified form of delivery of local anesthesia into the dermis that provides a rapid onset of anesthesia, provides a relatively bloodless field in which to operate, and requires decreased absolute amounts of local anesthetic leading to increased ease of performing skin surgery.

#### REFERENCES

1. Klein JA. Tumescent technique for liposuction surgery. *Am J Cosmetic Surg* 1987;4:263-7.
2. Namias A, Kaplan B. Tumescent anesthesia for dermatologic surgery. *Dermatol Surg* 1998;24:755-8.
3. Krejci-Manwaring J, Markus JL, Goldberg LH, Friedman PM, Markus RF. Surgical pearl: tumescent anesthesia reduces pain of axillary laser hair removal. *J Am Acad Dermatol* 2004;51:290-1.
4. Klein JA. Tumescent technique chronicles: local anesthesia, liposuction, and beyond. *Dermatol Surg* 1995;21:449-57.