

biopsy showing "vasculitis." Treatment is difficult, and the prognosis is dismal.

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## Tumescent Technique for Local Anesthesia

THE TUMESCENT TECHNIQUE for local anesthesia has made it possible to do liposuction, dermabrasion, face-lifts, carbon dioxide laser full-face resurfacing, hair transplants, and large cutaneous excisions and repairs totally by local anesthesia without intravenous sedation or narcotic analgesia. This technique is a novel approach for the delivery of local anesthesia that exploits the principle of pharmacokinetics to achieve extensive regional anesthesia of skin and subcutaneous tissue. The subcutaneous infiltration of a large volume of diluted lidocaine and epinephrine causes the targeted tissue to become swollen and firm, or tumescent, and permits a large-volume liposuction to be done entirely by local anesthesia. Depending on the clinical requirements, a tumescent anesthetic solution may contain a 5- to 20-fold dilution of the standard commercially available lidocaine (1%), epinephrine (1:100,000), and sodium bicarbonate (10 mEq per liter) in a physiologic saline solution.

A large volume of diluted epinephrine infiltrated into relatively avascular adipose tissue produces widespread prolonged and profound vasoconstriction. For a given dose, vasoconstriction diminishes the rate of systemic lidocaine absorption. This reduces both the peak plasma lidocaine concentration and the prevalence of toxicity and permits a much larger dose of lidocaine to be administered.

In fact, the tumescent technique permits safe lidocaine dosage of at least 35 mg per kg of body weight and provides effective local anesthesia for as long as ten hours. The widely accepted 7-mg-per-kg "safe maximum dose for lidocaine with epinephrine" when administered subcutaneously, as published in the *Physicians' Desk Reference* (Medical Economics, Montvale, NJ), has never been substantiated by a published scientific study.

Tumescent liposuction incorporates the tumescent technique for local anesthesia and with the use of liposuction microcannulas having an inside diameter of 2 mm and multiple small incisions for microcannular access that are not closed with sutures. Several small 2- to 3-mm incisions promote copious postoperative drainage that in turn reduces bruising, tenderness, swelling, and systemic lidocaine absorption. A description of the procedure was

first published in 1987, and tumescent liposuction entirely by local anesthesia improves the safety of large-volume liposuction substantially by virtually eliminating surgical blood loss and by completely eliminating the risks of general anesthesia, intravenous sedation, or narcotic analgesia. Traditional forms of liposuction rely on general anesthesia and are associated with so much surgical blood loss that autologous blood transfusions are often routine. Many plastic and reconstructive surgical procedures thought to require general anesthesia can now be done more safely and with less discomfort when done entirely by local anesthesia. Yet, some specialists other than dermatologists are unfamiliar with tumescent anesthesia.

Certain "tumescent paradoxes" may discourage some surgeons from using the tumescent technique and could explain why the tumescent technique has yet to gain acceptance outside of dermatologic surgery:

- Diluted lidocaine at a concentration of 0.05% to 0.1% provides better and more extensive anesthesia than more concentrated commercial preparations at 1% to 2% lidocaine.
- Diluted epinephrine at concentrations of 1:2 million to 1:1 million provides better and more extensive vasoconstriction than commercial local anesthetic solutions containing epinephrine at 1:100,000.
- Smaller 2-mm cannulas permit the removal of more fat than larger 6-mm cannulas.
- Multiple small incisions without sutures leave less apparent scars than do fewer larger incisions that are closed with sutures.
- With appropriate training and skill, tumescent liposuction is less painful and more pleasant without intravenous sedation than with intravenous sedation or general anesthesia.

New therapeutic applications of tumescent drug delivery will depend on the imagination of specialists in other clinical disciplines and the nature of the clinical problems they must solve. As an example, the tumescent delivery of chemotherapeutic agents to lymphatic vessels might be applicable to the treatment and diagnosis of disease in the lymphatic system. Because some degree of local anesthesia may persist for more than 24 hours, tumescent anesthesia may prove useful for preemptive analgesia after surgical procedures such as laparotomy or saphenectomy.

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## Rhytides—New Approaches to Old Wrinkles

SOCIETY PUTS great emphasis on smooth, healthy skin as a sign of youth. It is no surprise, then, that many patients are seeking treatment of their facial rhytides (wrinkles).