RGUHS
Journal of Dental Sciences

ORIGINAL ARTICLE

A Clinical Comparative Study between Conventional and Camouflaged Syringes to evaluate Behaviour and Anxiety in Children during Local Anesthesia Administration, A Novel Approach: An *In-vivo* Study

Sahana Bhatt*, Anagha Saseendran, Jome Joju, Priya Nagar
Department of Paediatrics and Preventive Dentistry, Krishnadevaraya College of Dental Sciences and Hospital, Bengaluru, Karnataka, India

***Corresponding author:**
Dr. Sahana Bhatt, Post Graduate Student, Krishnadevaraya College of Dental Sciences and Hospital, Bengaluru, Karnataka, India. E-mail: shnbhtt96@gmail.com

Received date: April 30, 2024; **Accepted date:** May 29, 2024; **Published date:** March 31, 2025

Abstract

Background: Dental anxiety in children, primarily triggered by the anticipation of pain, often discourages them from seeking necessary dental treatment.

Aim: This study compares the effectiveness of camouflaged metal cartridge syringes and conventional disposable 2 mL syringes with insulin syringes in delivering nerve block anesthesia among children aged 6 to 10 years.

Method: This randomized, crossover clinical trial included 20 pediatric patients aged 6-11 years from the outpatient ward of the Department of Paediatrics and Preventive Dentistry. Each patient required treatment in two quadrants of the same jaw and underwent two clinical sessions. Local anesthesia was administered using either a conventional 2 mL disposable syringe and an insulin syringe or a camouflaged metal cartridge syringe. Pain perception and anxiety levels were assessed using the FLACC behavior pain scale, pulse rate monitoring, and the Wong-Baker Faces Rating Scale (FRS). Patient preferences were recorded and behavioral assessment was conducted using the Wright *et al.* (1991) scale. Statistical analyses were performed using SPSS Version 22.0.

Results: Findings reveal a significant reduction in pain perception and anxiety levels in children receiving injections *via* camouflaged syringes. Additionally, physiological responses, such as pulse rate measurements post-procedure, were notably lower in the camouflaged syringe group, highlighting decreased anxiety. Patient preferences strongly leaned towards camouflaged syringes, reinforcing the need to prioritize patient comfort.

Conclusion: These results suggest that integrating camouflaged syringes into a pediatric dental practice can enhance patient cooperation, alleviate fear and encourage consistent dental visits, ultimately improving oral health outcomes.

Keywords: Dental Anxiety, Pediatric Dentistry, Local Anesthesia, Pain Management, Camouflaged Syringes, Physiological Measures

Introduction

Many children avoid dental care due to anxiety associated with pain. Research highlights the crucial role of pain perception in shaping dental fear, emphasizing the importance of accurate and pain-minimized administration of local anesthesia during pediatric dental treatments.[1,2]

Addressing dental fear requires creative solutions such as the Syringe Sleeve by AngelusTM, which conceals the appearance of a syringe within a playful, autoclavable toy-like casing resembling an alligator. This approach effectively diverts a child's attention, enhancing their overall dental experience.[3,4]

Dental anxiety has a considerable impact on children's oral health and willingness to seek treatment, according to studies by Olak *et al.* and Bedi *et al.*[5,6] Rantavuori *et al.* and Klingberg & Berren found that parental dental dread influences a child's level of anxiety.[7,8] Fear of injections causes significant dental suffering in youngsters, demanding effective management measures.

Various interventions have been proposed to mitigate these concerns. Studies by Chhabra & Chhabra and Kumar *et al*., emphasize the role of parental education in shaping children's attitudes toward dental care.[9,10] Ozbek *et al.,* and Alkhadra explore how distraction techniques, such as camouflaged syringes, can effectively reduce dental anxiety in pediatric patients.[11,12]

Understanding the psychological underpinnings of dental fear is essential for formulating effective intervention strategies. The conditioning theory of fear development, examined by Rachman, and qualitative analyses by Gao *et al.,* provide insights into dental anxiety in children.[13,14] Prospective studies by Ortiz *et al.* and Tickle *et al.,* further highlight the importance of long-term assessment in managing procedural anxiety.[15,16]

To address dental fear in children, a comprehensive approach integrating behavioral strategies, psychological interventions and parental education is necessary. Utilizing distraction techniques such as camouflaged syringes can significantly improve children's experiences, fostering positive attitudes toward dental visits.

This study seeks to assess and compare the efficacy of camouflaged metal cartridge syringes, conventional disposable 2mL syringes, and insulin syringes in administering nerve block anesthesia to children aged 6 to 10 years. Objectives of the study includes evaluating the effectiveness of camouflaged syringes in reducing pain perception during local anesthesia administration and comparing the efficiency of disposable 2mL syringes and insulin syringes in delivering nerve block anesthesia in 6 to 11-year-old children when combined with camouflaged metal cartridge syringes.

Materials and Methods

Study setting: A randomized, crossover study was conducted on subjects from the Department of Paediatrics and Preventive Dentistry outpatient ward, Krishnadevaraya College of Dental Sciences and Hospital, Bengaluru.

Selection Criteria: Children from 6 to 12 years of age have treatment needs in two different quadrants (either in the maxillary or mandibular arch), a minimum of two clinical appointments of similar operative procedures on both sides of the same jaw preceded by LA injection, children demonstrating positive behavior during pretreatment evaluation (ranking 3 or 4 on the Frankl scale) were included in the study. Children with emergency treatment needs, such as abscess, cellulitis, and space infection, and those needing premedication for dental treatment, medically compromised patients, uncooperative children, and children allergic to local anesthetic agents were excluded from the study.

Sample Size: The required sample size for each group was 20 patients. Each patient has 2 quadrants involved, leading to 40 arches. Power of Study = 0.80.

Method: Each child received injections using different syringe types across two sessions, ensuring they acted as their own control. The study utilized insulin syringes, camouflaged syringes, and standard disposable 2mL syringes.

In the first and second sessions, participants were randomly assigned to receive injections with either a conventional syringe and an insulin syringe or a camouflaged metal cartridge syringe. Pain perception and anxiety levels were assessed using the FLACC behavior pain scale, pulse rate monitoring, and the Wong-Baker Faces Rating Scale (FRS). Patient preferences for syringe type were also recorded.

The child's response was monitored and documented using the validated Wright *et al.* (1991) scale. Additionally, verbal instructions were provided to help children express their pain levels using the Wong-Baker FRS, which ranges from 0 (no pain) to 5 (severe pain). Data collected were analyzed to determine the

effectiveness of different syringe types in reducing pain and anxiety during local anesthesia administration.

Statistical Analysis

Statistical analyses was performed using the Statistical Package for Social Sciences (SPSS) for Windows Version 22.0, Released 2013, Armonk, NY: IBM Corp.

Results

Age & Gender Distribution: The study included 40 participants, 60% of whom were between 6 and 8 years old and 40% of whom were in the 9-11 age group. The mean age of the study population was 8.3 years, with a standard deviation of 1.46.

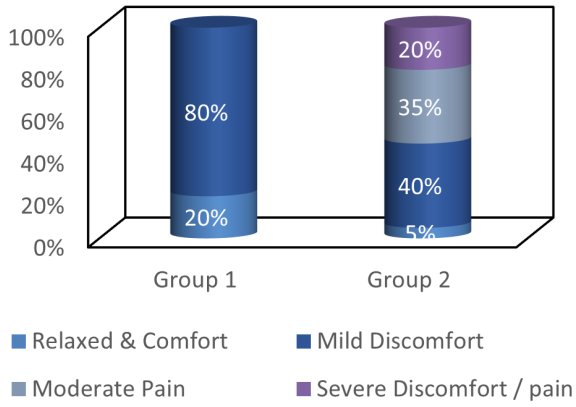

Figure 1: Distribution of FLACC Scale scores between 2 groups

Comparison of FLACC Scale Scores: When comparing the FLACC scale scores between the two groups using the Chi-Square test, it was found that 80% of participants in the alligator Group (Group 1) reported only mild discomfort during local anesthesia administration, whereas only 40% in the conventional Group (Group 2) experienced mild pain (Figure 1). The discomfort was more severe in the conventional group, with 35% experiencing moderate pain and 20% experiencing severe discomfort or pain.

The discomfort was more severe in Group 2 compared to Group 1.

Comparison of Wong Baker Facial Pain Rating Scale Scores: Significant differences were observed between the two groups in terms of the Wong Baker Facial Pain Rating Scale scores. Participants in the alligator group had a mean score of 4.10, while those in the conventional group had a mean score of 8.20 (Figure 2). This suggests that participants in the alligator group experienced significantly less pain compared to those in the conventional group.

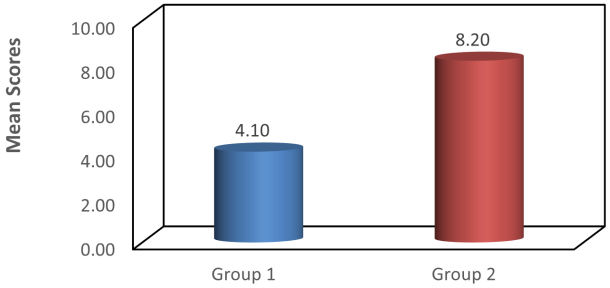

Figure 2: Mean Wong Baker Facial Pain Rating Scale scores between 2 groups

Comparison of SEM Scale Scores: The Mann Whitney test revealed a significant difference in SEM scale scores between the two groups. Participants in the alligator group had a mean score of 4.40, whereas those in the conventional group had a mean score of 6.85 (Figure 3). This indicates that participants in the alligator group exhibited lower levels of discomfort during the injection procedure than those in the conventional group.

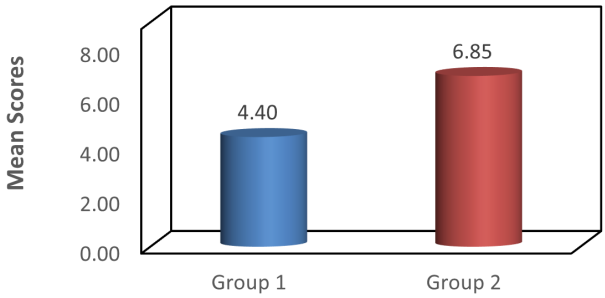

Figure 3: Mean SEM Scale scores between 2 groups

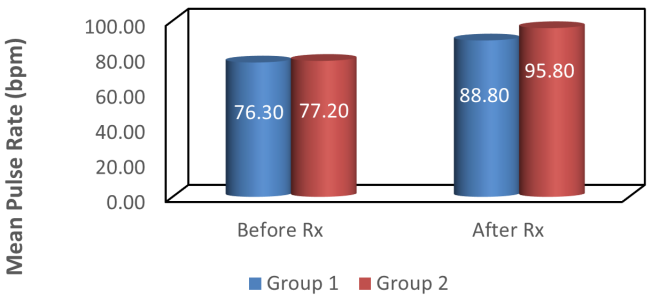

Figure 4: Mean Pulse Rate (bpm) Before & After Treatment between 2 groups

Comparison of Pulse Rate Before & After Treatment: When comparing the mean pulse rate before and after treatment between the two groups using the Independent Student t-test, it was found that there was a statistically significant decrease in pulse rate after treatment in both groups. However, the decrease was more pronounced in

the alligator group (from 76.30 to 88.80 bpm) compared to the conventional group (from 77.20 to 95.80 bpm) (Figure 4).

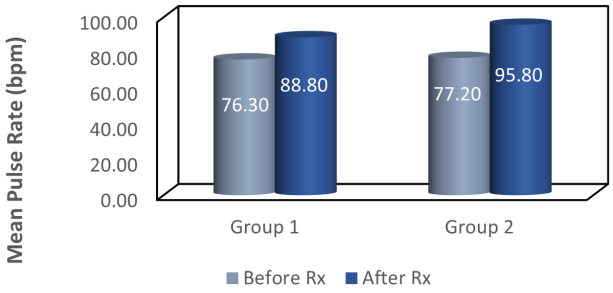

Figure 5: Mean Pulse Rate (bpm) between Before & After Treatment in each group

Comparison of Pulse Rate Before & After Treatment Within Each Group: There was a significant decrease in pulse rate after treatment compared to before treatment, as evidenced by the Student Paired t-test. In the alligator group, the mean pulse rate decreased from 76.30 to 88.80 bpm, while in the conventional group, it decreased from 77.20 to 95.80 bpm (Figure 5).

Overall, the results indicate that the use of camouflaged syringes resulted in significantly lower levels of pain and discomfort during local anesthesia administration, and a more pronounced decrease in pulse rate after treatment compared to conventional syringes.

Discussion

This study aimed to assess how well camouflaged syringes managed children's pain and anxiety during the administration of local anesthesia in comparison to conventional syringes. The results showed that the camouflaged syringe group experienced a significant decrease in pain and anxiety, suggesting that it could be a useful tool in pediatric dentistry.

Pain and Anxiety Levels

Compared to children treated with conventional syringes, children who received anesthesia using camouflaged syringes had significantly lower FLACC and Wong-Baker FRS scores. These findings are in line with earlier studies that demonstrated how well distraction techniques work to reduce pediatric patients' procedural pain and anxiety.[17,18] These results were probably influenced by the camouflaged syringe's entertaining and entertaining design, which distracted kids from the injection procedure.

Physiological Measures

The camouflaged syringe group showed a significant decrease in pulse rates after treatment, which further supports its ability to reduce anxiety. This is consistent with previous research, which indicates that more stable physiological reactions during dental procedures are a result of lower anxiety levels.[19]

Patient Preferences

Children showed a clear preference for camouflaged syringes over traditional ones, highlighting how crucial it is to take patient comfort and perception into account in clinical settings. This preference is especially significant since it could favorably affect a child's readiness to receive dental care in the future.[20]

Clinical Implications

A quick and easy way to lessen the fear and anxiety related to local anesthesia is to use camouflaged syringes in pediatric dentistry practices. By lowering avoidance behaviors, using such techniques can improve long-term oral health, promote positive behavior during dental visits and improve the overall patient experience.

Limitations: Due to the nature of the study, blinding the dentist was not possible. However, bias was reduced by ensuring that both groups received local anesthesia from a single, skilled pediatric dentist. The stiff design of the alligator-shaped sleeve made administering an inferior alveolar nerve block difficult, necessitating more needle exposure. This study supports incorporating camouflaged syringes into standard pediatric dentistry procedures, aligning with the findings of Ujaoney *et al.* However, commercially available camouflaged syringes must be as maneuverable as regular syringes and incorporate age-appropriate toy shapes into the sleeve to reduce bulk. To meet clinical demand, it is also essential to produce inexpensive, disposable camouflage syringe sleeves on a large scale.

Conclusion

Camouflaged syringes significantly reduce pain and anxiety levels in children during local anesthesia administration compared to conventional syringes. Their implementation in pediatric dentistry can improve patient experiences, reduce dental fear, and encourage positive attitudes towards dental care.

Conflicts of Interest

Nil

References

1. Peretz B, Nazarian Y, Bimstein E. Dental anxiety in a students' paediatric dental clinic: children, parents and students. Int J Paediatr Dent 2004;14(3):192-8.

2. Klingberg G, Broberg AG. Dental fear/anxiety and dental behaviour management problems in children and adolescents: a review of prevalence and concomitant psychological factors. Int J Paediatr Dent 2007;17(6):391-406.
3. Wright GZ, Alpern GD. Variables influencing children's cooperative behavior at the first dental visit. J Dent Child 1971;38(2):124-8.
4. Primosch RE, Kavita M. Assessment of pain control in children undergoing restorative dentistry using a computerized local anesthetic delivery system. Pediatr Dent 2001;23(5):401-6.
5. Olak J, Saag M, Vahlberg T, *et al*. Children's dental fear in relation to dental health and parental dental fear. Stomatologija 2013;15(1):26-31.
6. Bedi R, Sutcliffe P, Donnan PT, *et al*. The prevalence of dental anxiety in a group of 13- and 14-year-old Scottish children. Int J Paediatr Dent 1992;2(1):17-24.
7. Klingberg G, Berren J. Dental fear and behavior management problems in children and adolescents: a review of prevalence and concomitant psychological factors. Int J Paediatr Dent 2007;17(6):391-406.
8. Rantavuori K, Zerman N, Ferro R, *et al*. Dental fear of Finnish children in the light of different measures of dental fear. Acta Odontol Scand 2002;60(4):231-6.
9. Chhabra N, Chhabra A. Parental knowledge, attitudes, and cultural beliefs regarding oral health and dental care of preschool. Int J Clin Pediatr Dent 2012;5(2):91-5.
10. Kumar S, Mohammadi JJ, Mehta S, *et al*. The prevalence of dental anxiety among children of public and private schools of Panchkula, Haryana, India. J Indian Soc Pedod Prev Dent 2013;31(1): 8-13.
11. Ozbek M, Ceyhan D, Atac A, *et al*. Behavioral evaluation of child dental patients with the aid of digital video disc. J Oral Sci 2007;49(3):189-95.
12. Alkhadra TA. Reducing dental anxiety in children: comparing the efficacy of behavioral management techniques. Saudi J Dent Res 2016;7(1):1-5.
13. Rachman S. The conditioning theory of fear-acquisition: a critical examination. Behav Res Ther 1977;15(5):375-87.
14. Gao X, Hamzah SH, Yiu CK, *et al*. Dental fear and anxiety in children and adolescents: qualitative exploration of child-related factors. BMC Oral Health 2013;13:82.
15. Ortiz FR, Zanetti CH, Delli K, *et al*. Procedural pain and dental anxiety in children: a prospective investigation. J Oral Facial Pain Headache 2018; 32(2):176-84.
16. Tickle M, Marshman Z, Humphris G, *et al.* Relative effects of dental pain and dental anxiety on the behavioural change in children. J Dent Res 2012;91(5):460-5.
17. Kuhn BR, Allen KD. Expanding child behavior management technology in pediatric dentistry: a behavioral science perspective. Pediatr Dent 1994;16(1):13-7.
18. Wright GZ, Alpern GD. Variables influencing children's cooperative behavior at the first dental visit. J Dent Child 1971;38(2):124-8.
19. Primosch RE, Kavita M. Assessment of pain control in children undergoing restorative dentistry using a computerized local anesthetic delivery system. Pediatr Dent 2001;23(5):401-6.
20. Wright GZ, Weinberger SJ, Marti R, *et al*. The use of imagery suggestions during administration of local anesthetic in pediatric dental patients. ASDC J Dent Child 1977;44(1):10-3.