Dermatology Practical & Conceptual

Safety of Local Anesthesia in Pediatric Dermatologic Surgery: Our Experience and a Concise Review of the Existing Literature

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ABSTRACT

Introduction: Pediatric dermatologic surgery is important for both diagnosis and treatment, including excision of suspected cutaneous neoplasms. While general anesthesia and deep sedation are well studied in this setting, evidence on the safety of local anesthesia is more limited.

Objectives: To evaluate the safety of local anesthesia in pediatric dermatologic surgery and compare our findings with a concise review of the literature.

Methods: We conducted a single-center retrospective study of 678 children who underwent skin biopsy or excision with histopathologic diagnosis at the Pediatric Dermatology Unit, University of Bologna, Italy, between 2018 and 2023. Data on age, procedures, anesthetic techniques, and adverse events were collected. A concise PubMed review up to April 3, 2025 included English-language human clinical studies on local anesthesia in pediatric dermatologic surgery.

Results: The cohort included 678 children (342 males, 336 females) aged 1 month to 14 years (mean age, 9 years), undergoing 516 biopsies and 162 excisions. All received topical anesthesia, and 617 also received infiltrative anesthesia. No local or systemic adverse reactions occurred after infiltrative anesthesia. Three mild cases of localized purpura were observed after occlusive lidocaine-prilocaine cream, all resolving spontaneously. Thirty-six children were referred for sedation or general anesthesia,

mainly because of poor compliance or the need for wide excision. The literature review identified five studies including 1322 children; no systemic adverse effects were reported.

Conclusions: Pediatric dermatologic surgery can be safely performed in an outpatient setting under local anesthesia. Age, procedure type, and child and parent compliance should guide anesthetic choice.

Introduction

Pediatric dermatologic surgery plays a crucial role both diagnostically and for the surgical excision of suspected cutaneous neoplasms. While general anesthesia and deep sedation in pediatric dermatologic surgery have been extensively studied and shown to be safe, the use of local anesthesia is less documented [1-3]. In addition, due to high skin-elasticity and pronounced capacity to recover from trauma in newborns and young infants, early pediatric dermatologic surgery usually reveals excellent cosmetic results.

Objectives

The objective of this study was to evaluate the potential risks associated with local anesthesia and assess whether these procedures can be performed safely in children and to provide a concise review of the existing literature.

Patients and Methods

A single-center retrospective study was conducted on 678 children with a histopathological diagnosis who had had surgery at the Pediatric Dermatology Unit of the University of Bologna (Italy) from 2018 to 2023.

Concise Review of the Literature

In this review we identified studies indexed in PubMed from its inception up to 03 April 2025. All the papers reported in the present study were clinical studies involving humans, including case reports, case series, and reviews. The search parameters included the terms "Dermatologic Surgery in Pediatric Patients," "Pediatric dermatologic surgery," "Pediatric anesthesia in dermatologic surgery," and "Local anesthesia in pediatric dermatology." A subsequent review of the respective bibliographies aimed to identify any undetected reports. All papers written in English were considered in this concise review.

Results

Results of our Retrospective Study

A total of 678 pediatric patients (342 males, 336 females) aged between 1 month and 14 years were included in the study. Both topical and infiltrative anesthetics were used during the procedures (Table 1). In our sample, the average amount of infiltrative anesthetic administered per procedure ranged from 0.5 to 3 ml. All patients received topical anesthesia before surgical procedures, while infiltrative anesthesia was administered only to 617 children.

The mean age of the patients was nine years, and a total of 162 excisions and 516 skin biopsies were performed. Complete excisions are procedures that generally require a longer operative time compared to skin biopsies. During these procedures, several strategies were adopted to improve the child's comfort and cooperation such as allowing a parent and a nurse to remain close to the child to provide reassurance and gentle restraint if necessary and also asking the parent to hold a mobile phone to play videos or songs to reduce anxiety and the perception of pain.

Age and personality of the child are important factors to consider, and in our experience, children aged between four and 10 years are often the most difficult to manage. In our cohort, 36 out of 714 patients were referred to pediatric surgery to undergo the procedures under sedation or general anesthesia. These patients were between three and 12 years old, and the main reasons for referral to pediatric surgery were: i) poor compliance of the child or parents; ii) wide excision of melanoma; iii) wide local excision with adequate margins for dermatofibrosarcoma protuberans and cutaneous primary lymphomas.

The post-skin biopsy wounds were closed with external nonabsorbable Prolene sutures, whereas for excisions, internal absorbable Vicryl sutures were used for the subcutaneous tissue and external nonabsorbable Prolene sutures for the skin.

Of the excised lesions, 96% were benign. The most common benign melanocytic tumors were melanocytic nevi and Spitz nevi, while pyogenic granulomas and pilomatricomas were the most frequent nonmelanoma tumors. Only 4% of excised or biopsied lesions were diagnosed histologically as malignant. These included melanoma, cutaneous lymphoma, and dermatofibrosarcoma protuberans. No local or systemic adverse reaction was observed following the administration of infiltrative anesthetics. In the case of topical anesthesia, three cases of localized purpura were reported at the site of occlusive application of prilocaine-lidocaine 2.5% cream. All three cases were mild and resolved spontaneously within approximately two weeks. Our results demonstrate that

Table 1. Summary of pediatric patients undergoing dermatologic surgery at the Pediatric Dermatology Unit of the University of Bologna (Italy), from 2018 to 2023.

Parameter	Data
Total number of patients	678
Sex	342 males (50.4%)
	336 females (49.6%)
Age (range and mean)	1 month to 14 years (mean: 9 years)
Procedures performed	Total: 678
	162 excisions (23.9%)
	516 biopsies (76.1%)
Anesthetics used (topical)	Prilocaine-lidocaine 2.5% (420/678), Lidocaine 4% (180/678), Lidocaine 5% (78/678)
Anesthetics used (infiltrative)	Mepivacaine 20mg/mL (± adrenaline 1:200,000) (420/678), Lidocaine 20mg/mL (197/678)
Diagnoses	222 inflammatory conditions (32.7%),
	350 nonmelanocytic skin tumors (51.6%)
	150 melanocytic skin tumors (22.1%)
Benign lesions excised	96%
Common benign melanocytic tumors	Melanocytic nevi, Spitz nevi
Common benign nonmelanocytic tumors	Pyogenic granulomas, Pilomatricomas
Malignant lesions (% of total)	4% (Melanoma, Cutaneous lymphoma, Dermatofibrosarcoma protuberans)
Adverse reactions (infiltrative anesthetics)	None reported
Adverse reactions (topical anesthetics)	3 cases of localized purpura (mild, resolved spontaneously)

local anesthesia, both infiltrative and topical, is safe in pediatric patients.

Results of Concise Review of the Literature

We additionally compared our results with data from a review of the literature; five studies that evaluated adverse reactions to topical or infiltrative anesthetic in pediatric patients were retrieved for a total of 1322 children (Table 2) [1-5].

The age reported in the various studies ranged from a few months to 16 years, and no stratification of patients by age and type of procedure performed, such as biopsy or complete skin excision, was reported[1,5]. In our experience, the age range 4–10 years is the most difficult to manage, especially for cutaneous complete excision. Indeed, in younger children under age four, gentle restraint is easier to achieve, while in those over 10 years, there is greater compliance.

Across all studies, 844 children were treated with topical cream: a combination of lidocaine and prilocaine at 2.5% in 526[1], lidocaine 4% in 180, lidocaine 5% in 78, and iontophoretic treatment with 2% lidocaine + 1:00000 epinephrine in 60 children[2]. Conversely, infiltrative anesthetic was performed in 1103 patients: mepivacaine 20mg/mL (± adrenaline 1:200,000) in 420, lidocaine 20mg/mL in 387[1], diluted prilocaine and ropivacaine in 204 children[3], and tumescent local anesthesia with epinephrine, ropivacaine 1%, and lidocaine 2% (since 2007) and prilocaine 2% (prior to 2007) in 92 infants[5]. Only one adverse event, delaying wound healing, was described in a child with lupus panniculitis following cutaneous biopsy[1]. Slight erythema occurred in some children[3,5]. No systemic side effect was reported in any of the studies[1-5]. All included studies adhered to the recommended dosage guidelines for both topical and infiltration anesthetics[6]. Systemic adverse reactions in pediatric patients, such as methemoglobinemia, have only been reported after excessive use of topical anesthetics[7] or during invasive surgical procedures such as neurosurgery, in which high doses of lidocaine with epinephrine were used for infiltration (6–15 mL of 1% lidocaine with epinephrine 1:200,000)[8]. Local purpura following occlusive topical anesthesia, as in our sample, was previously reported in three children[9].

Discussion

Our findings are consistent with the existing literature on local anesthesia in pediatric dermatologic surgery. Across the five studies identified in our review, encompassing 1322 children, no systemic adverse events were reported [1-5], in line with our single-center series of 678 patients. The mild localized purpura observed in three of our patients following

Table 2. Literature review on adverse reactions to local anesthetics in pediatric patients.

Study and year of publication	Type of study	Number	Age (Range; Mean)	Sex (N, %)	Common clinical & histopathological diagnoses	ASA status	Place	Pediatric anesthesiologist presence	Type	Complications
Carmine D'Acunto et al., 2014	Retrospective	296	2 – 15 years; 7 years	Male (154, 52%); Female (142, 48%)	Melanocytic lesions; Granuloma annulare; Pyogenic granulomas	Not specified	Outpatient setting	Not specified	106/296 patients received lidocaine-prilocaine cream only; 190/296 also received subcutaneous lidocaine 20 mg/mL	No side effects observed; 1 case of delayed healing (4 months) in a child with lupus panniculitis
William T. Zempsky, 2003	A prospective multicenter randomized double-blind placebo-controlled trial.	60 (31 Lidocaine group; 29 Placebo group)	4–16 years. Mean age for lidocaine group 11.2 years; Mean age for placebo group 11.4 years	Lidocaine group: Male (18, 58%); Female (13, 42%) Placebo group: Male (16, 55%); Female (13, 45%)	Not specified	Not specified	Not specified	Not specified	Iontophoretic treatment with 2% lidocaine + 1:100.000 epinephrine or saline	No adverse effects in either group. Blanching/erythema occurred in 58/60 patients, resolving in <1 hour. No burning or stinging reported
Matthias Moehrle & Helmut Breuninger, 2001	Retrospective	271 (67 general anesthesia, 204 local anesthesia)	3 months – 16 years. Mean age for general anesthesia 3.05 ± 2.93 years. Mean age for SIA 9.00 ± 4.2 years.	Not specified	Nevi; Hemangiomas; Scars; Warts	Not specified	Not specified	Not specified	Diluted prilocaine and ropivacaine (0.3%, 0.15%, 0.08%). Max dose: 2 mL/kg (0.3%), 4 mL/kg (0.15%), 8 mL/kg (0.08%). Administered via infusion pump	No side effects observed

Study and year of publication	Type of study	Number	Age (Range; Mean)	Sex (N, %)	Common clinical & histopathological diagnoses	ASA status	Place	Pediatric anesthesiologist presence	Type	Complications
M. Heister et al., 2017	Retrospective	92	1.5 – 6.7 months; 4.2 months	Male (39, 42%); Female (53, 58%)	Melanocytic nevus (59%); Hemangioma (25%), Naevi sebaceous (6%); Others (10%)	Not specified	Not specified	Not specified	Tumescent local anesthesia solution: isotonic electrolytes (Jonosteril®), epinephrine, ropivacaine 1%, lidocaine 2% (from 2007), prilocaine 2% (before 2007). Concentrations: 0.05%–0.30%	No side effects observed
Antonella Fabiano et al., 2020	Retrospective	670	0–16 years; 9.8 years	Male (335, 50%); Female (335, 50%)	Warts (49.2%); Molluscum contagiosum (21.5%); Melanocytic nevi (9.5%); Ingrown toe-nails (2.4%), pyogenic granuloma and vascular lesions	Not specified	Not specified	Not specified	Topical, infiltration or nerve block	No adverse effects in either group. Slight erythema occurred in some children. No burning or stinging reported.

occlusive application of lidocaine-prilocaine cream represents a known and self-limiting complication, previously described in the literature [9], and does not preclude the use of topical anesthesia. The rate of referral to sedation or general anesthesia in our cohort (36/714, approximately 5%) was primarily driven by poor behavioral compliance and the need for wide excisions, consistent with the experience of other centers [3,5]. Age remains a key determinant of compliance: children aged 4–10 years proved the most challenging to manage, whereas younger children and adolescents were generally more cooperative. The combined use of topical and infiltrative anesthesia, along with behavioral strategies such as parental presence and distraction techniques, allowed the vast majority of procedures to be completed safely in the outpatient setting. These results support the broader adoption of local anesthesia protocols in pediatric dermatologic surgery, with appropriate patient selection based on age, procedure type, and expected compliance.

Conclusions

Pediatric dermatologic surgery can be safely performed in an outpatient setting using local anesthesia (both topical and infiltrative). However, several factors must be considered in pediatric dermatologic surgery such as the patient's age, the type of procedure (biopsy or complete excision), and the compliance of both the child and the parents.

This approach offers an excellent safety profile and is less invasive, resulting in less impact on the young patient and thus improving the quality of life of children and their parents[10].

Finally, surgery under local anesthesia costs less and reduces waiting lists.

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