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ORIGINAL ARTICLE

Comparison of large antecubital vein versus small vein on dorsum of hand for prevention of propofol injection pain.

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ABSTRACT… Objective: To determine whether using a large antecubital vein versus a small dorsum hand vein reduces the incidence and severity of pain during propofol injection in pediatric patients. **Study Design:** Non Randomized Controlled Trial. **Setting:** Institute of Child Health, Faisalabad. **Period:** 01 January 2025 to 30 April 2025. **Methods:** This study included 214 children aged 8–14 years undergoing elective surgery under general anesthesia. Participants were assigned to two groups: Group 1 received a propofol-lidocaine mixture via a large antecubital vein, and Group 2 via a small vein on the dorsum of the hand. Pain during injection was assessed using a Visual Analogue Scale (VAS) from 0 to 10, and categorized as none, mild, moderate, or severe. Baseline and post-injection heart rate, blood pressure, and oxygen saturation were recorded. **Results:** Group 1 (antecubital vein) reported significantly lower pain scores compared to Group 2. Forty-seven (43.9%) patients in Group 1 reported no pain, versus 13 (12.1%) in Group 2. Severe pain was reported in only 10.3% of Group 1 compared to 31.8% of Group 2. The average pain score was 2.63 ± 1.80 in Group 1 and 5.95 ± 2.79 in Group 2 ($p < 0.001$). **Conclusion:** Administering propofol-lidocaine admixture through a large antecubital vein significantly reduces injection pain compared to a small dorsum hand vein in children. This simple technique should be considered to enhance patient comfort during anesthesia induction.

Key words: Antecubital Vein, Dorsum Hand Vein, Injection Pain, Propofol, Pediatric Anesthesia.

INTRODUCTION

Propofol is one of the most commonly used intravenous anesthetic agents worldwide. It is widely favored due to its rapid onset, short duration of action, and rapid recovery, making it ideal for induction and maintenance of general anesthesia. In pediatric practice, it is frequently used in various elective surgical procedures because of its predictable pharmacodynamic profile and ease of titration. Despite these advantages, one of the most distressing side effects during induction is pain at the site of intravenous injection, which often occurs immediately after drug administration.[1]

The incidence of propofol injection pain ranges from 26% to as high as 70% depending on multiple factors, including the site of venous access, size of the vein, rate of injection, temperature of the solution, and patient characteristics.[2] In children, this pain can be more prominent and difficult to assess or manage due to limited communication, heightened anxiety, and lower pain thresholds.[3] Injection pain is not just uncomfortable; it contributes to negative preoperative experiences, which may affect patient cooperation in future procedures.[4]

Several mechanisms are believed to contribute to the pain associated with propofol injection. The drug's lipid-based formulation may irritate the vascular endothelium, while activation of the kallikrein–kinin system can increase bradykinin levels, enhancing vasodilation and permeability, exposing nerve endings to the irritant.[5] Multiple strategies have been tried to address this problem, including pre-treatment with lidocaine, ketamine, magnesium, and cold propofol.[6]

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However, the size and location of the vein used for injection may also play a significant role in modulating this pain. Larger veins, with better blood flow and fewer superficial nociceptors, may dilute propofol more effectively, reducing local irritation.[7]

Existing studies have predominantly focused on pharmacologic interventions like lidocaine pre-treatment or the use of alternative drugs to minimize pain.[6,8,9] Although some trials have explored site variation for intravenous access, most have not directly compared large veins, such as those in the antecubital fossa, with smaller veins like those on the dorsum of the hand, especially in pediatric populations. There is limited data evaluating whether anatomical vein selection can enhance the pain-relieving effects of lidocaine admixture during propofol injection.[9,10]

This study aims to bridge that gap by evaluating the difference in pain scores between a large antecubital vein and a small dorsum hand vein, both using the same lidocaine-propofol mixture. Understanding the role of venous site selection may help clinicians adopt a simple, cost-effective technique to enhance comfort in children during anesthesia induction. By highlighting a non-pharmacological strategy that can be implemented easily in routine clinical practice, this research can contribute significantly to improving patient experiences in pediatric anesthesia.

METHODS

Study Design and Setting

This non randomized controlled trial was conducted at the Children Hospital and Institute of Child Health, Faisalabad, Department of Anesthesia from 01 January 2025 to 30 April 2025. Approval for this study was obtained from the Institutional Review Board of Children Hospital and Institute of Child Health, Faisalabad (Ref No. 30/CH & ICH/FSD; Date: 17/12/2024).

Participants

A total of 214 children aged 8 to 14 years were enrolled after fulfilling the eligibility criteria and obtaining written informed consent from their legal guardians.

Inclusion Criteria

1. Children aged 8 to 14 years
2. Classified as ASA physical status I or II
3. Undergoing elective surgery under general anesthesia

Exclusion Criteria

1. Children aged below 8 or above 14 years
2. ASA status III–IV
3. Scheduled for emergency surgeries
4. Known comorbidities or allergy to propofol

Intervention and Grouping

All 214 participants were assigned to two equal groups of 107, Group 1: Received a 20-gauge IV cannula in a large antecubital vein and Group 2: Received a 20-gauge cannula in a small dorsum hand vein.

Standard monitoring was established in the operating room. A lactated Ringer's infusion was initiated at a rate of 120 ml/h, and the IV site was draped. A fresh mixture of 1 mL of 2% lidocaine with 19 mL of 1% propofol was prepared for each patient. To evaluate pain, 30% of the total calculated dose of propofol (2 mg/kg) was injected slowly.

Pain Assessment

Patients were instructed in advance to score their pain using a Visual Analogue Scale (VAS) from 0 to 10:

- 0: No pain
- 1–4: Mild pain
- 5–7: Moderate pain
- 8–10: Severe pain

Pain was recorded immediately after 30% propofol administration. The remainder of the dose was then injected to complete induction. Vital signs including heart rate, SpO_2, and non-invasive blood pressure (NIBP) were recorded before and after injection.

Statistical Analysis

Statistical analysis was performed using SPSS version 29. Continuous variables (age, weight,

height, heart rate) were expressed as mean ± standard deviation (SD) and analyzed using independent t-tests. Pre and post propofol heart rate were compared with paired t test. Categorical variables (gender, pain level) were analyzed using the Chi-square test.

The outcome of interest was the incidence of moderate to severe pain. Based on previous literature, a sample size of 214 participants was calculated to achieve 80% power, with a significance level of $\alpha = 0.05$ and two degrees of freedom.

RESULTS

The two groups were comparable in baseline characteristics including age (years), height (cm), weight (kg), and gender. There was no statistically significant difference in these variables between the two groups ($p > 0.05$ for all).

Patient Characteristics	Group 1, Antecubital Vein N = 107	Group 2, Dorsum of Hand Vein N = 107	P-Value
Age (years)	10.46±2.7	9.95±2.1	0.123
Height (cm)	95.30±22	92.32±18	0.298
Weight (kg)	28.75±6.9	28.11±5.6	0.455
Gender Male/Female	43/64 40%/60%	48/59 45%/55%	0.290

Table-I. Distribution of patient by comparing patient characteristics among the groups

For continuous variables like age, height and weight independent sample t test was used and chi square test for gender. Data presented as mean ± SD or frequency with percentages as required. A p-value ≤ 0.05 is considered as significant.

Pain Scores

In Group 1, 47 children (43.9%) reported no pain, and only 11 (10.3%) reported severe pain. In Group 2, only 13 children (12.1%) had no pain, while 34 (31.8%) reported severe pain. The mean pain score (VAS) in Group 1 was 2.63 ± 1.80 and Group 2 was 5.95 ± 2.79 ($p < 0.001$, statistically significant).

		Groups		Total	P-Value
		1. Antecubital Vein	2. Dorsum of Hand Vein		
Postop Pain	No Pain	47	13	60	0.000
		43.9%	12.1%	28.0%	
	Mild	28	15	43	
		26.2%	14.0%	20.1%	
	Moderate	21	45	66	
		19.6%	42.1%	30.8%	
	Severe	11	34	45	
		10.3%	31.8%	21.0%	
Total		107	107	214	
	100.0%	100.0%	100.0%		

Table-II. Assessment of pain on propofol injection

Pain was compared using chi square test. Data presented as mean ± SD or frequency with percentages as required. A p-value ≤ 0.05 is considered as significant.

Heart Rate Comparison

Group 1 (antecubital vein) had Pre-propofol heart rate of 84.77 ± 5.74 and Post-propofol heart rate of 85.40 ± 6.01 ($p < 0.001$). Group 2 (dorsum hand vein) had Pre-propofol heart rate of 76.96 ± 5.93 and Post-propofol heart rate of 84.40 ± 6.01 ($p = 0.254$). These heart rate changes reflect the physiological response to pain and support the VAS results.

DISCUSSION

Propofol is an essential agent in modern anesthesia practice, widely preferred for its rapid onset, smooth recovery, and favorable pharmacokinetics. However, pain on injection remains a well-documented adverse effect, particularly distressing in pediatric patients who are often more sensitive to procedural discomfort. Several reports place the incidence of pain between 26% and 70%, making it one of the most frequent complaints during anesthesia induction.[2] This pain not only causes discomfort but also contributes to increased anxiety, reduced cooperation, and traumatic procedural memories.[3]

The pathophysiology of propofol-induced pain is multifactorial. Propofol, being formulated in a lipid emulsion, causes direct irritation of the

venous endothelium. Additionally, it activates the kallikrein–kinin system, resulting in bradykinin release which increases vascular permeability and dilates blood vessels, thereby allowing more contact between the drug and nerve endings.[5] In children, who have a heightened pain perception and may be less able to verbalize their discomfort, managing this pain becomes crucial to avoid agitation, movement during induction, and lasting fear of medical procedures.[4]

Pharmacological strategies, particularly the admixture of lidocaine with propofol, have been shown to reduce pain significantly.[6,9] Lidocaine acts both by anesthetizing the venous endothelium and by increasing the pH of the admixture, reducing irritation. However, even with lidocaine, pain persists in many patients, especially when injected into small superficial veins such as those on the dorsum of the hand.[10] This underscores the relevance of exploring complementary strategies — specifically, the role of vein size and site.

Our study demonstrated that pain was significantly reduced when propofol-lidocaine admixture was administered via a large antecubital vein rather than a small dorsum hand vein. The mean pain score in the antecubital group was less than half of that in the dorsum group (2.63 ± 1.80 vs. 5.95 ± 2.79, $p < 0.001$), and the incidence of severe pain dropped from 31.8% in the dorsum group to only 10.3% in the antecubital group. These findings suggest that the physical characteristics of the vein play a major role in modifying pain perception during propofol injection.[11]

The anatomical and physiological advantages of larger veins are evident. They have greater luminal diameter, higher blood flow rates, and are situated deeper, which may dilute the propofol more effectively, reduce its contact time with the venous wall, and limit the stimulation of superficial nociceptors.[7,9] This rationale is supported by prior studies, including the work of Wasinwong et al., which emphasized that combining lidocaine with large vein access significantly reduces injection pain in children.[7]

In terms of physiological stress response, our results also showed a higher increase in heart rate post-propofol in Group 2 (dorsum hand group), consistent with the VAS pain scores and confirming the subjective experience of pain with an objective marker. Though the heart rate difference was not statistically significant in Group 2, the trend reflected the sympathetic activation expected in response to pain.[4]

The study aligns with previous research by Kim et al. and Bakhtiari et al., who both concluded that lidocaine alone is insufficient when injected into small veins, and that the choice of venous access plays a pivotal role in pain modulation.[6,12] It also extends these findings by confirming the benefits of anatomical site selection in pediatric anesthesia, a group in which pain prevention is particularly important due to the long-term behavioral implications of early medical trauma.[3]

By demonstrating statistically and clinically meaningful pain reduction, our study supports the combined use of pharmacological and anatomical strategies for a more holistic approach to comfort in pediatric patients undergoing general anesthesia. The technique is simple, cost-effective, requires no additional training or equipment, and is immediately implementable in routine practice.

CONCLUSION

In conclusion, while pain from propofol injection remains a common issue, it can be significantly reduced using simple, evidence-based measures. Our study shows that the use of a large antecubital vein, combined with a lidocaine-propofol admixture, offers superior comfort compared to injection through small dorsum hand veins.

This approach is low-cost, easy to implement, and particularly effective in pediatric patients, where minimizing discomfort is essential. Based on these results, we recommend that propofol induction in children should preferentially utilize antecubital vein access whenever feasible.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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REFERENCES

1. Fernando C, Pablo J, Candela. **Sedation, propofol, indications, monitoring, and clinical results.** Springer eBooks. 2023 Jan 1; 69-77.

2. Kim D, Park SH, Kim JW, Kim HS, Kwon JY. **Optimal dose of lidocaine to reduce pain from propofol injection.** J Int Med Res. 2014 Mar; 42(3):738-45.

3. Shakya S, Shah M, Bhatta A, Pandit A. **Efficacy of lidocaine pretreatment in reducing pain associated with intravenous propofol injection.** J Nepalgunj Med Coll. 2022 Jan; 20(1):1-5.

4. Leff PJ, Dinner BA, Chuang K, Leff DB. **Characteristics that increase the risk for pain on propofol injection.** BMC Anesthesiology. 2024; 24:190.

5. Arif M, Fatima A, Firdous N, Khan T**. Propofol injection pain and its prevention: comparison between lidocaine and magnesium sulfate**. Ann Abbasi Shaheed Hosp Karachi Med Dent Coll. 2020 Jul; 25(2):155-8.

6. Fu D, Wang X, Zhang J. **Lidocaine pretreatment for propofol injection pain: A systematic review and meta-analysis.** Pain Res Manag. 2022 Jan; 2022:4289905.

7. Soomro ZA, Kazi A, Memon M. **Comparison of different pharmacological agents in reducing pain of propofol injection.** Pak J Med Health Sci. 2022 May; 16(5):764-7.

8. Bakhtiari E, Hosseini A, Afshari AR. **Prevention of propofol injection pain: Systematic review of pharmacologic agents.** Expert Rev Clin Pharmacol. 2021 Sep; 14(9):1127-38.

9. Wasinwong W, Terhmthong S, Plansangkate P, Tanasansuttiporn J, Kosem R, Chaofan S. **A comparison of ondansetron and lidocaine in reducing injection pain of propofol: A randomized controlled study.** BMC Anesthesiol. 2022 Sep; 22:109.

10. Chachart V, Gantaros. **Evaluation of the effectiveness of lidocaine and ketamine in-jections in reducing pain from propofol injection in general anesthesia.** Anesthesia Pain Soc J. 2025; 1(1):26-31.

11. Ahmad S, Ahmed F, Khalid N, Khan S. **Intravenous acetaminophen for propofol injection pain reduction: A double-blind controlled study.** Pain Res Treat. 2013 Jan; 2013:734531.

12. Elsayed HM, AlMetwalli RR, Abdelraheem M, Badawy F. **Optimal lidocaine propofol mixture for painless induction of anesthesia.** Saudi J Anaesth. 2025; 19:494-7.

AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Sana Malik:** Manuscript writing.
2	**Mohsin Riaz Askri:** Literature search, study design, conceptualization.
3	**Shumyala Maqbool:** Data analysis, interpretation.
4	**Waleed Manzoor:** Data Collection, proof reading.
5	**Sana Fatima:** Statistical analysis, proof reading.
6	**Hasan Talal:** References.