

How do I do?

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Tumescent anesthesia as an aid for wide local excision in dermatologic surgery

Anestesia tumescente: técnica auxiliar para excisões extensas em cirurgia dermatológica

ABSTRACT

Introduction: Local anesthesia is the most common form of anesthesia used in cutaneous surgery. Some patients have comorbidities that put them at risk for general anesthesia. Tumescent anesthesia is the technique of injecting a large amount of dilute local anesthesia into the subcutaneous plane of the skin. Tumescent anesthesia can minimize discomfort, aid in hemostasis, and contribute to the ease of closing large surgical defects that would otherwise be challenging.

Objective: To discuss the pros and cons of using tumescent anesthesia in dermatologic surgery.

Conclusion: Tumescent anesthesia is a viable option that can aid in cutaneous reconstructive surgery, especially when removing tissue in the deeper subcutaneous fat or fascia. Tumescent anesthesia is also associated with good results and few adverse reactions.

Keywords: anesthesia; skin neoplasms; mohs surgery.

RESUMO

Introdução: A anestesia local é a forma mais comum de anestesia utilizada em cirurgias cutâneas. Alguns pacientes possuem comorbidades que os colocam no grupo de risco para anestesia geral. A anestesia tumescente é uma técnica que consiste na injeção de uma grande quantidade de anestesia diluída local no plano subcutâneo. A anestesia tumescente pode minimizar o desconforto, auxiliar na hemostasia e contribuir para a facilidade do fechamento de grandes defeitos cirúrgicos que, do contrário, apresentariam dificuldade significativamente maior.

Objetivo: O nosso objetivo é discutir os prós e contras da anestesia tumescente na âmbito da cirurgia dermatológica.

Conclusão: A anestesia tumescente é uma opção viável que pode ajudar na cirurgia cutânea reconstrutiva, especialmente na remoção de tecido no plano subcutâneo profundo ou em fâscias. A anestesia tumescente também é associada a bons resultados e poucas reações adversas.

Palavras chaves: anestesia; câncer da pele; cirurgia de mohs.

INTRODUCTION

Local anesthesia has long been the mainstay in cutaneous surgery. Traditional local anesthesia, however, can have certain disadvantages. For example, the reconstruction of larger and complex wounds may be limited due to the recommended safe dosage of lidocaine; namely 3–5 mg/kg lidocaine without epinephrine, and 5–7 mg/kg lidocaine with epinephrine.¹ In addition, older patients may have comorbidities that limit their ability to undergo general anesthesia, thus limiting their options for complex reconstructive surgery.

Tumescent anesthetic technique (TAT) involves injecting large amounts of dilute lidocaine into the subcutaneous compartment of the skin.^{2–9} There are various formulations for tumescent anesthesia, however the standard formula is considered to be 1000 ml of normal saline, 50–100 ml of 1% lidocaine, 1 ml of 1:1000 epinephrine, and 12.5 ml of sodium bicarbonate.¹⁰ Because of the dilute nature of the anesthetic, large amounts can be safely injected without risk of lidocaine toxicity (35 to 55 mg/kg).^{2,7} The TAT has been a long established practice in cutaneous cosmetic surgery, and has also been used in soft tissue reconstruction and as a part of Mohs micrographic surgery.^{11,12}

THE TUMESCENT ANESTHETIC TECHNIQUE

The TAT is the subcutaneous infiltration of large amounts of dilute lidocaine and epinephrine, which causes the surgical site to become swollen, firm, and tumescent, resulting in extensive regional anesthesia of the skin and subcutaneous tissue.^{5,13} Dr. Jeffrey Klein described this technique extensively in the outpatient surgery setting, and has demonstrated the safe upper limit of lidocaine used in the TAT to be approximately 35

mg/kg, with other reports showing the upper safety limit to be as high as 55 mg/kg for use during liposuction.^{2,7}

Depending on the clinical scenario, the tumescent solution may contain anywhere from a 5- to 20-fold dilution of the standard commercially available 1% lidocaine, mixed with epinephrine (1:100,000), and sodium bicarbonate (10 mEq/L) in a physiologic saline solution.⁵ This solution provides a safe local anesthesia that remains for up to 10 hours after the procedure.⁵

When injecting tumescent anesthesia, an entry point is identified where the cannula is introduced. The cannula is then introduced into the subcutaneous compartment of the skin with the non-dominant hand, while the dominant hand is placed on top of the skin to guide the location of the cannula tip as the anesthetic is being injected.

PROS OF TUMESCENT ANESTHESIA IN DERMATOLOGIC SURGERY

The large volume of dilute epinephrine that is infiltrated into the mostly avascular subcutaneous adipose tissue produces a widespread and prolonged vasoconstriction.^{4,5,14} When performing a wide local excision, this produces a significantly less amount of intra-operative bleeding, and reduces the necessity for excessive cauterization. Tumescent anesthesia has also been shown to have an antibacterial effect that may reduce the development of post-operative wound infections.¹⁵

In addition, the stretching of the skin that results from the large volume of tumescent solution introduced at the surgical site can cause an intra-operative acute tissue expansion, which results in an easier approximation of the wound edges in relatively large surgical defects. This tissue expansion means that in



Figure 1: Injection of tumescent anesthesia in the axilla of a patient undergoing wide local excision



Figure 2: Excision in the axilla demonstrating excellent hemostasis and tissue expansion due to tumescent anesthesia



Figure 3: Closure of the excision in the axilla with minimal undermining and limited trauma to surrounding tissue

many cases tissue undermining becomes unnecessary, resulting in less surgical trauma to the surrounding viable tissue.

Finally, as mentioned previously, the TAT produces an extensive regional anesthesia, both lateral and deep to the surgical site. Thus, wide local excisions that need to extend to fascia – such as in the setting of malignant melanoma re-excisions – have effective anesthesia in the deeper parts of the excision, which causes less discomfort to patients who would otherwise only experience superficial anesthesia.

CONS OF TUMESCENT ANESTHESIA IN DERMATOLOGIC SURGERY

When using the TAT on the distal upper or lower extremities, one should be careful not to introduce too much anesthesia, thus causing a compartment syndrome. In addition, the tissue expansion that occurs during the TAT when operating on an extremity – sometimes around the entire circumference of the limb – may hamper wound closure. Because of these issues, TAT should probably not be attempted on digits.

Also, even though the upper safety limit of lidocaine is very high in the setting of tumescent anesthesia, there has been a report of a fatality due to toxic levels of anesthetics in a 38-year-old female who underwent an outpatient liposuction procedure.¹⁶

CONCLUSIONS

The TAT has been demonstrated to be a safe and effective tool in the realm of cutaneous surgery.^{4,6,8,9,11,12,14,17-24} The TAT is not only beneficial when used in simple wide local excisions, but can also be a major tool in other forms of cutaneous oncological surgery, such as Mohs micrographic surgery.^{17,18} This may be particularly beneficial when dealing with large skin cancers that leave relatively large defects

on the scalp and face that require complex closures.^{11,17,20,21} The TAT has also been used for liposuction, dermabrasion, and even sentinel lymph node biopsy.^{3,4,6,8,12,14,25,26} Other situations in which the TAT has been used include the treatment of a cutaneous schwannoma, and outside of the realm of cutaneous surgery, as an aid in total mastectomies and breast surgery.^{22,27-29}

In the setting of wide local excision in dermatologic and cutaneous oncological surgery, the TAT can provide excellent hemostasis, exceptional regional anesthesia both lateral and deep to the surgical site, and aid in tissue expansion and closure of otherwise large and difficult defects. Although there are many benefits to using the TAT in cutaneous surgery, care should be taken to avoid the possibility of a compartment syndrome when operating on an extremity. Although there have been fatalities reported due to tumescent anesthesia, one report that examined over 15,000 patients demonstrated tumescent anesthesia to be an effective technique with minimal to no significant risks when performed properly.³⁰

In summary, the TAT is a safe, effective method of obtaining excellent regional anesthesia in the setting of dermatologic surgery with excellent results and minimal complications. ●

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