



The Relationship of Topical Anesthesia to The Recovery of Patients who Receive Procedures in The Field of Dermatology

Puguh Riyanto¹, Pho Denita Meiliani²

Universitas Diponegoro, Semarang, Indonesia

Email: dvekulcell@gmail.com¹, phodenita94@gmail.com²

KEYWORDS	ABSTRACT
topical anesthesia, dermatology, procedure, healing	Topical anesthesia is frequently used in dermatological procedures due to its minimally invasive nature, cost-effectiveness, and ease of application. Its role in patient recovery—especially in pain relief, wound healing, and infection prevention—has been recognized but remains insufficiently studied in an integrated manner. This study aims to investigate the relationship between topical anesthesia and the recovery of patients undergoing dermatological procedures, focusing on pain control, wound healing, and infection outcomes. A systematic review was conducted by retrieving articles from PubMed, ScienceDirect, and Google Scholar using keywords "topical anesthesia," "dermatology," and "procedure." Articles published from 2020 to 2025 were screened based on inclusion criteria following the PICOS framework. A total of six eligible studies were included, consisting of randomized controlled trials and observational studies. The review reveals that topical anesthesia—particularly lidocaine-tetracaine combinations, EMLA, and cryoanesthesia—significantly reduces procedural pain and supports improved wound healing. Some agents also show lower infection rates compared to infiltrative anesthesia. EMLA demonstrated superior efficacy among modalities, and side effects were generally minimal and self-limiting. The findings highlight topical anesthesia as an effective and safe alternative for superficial dermatological procedures. However, the limited number of comprehensive studies underscores the need for future large-scale, randomized trials to validate these outcomes and further explore long-term effects across diverse populations and skin conditions.

DOI: 10.58860/ijsh.v4i5.309

Corresponding Author: Puguh Riyanto*
Email: dvekulcell@gmail.com

INTRODUCTION

Anesthesia is an important component of dermatological procedures, affecting pain management and patient outcomes, including wound healing, infection control, and cosmetic appearance. As dermatological procedures continue to evolve, anesthesia choices are becoming more nuanced, potentially impacting the quality of care and the overall patient experience. Different types of anesthesia, topical, local, regional, and general, are used depending on the complexity of the procedure, the patient's health, and the desired outcome (Kumar et al., 2015; Navarro-Rodriguez et al., 2021).

Local, especially topical anesthesia is the most commonly used type of anesthesia in dermatology due to its low effectiveness and side effects. Topical anesthesia is a drug that is commonly used in medicine to obtain local anesthesia through topical application. These drugs play a role in administering local anesthesia in cutaneous procedures, ocular procedures, and mucosal procedures, among other indications. There are several topical anesthetics that are widely used in dermatology, namely benzocaine 20%, lidocaine 6%, and tetracaine 4% (Kumar et al., 2015; Navarro-Rodriguez et al., 2021; Sutton & Hanke, 2023; Tayeb et al., 2017).

Studies on the use of topical anesthesia in the field of dermatology are still a concern. Recent studies have assessed the safety of topical anesthetic agents, the profile of side effects, and stated the ease of obtaining and performing topical anesthesia, as well as the relatively lower cost than infiltrative and general anesthesia. Based on the widespread use of topical anesthesia in the field of dermatology, researchers tasked researchers researching the relationship between topical anesthesia and the recovery of patients who received treatment in the field of dermatology.

This study aims to investigate the relationship between topical anesthesia and the recovery of patients undergoing dermatological procedures, focusing on pain control, wound healing, and infection outcomes. This research introduces a comprehensive systematic review specifically targeting the relationship between topical anesthesia and recovery outcomes—such as pain management, wound healing, and infection rate—in dermatological procedures. Unlike previous studies which often focus on a specific type of topical anesthetic (e.g., lidocaine-tetracaine cream in the 3P-Trial (Brumana et al., 2020), or ice packs vs. lidocaine-prilocaine mixture (Roongpisuthipong et al., 2023) this study compares multiple anesthetic modalities across a wider range of clinical contexts, including cryoanesthesia, EMLA, cryogel, and lignocaine spray (Gupta et al., 2020). Additionally, while prior work such as Brumana et al. (2020) emphasized pain reduction alone (Brumana et al., 2020), this study broadens the scope by also analyzing effects on wound dimensions and infection incidence, a less-explored domain. The integration of these variables under a unifying analytical framework using PICOS criteria offers a more holistic understanding of the recovery process in dermatological care, which has not been extensively synthesized in earlier reviews.

METHOD

This research method uses *systematic review*. The search for data in this study refers to national and international database sources, *PubMed*, *ScienceDirect*, and *Google Scholar*. We searched articles in the three *databases* using the keywords *topical anesthesia*, *dermatology*, and *procedure*. Keyword selection and use of Boolean Operators were applied at the beginning of the literature search in *the database* and were intended by the researcher to cover the entire article extensively.

The literature accessed in this research process was screened based on the following criteria: research articles published in the period 2020-2025; featured *full-text* articles that can be accessed for free, types of *clinical trial* and *randomized controlled trial* articles; and articles in English and Indonesian.

Articles were selected based on their suitability with the PICOS criteria: Population (patients who received therapy in the form of actions in dermatovenereology), Intervention (administration of topical anesthesia adjusted based on the doctor's dose), Comparison (administration of the type of anesthesia adjusted based on the doctor's dose), Outcome (duration of healing, infection due to the action, and pain) in accordance with the study to be conducted, and Study (*randomize control trial*, *single blind clinical trial*, *a cross overtrial*, and *quasi experimental*). The overall results of articles that are eligible for review are 6 articles presented.

This research introduces a comprehensive systematic review specifically targeting the relationship between topical anesthesia and recovery outcomes—such as pain management, wound healing, and infection rate—in dermatological procedures. Unlike previous studies which often focus on a specific type of topical anesthetic (e.g., lidocaine-tetracaine cream in the 3P-Trial (Brumana et al., 2020), or ice packs vs. lidocaine-prilocaine mixture (Roongpisuthipong et al., 2023), this study compares multiple anesthetic modalities across a wider range of clinical contexts, including cryoanesthesia, EMLA, cryogel, and lignocaine spray (Gupta et al., 2020). Additionally, while prior

work such as Brumana et al. (2020) emphasized pain reduction alone, this study broadens the scope by also analyzing effects on wound dimensions and infection incidence, a less-explored domain. The integration of these variables under a unifying analytical framework using PICOS criteria offers a more holistic understanding of the recovery process in dermatological care, which has not been extensively synthesized in earlier reviews.

RESULT AND DISCUSSION

Literature search was conducted by selecting databases drawn from articles published on *PubMed*, *ScienceDirect*, and *Google Scholar*. During the literature search, the researcher found xx research articles from national and international journals related to the researcher's title Relationship of Topical Anesthesia to the Healing of Patients Receiving Action in the Field of Dermatovenerology. Furthermore, from the articles published in these journals, an analysis of the conformity of PICOS was carried out. The 6 articles included in this review are presented in the PRISMA diagram in Figure 1.

DISCUSSION

Anesthesia is of Greek origin, defined as a controlled temporary loss of sensation or consciousness induced for medical purposes. These conditions can include partial or total analgesia (pain relief or prevention), paralysis (muscle relaxation), amnesia (memory loss), and unconsciousness. There are three types of anesthesia techniques, namely general, regional, and local anesthesia (American Society of Anesthesiologists, 2025; Watson, 2023). In the field of dermatology, the use of local anesthesia can be in the form of infiltrative local anesthesia and topical anesthesia. Infiltration local anesthesia causes discomfort in the patient and interferes with the wound healing stage, so topical anesthesia is preferred in the field of dermatology (Kumar et al., 2015; Navarro-Rodriguez et al., 2021).

Topical anesthesia is defined as the loss of superficial sensation in the conjunctiva, mucous membranes, or skin, caused by the direct application of a local anesthetic solution, ointment, gel, or in the form of a spray. There are three routes of penetration of topical anesthesia through the stratum corneum, namely the intercellular route, the para or trans-cellular route, and the transappendageal route or shunt route. The intercellular route is the penetration through the intercellular space of keratinocytes that undergo cornification. The para or trans-cellular route is penetration through cells that are cornenized. The transappendageal route or shunt route is penetration through the gap of the hair follicles and sweat glands (Kumar et al., 2015; Navarro-Rodriguez et al., 2021).

Topical anesthesia has a mechanism of action that reversibly blocks nerve conduction near the site of administration by targeting the free nerve endings in the dermis or mucosa, thereby causing temporary loss of sensation in a limited location. Blocking the conduction of nerve impulses is done by reducing the permeability of nerve cell membranes to sodium ions. This state leads to a reduction in depolarization and an increase in the stimulus threshold to the loss of the ability to produce action potential, resulting in numbness or local analgesia. The effects of topical anesthesia blockade are reversible, once the anesthesia is metabolized or eliminated, normal nerve function returns (Kumar et al., 2015; Navarro-Rodriguez et al., 2021).

Topical anesthesia primarily acts on peripheral sensory nerves, thus providing a local analgesic effect in the area of application without affecting deeper tissues or having systemic

effects. This leads to topical anesthesia being ideal for minor skin procedures and pain management in superficial skin lesions. Some of the most common topical anesthetic agents that can penetrate the skin completely are *Eutectic mixture of local anesthetics* (EMLA), ELA-Max, amethocaine, and *lidocaine in acid mantle* or *velvachol* (Kumar et al., 2015; Navarro-Rodriguez et al., 2021).

In addition to being in the form of solutions, gels, ointments, and sprays, topical anesthesia can be in the form of cryoanesthesia. Cryoanesthesia refers to the use of "cold" externally on the skin to produce numbness. Ice, *refrigerant spray*, and liquid nitrogen have been used for this purpose. Ice applied directly to the site for 30-60 seconds provides a short-duration superficial anesthesia acceptable for a *shave biopsy*. This app is especially useful for children or adults who are afraid of syringes. Spray refrigerants, such as ethyl chloride and dichlorotetrafluoroethane, are useful for administering anesthesia to superficial lesions before removal (Alsalhi & Tosti, 2022; Park et al., 2023). This spray in particular helps to provide an anesthetic effect of molluscum-associated tumors before curettage and cysts or furuncles before incision and drainage. After ice analgesia forms on the skin, a period of anesthesia of 10 to 12 seconds occurs before the temperature and sensation of the skin return to normal. In our findings, we showed that although it was theoretically stated that the use of cold sensations could increase the effectiveness of topical anesthesia, the study showed that there was no statistically significant difference in pain perception in the group given topical anesthesia alone compared to the combination of topical anesthesia with forced air cooling (Islam et al., 2024).

Anesthesia in dermatology is an essential component of dermatological procedures, affecting pain management and patient outcomes, including wound healing, infection control, and cosmetic appearance. Data on the relationship between topical anesthesia administration to wound healing, infection control, and cosmetic appearance are limited. In relation to wound healing, although the studies found are still relatively limited. We have just obtained a study that assesses that it is related to wound healing after topical anesthesia. Improvement and reduction of wound dimensions were obtained after 14 days of treatment with 5% lidocaine cream accompanied by an improvement in pain intensity and perception (Islam et al., 2024; Rękas-Dudziak et al., 2023; Tayeb et al., 2017).

Some studies have assessed the effect on pain scale during dermatological procedures and post-procedure. Studies have shown that some formulations of topical anesthesia have similar effectiveness to conventional local anesthesia that are generally administered infiltration. Studies have also shown that the administration of topical anesthesia in the form of 7% lidocaine-7% tetracaine cream which is occlusive can reduce the VAS score by up to 47%. *Navarro et al* in their study stated that topical anesthesia has good effectiveness in pain management when compared to the placebo group and the conventional local anesthesia group. The administration of topical anesthesia was considered better than cryoanesthesia. This is because in cryoanesthesia, pain control is only temporary with a very short duration of anesthesia so that no long-term anesthesia effects are found after dermatological procedures and it is necessary to perform repeated exposure to cryoanesthesia in performing dermatological procedures (Brumana et al., 2020).

A study in our systematic review conducted a study that compared three modalities or topical anesthetic agents, namely EMLA, cryogel, and lignocaine spray. A significant decrease in VAS scores was found to be better in the EMLA group. This shows that EMLA is superior to cryogel and lignocaine spray. Another study also showed that side effects were minimal, temporary, and self-healing without intervention were obtained in individuals who received topical anesthesia. Infection was found in only 3.7% of patients, suture dehiscence in 3.7% of patients and resuture in 1.8%. This result was much lower than in the group that received conventional local anesthesia, namely 7.8% of the incidence of infection, 1.8% of restitching, and 2.8% of swelling in the suture area (Baldo, 2023; Cherobin & Tavares, 2020; Macfarlane et al., 2021; Navarro-Rodriguez et al., 2021; Steele, 2017).

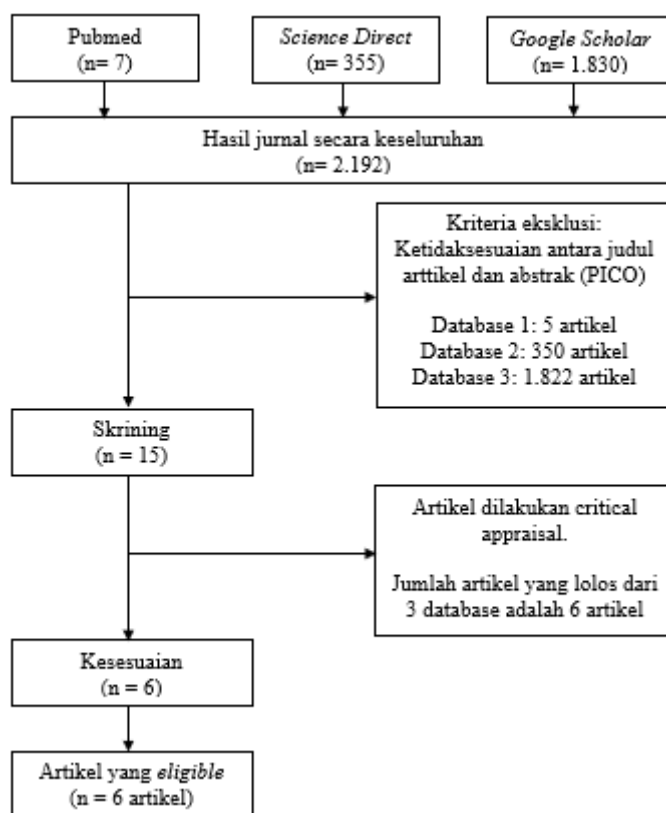


Figure 1. Diagram PRISMA

Table 1. Results of a systematic review: The relationship between topical anesthesia and the recovery of patients receiving treatment in the field of dermatology

No.	Title/Year	Research Design	Result
1.	A comparative study of pain perception during the microfocused ultrasound procedure between topical anesthesia and combined topical anesthesia with forced air cooling/2023 (Vachirammon et al., 2023)	Prospective, single-blinded, randomized controlled trial	In this study, there was no statistically significant difference in pain perception between the group given topical anesthesia and the combination of topical anesthesia with <i>forced air cooling</i> . This result was better than pain perception in the non-anesthesia group.

<p>2. Efficacy of lidocaine 7 %, tetracaine 7 % self-occlusive cream in reducing MAL-cPDT-associated pain in subjects with actinic keratosis: A randomized, single-blind, vehicle-controlled trial (The "3P-Trial")/2020 (Brumana et al., 2020)</p>	<p>Prospective, randomized, balanced (1:1), parallel-group, single-blind two-center trial</p>	<p>3P trials have shown that the occlusive application of 7%-tetracaine lidocaine 7% cream is highly effective in reducing procedure-related pain during MAL-cPDT for the treatment of AK lesions, with a VAS score reduction of up to 47%.</p>
<p>3. Comparative effectiveness of ice packs versus topical lidocaine-prilocaine mixture for pain control in laser hair removal of the axilla: A rater-blinded randomized controlled trial/2023 (Roongpisuthipong et al., 2023)</p>	<p>Single tertiary center, rater-blinded, and randomized controlled trial.</p>	<p>In patients receiving <i>axillary laser hair removal</i>, pain control immediately after treatment appears to be better with the use of ice packs compared to topical lidocaine-prilokain cream. In contrast, pain control 5 minutes after laser treatment was better with topical lidocaine-prilokain cream compared to the use of ice packs.</p>
<p>4. 5% Lidocaine Hydrochloride Cream for Wound Pain Relief: A Multicentre Observational Study/2022 (Janowska et al., 2022)</p>	<p>Prospective, observational, multicentre study</p>	<p>This prospective, observational, and multicentric study found a beneficial effect of 5% Lidocaine Cream treatment in pain management in patients with painful wounds. After 14 days of treatment, the dimensions of the wound decreased, and the intensity and perception of pain continued to improve. Treatment is well tolerated. Only 3 patients stopped treatment due to side effects. In the efficacy analysis, Lidocaine 5% Cream significantly reduced pain intensity and pain perception compared to the initial condition at all time points considered.</p>
<p>5. Comparative Study of Three Different Modalities of Topical Anesthesia in Various Dermatological Procedures/2020 (Gupta et al., 2020)</p>	<p>A hospital-based cross-sectional study</p>	<p>The study found that all topical anesthesia modalities were significantly better than controls, as there was a significant decrease in VAS scores. This study found that EMLA was superior to cryogel and lignocaine sprays. Lignocaine spray was found to be better than cryogel. By comparing individual anesthetic agents by application location, all anesthetics showed better efficacy when used on the face and neck compared to other areas of the body.</p>
<p>6. A Comparative Study to Evaluate the Efficacy of Topical and Infiltrative Anesthesia for Dermatosurgery Through a Subject-Oriented Approach/2024 (Pottipati et al., 2024)</p>	<p>cross-sectional study</p>	<p>The results of this study prefer topical anesthesia creams. Topical anesthesia creams are a better choice of anesthesia in superficial aesthetic procedures and skin surgery to provide adequate adherence during application compared to traditional infiltration anesthesia, which is invasive and painful during administration. Infiltration anesthesia is a better option for procedures that are deep and have no time-constraints related to waiting periods. The side effects experienced are minimal, temporary, and resolve on their own without intervention. There has always been a need to conduct</p>

varied research and include more cases in large-scale studies to sustain the scarcity of literature in this area.

CONCLUSION

Topical anesthesia plays a significant role in enhancing patient recovery in dermatological treatments, particularly in managing pain, improving wound dimensions, and minimizing infection-related side effects. Despite its potential benefits, the limited number of studies remains a concern in fully understanding its effectiveness. Therefore, future research should prioritize large-scale, randomized controlled trials to assess the long-term efficacy and safety of various topical anesthetics across different dermatological procedures. Emphasis should be placed on evaluating patient-reported pain outcomes, wound healing progress, and infection rates across diverse skin types, as well as comparing topical anesthesia with other pain management methods to establish the most effective clinical practices.

REFERENCES

- Alsalmi, W., & Tosti, A. (2022). Cryo-Cap Anesthesia to Minimize Scalp Discomfort during Platelet-Rich Plasma Injection. *Skin Appendage Disorders*, 8(5), 406–406. <https://doi.org/10.1159/000524175>
- American Society of Anesthesiologists. (2025). *Local Anesthesia - Procedures & Risks | Made for This Moment [Internet]*. [cited 2025 Apr 21]. Available from: <https://madeforthismoment.asahq.org/anesthesia-101/types-of-anesthesia/local-anesthesia/>.
- Baldo, B. A. (2023). Allergic and other adverse reactions to drugs used in anesthesia and surgery. *Anesthesiology and Perioperative Science*, 1(2), 16. <https://doi.org/10.1007/s44254-023-00018-2>
- Brumana, M. B., Milani, M., & Puviani, M. (2020). Efficacy of lidocaine 7 %, tetracaine 7 % self-occlusive cream in reducing MAL-cPDT-associated pain in subjects with actinic keratosis: A randomized, single-blind, vehicle-controlled trial (The “3P-Trial”). *Photodiagnosis and Photodynamic Therapy*, 30, 101758. <https://doi.org/10.1016/j.pdpdt.2020.101758>
- Cherobin, A. C. F. P., & Tavares, G. T. (2020). Safety of local anesthetics. *Anais Brasileiros de Dermatologia*, 95(1), 82–90. <https://doi.org/10.1016/j.abd.2019.09.025>
- Gupta, J., Khunger, N., & Ramesh, V. (2020). Comparative Study of Three Different Modalities of Topical Anesthesia in Various Dermatological Procedures. *Indian Journal of Drugs in Dermatology*, 6(1), 22–27. https://doi.org/10.4103/ijdd.ijdd_43_18
- Islam, R. K., Tong, V. T., Robicheaux, C., Tageant, H., Haas, C. J., Kline, R. J., & Islam, K. N. (2024). The Impact of Anesthesia on Dermatological Outcomes: A Narrative Review. *Cureus*. <https://doi.org/10.7759/cureus.72321>
- Janowska, A., Papa, G., Romanelli, M., Davini, G., Oranges, T., Stocco, C., Arnez, Z. M., & Dini, V. (2022). 5% Lidocaine Hydrochloride Cream for Wound Pain Relief: A Multicentre Observational Study. *Journal of Investigative Surgery*, 35(1), 49–52. <https://doi.org/10.1080/08941939.2020.1821134>
- Kumar, M., Chawla, R., & Goyal, M. (2015). Topical anesthesia. *Journal of Anaesthesiology Clinical Pharmacology*, 31(4), 450. <https://doi.org/10.4103/0970-9185.169049>
- Macfarlane, A. J. R., Gitman, M., Bornstein, K. J., El-Boghdadly, K., & Weinberg, G. (2021). Updates in our understanding of local anaesthetic systemic toxicity: a narrative review. *Anaesthesia*, 76(S1), 27–39. <https://doi.org/10.1111/anae.15282>
- Navarro-Rodriguez, J. M., Suarez-Serrano, C., Martin-Valero, R., Marcen-Roman, Y., & de-la-Casa-Almeida, M. (2021). Effectiveness of Topical Anesthetics in Pain Management for Dermal Injuries: A Systematic Review. *Journal of Clinical Medicine*, 10(11), 2522. <https://doi.org/10.3390/jcm10112522>

- Park, S. J., Shin, S. H., Koh, Y. G., Kim, G., Rho, N. K., & Park, K. Y. (2023). Cold anesthesia for pain reduction during intralesional steroid injection for nodulocystic acne. *Journal of Cosmetic Dermatology*, 22(12), 3375–3378. <https://doi.org/10.1111/jocd.15829>
- Pottipati, P., Kathirvel, G. S., M, S. S., & Kathirvel, D. (2024). A Comparative Study to Evaluate the Efficacy of Topical and Infiltrative Anesthesia for Dermatotomy Through a Subject-Oriented Approach. *Cureus*. <https://doi.org/10.7759/cureus.57966>
- Rękas-Dudziak, A., Męcińska-Jundziłł, K., Walkowiak, K., & Witmanowski, H. (2023). The use of local anaesthetics in dermatology, aesthetic medicine and plastic surgery: review of the literature. *Advances in Dermatology and Allergology*, 40(1), 22–27. <https://doi.org/10.5114/ada.2023.125221>
- Roongpisuthipong, W., Christensen, R. E., Dirr, M. A., Anvery, N., Geisler, A., Schaeffer, M., Waldman, A., Brieva, J. C., & Alam, M. (2023). Comparative effectiveness of ice packs versus topical lidocaine-prilocaine mixture for pain control in laser hair removal of the axilla: A rater-blinded randomized controlled trial. *Journal of the American Academy of Dermatology*, 88(3), 617–622. <https://doi.org/10.1016/j.jaad.2022.11.022>
- Steele, K. (2017). Topical Treatments for Acute and Chronic Wound Pain #327. *Journal of Palliative Medicine*, 20(5), 560–561. <https://doi.org/10.1089/jpm.2017.0010>
- Tayeb, B. O., Eidelman, A., Eidelman, C. L., McNicol, E. D., & Carr, D. B. (2017). Topical anaesthetics for pain control during repair of dermal laceration. *Cochrane Database of Systematic Reviews*, 2017(2). <https://doi.org/10.1002/14651858.CD005364.pub3>
- Vachiramon, V., Palakornkitti, P., Anuntrangsee, T., Rutnin, S., Visessiri, Y., & Fabi, S. (2023). A comparative study of pain perception during the microfocused ultrasound procedure between topical anesthesia and combined topical anesthesia with forced air cooling. *Journal of Cosmetic Dermatology*, 22(4), 1279–1285. <https://doi.org/10.1111/jocd.15568>
- Watson, E. (2023). The Evolution and Importance of Anaesthesia in Modern Medicine. *Surgery: Current Research*, 14(2), 455. <https://doi.org/10.35248/2161-1076.24.14.2.455>



© 2025 by the authors. It was submitted for possible open-access publication under the terms and conditions of the Creative Commons Attribution (CC BY SA) license (<https://creativecommons.org/licenses/by-sa/4.0/>).