A Case Report

Comparision of Injection Pain Caused by Cartridge with Dental Vibe Injection System Versus a Traditional Syringe in Paediatric Patients

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Abstract

Introduction: A current non-pharmacological mean for attaining painless local anaesthesia (LA) is presented by dental vibe devices. Their concept is to reduce injection pain due to distraction by applying physical stimuli which interfere with pain signals. The aim of this study is to determine the efficacy of the dental vibe (DV) device in reducing pain and anxiety associated with LA in paediatric patients. A dental cartridge for LA contains Nitrogen Bubble, 1-2mm in diameter and is present to prevent Oxygen from being trapped in the cartridge and potentially destroying the Vasopressor or vasoconstrictor, so this is the function of Nitrogen Bubble in the LA cartridge. Hence dental cartridges have their own significance in delivering LA drugs.

Methods & Analysis: The proposed study is a randomised controlled clinical trial with split-mouth design. Included are positive patients aged 7-12 years, requiring buccal and lingual infiltration for extraction of retained deciduous anterior maxilla.

Aim: The aim of the study is to assess the knowledge, attitudes and practice regarding the use of dental vibe with cartridges for LA by dental practitioners.

Objective: The study is done as a questionnaire survey among the practitioners in a region. The questionnaire is framed under the criteria of knowledge, attitude, preference, practice, advantages and disadvantages of dental vibe with cartridges for LA.

Results: Results shows that the knowledge, attitudes and practice regarding the use of dental vibe with cartridges for LA by dental practitioners is adequate (70%).

Conclusion: The study is concluded that vigorous dental awareness program needs to be Initiated to address this concern.

Key Words: Local anaesthesia, dental cartridges, dental vibe

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Introduction

Painless treatment is an integral element ofquality paediatric dental care. Fear associated with seeing and experiencing needle penetration, as well as sensation of swelling soft tissues, is the most common factor causing children and dental clinicians to experience anxiety regarding the use of infiltration local anaesthesia (LA). Recent progress in the field of dental pain management has led to development of newer delivery devices and also modification in injection techniques. Their aim is to allow the clinician a treatment approach, associated with reduced injection pain, essential for managing anxiety in paediatric patients.[1]

The gate control theory of pain by Melzack [2] is a widely accepted concept of pain perception. In recent years, several innovative dental appliances have been developed on its basis DentalVibe (DV).[3] Their concept is to reduce the pain of needle injection by using dentalvibe. The applied physical stimuli are hypothesised to modify or interfere with pain signals by closing the neural gate of cerebral cortex, aimed to decrease the pain perception due to distraction.

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Dental Vibe Comfort Injection system is designed to reduce injection pain by applying pressure and vibration at the injection site. The number of conducted clinical trials regarding its efficacy and acceptance in paediatric patients is insufficient to validate the method as effective and applicable in this age group. Exploring this new non-pharmacological mean for attaining painless LA will help improve the quality of care in paediatric dentistry by evaluating its clinical adequacy.

Trial Design

The trial to be conducted is a randomised controlled clinical cross-over experimental study with split-mouth design. The within-subject design randomly allocates experimental and control interventions to different areas in the oral cavity (teeth, surfaces, arches, quadrants) and has the advantage of reducing outcome variability estimation since each patient is in his/her own control, leading to potential increase in statistical power. A disadvantage of the split-mouth design is the need of including patients with symmetrical and similar dental defects/conditions, and many patients are not eligible.

Experimental procedure in this study consists of a DV-assisted local anaesthetic injection prior to extraction of a retained deciduous anterior maxilla, whereas control manipulation consists of conventional anaesthetic injection prior to extraction of a contra lateral primary upper jaw molar of the same patient.

The required number of patients is calculated on the basis of a micro sample at an accepted level of significance ($p<0.05$) and a maximum permissible error $\alpha<0.05$and $\beta<0.2$. Intention-to-treat concept is chosen as statistical approach for data analysis. [Figure 1]

Figure 1: Dental Vibe

Eligibility

Inclusion Criteria

1. Participants in the study are children 7–12 years old.
2. Children who are not considered medically compromised or medically complex patients. The absence of done is confirmed by anamnestic interview with aparent or a caregiver of the child and excludes generalacute or chronic disease, cognitive impairment.
3. Children without previous experience with LA, requiring LA infiltration for extraction of retained deciduous anterior maxilla.

Exclusion Criteria

1. Children who are first-time ever dental patients.
2. Patients with bisulfite sensitivity or allergy to local aesthetics of the amide group.

The primary outcome measure will be pain felt during injection self-reported by the patient immediately after LA infiltration using a VAS, containing a combination of Numeric Rating Scale (0–10, where 0 means no pain, 10 means worst possible pain). Allowed children to pick a facial expression that corresponds with their pain and see a number that matches it. [Figure 2]

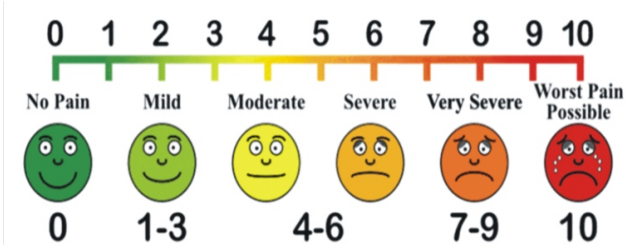

Figure 2:Visual analog scale for the assessment of child's pain

Strengths & Limitations of this Study

- Vibrotactile devices such as Dental Vibe (DV) present a new non-pharmacological method that could allow the clinician a treatment approach, associated with reduced injection pain, essential for managing anxiety in paediatric patients.
- This randomised controlled trial is a well-powered, one-centre experimental study with split-mouth design.
- The clinical adequacy of DV-assisted injection for achieving painless infiltration of local anaesthesia (LA) is investigated in a complex manner with both subjective and objective measurements of pain, anxiety, dental fear and heart rate in subjects from a narrow age group without previous experience with LA.
- This study involves only one operator and one primary investigator, in both genders, reducing interindividual variability from the estimates of the treatment effect. Disadvantages of this trial include the need to find positive patients with symmetrical and similar conditions, and many patients are not eligible, as well as the open-label design of the study due to the nature of the investigated device.

Discussion

The purpose of this study was to compare the pain experienced during needle insertion with either a traditional syringe or the dental vibe in retained deciduous anterior maxilla. To the best of our knowledge, this is the first study aiming to evaluate the effectiveness of the dental vibe in paediatric dentistry patients. The progression of a child's physical, psychological, and cognitive development is important when examining his or her experiences of pain.

These factors make pain assessment in children a particularly complex process **[Bieri et al., 1990].** [4] Since paediatric patients' subjective evaluation of pain may affect the reliability of the results, both subjective and objective evaluations were performed to measure pain in this study. The PRS, developed with the aim of subjective evaluation, has adequate psychometric properties, and it is easy and quick to use [Wong and Baker, 1998].[5]

Furthermore, it was also the preferred pain assessment instrument of children 7-10 year. However, it is not always reliable in young children, since not all children have reached the level of cognitive development necessary for understanding the pain scale **[Versloot et al., 2005].**[6] Moreover, young children have demonstrated a tendency to select faces at the extremes of the scale during procedure-related pain.

The visual analogscale, which was developed with the aim of objective evaluation, has been shown to have excellent validity and reliability for pain assessment in young.

There are several devices used to decrease patients' fear of injection by taking advantage of the gate control theory of pain management **[Dickenson, 2002]** in present case we have used dental vibe.[7] They concluded that one possible reason is that the vibrations were extremely small and did not activate the large nerve fibers in that area for man individuals **[Roeber et al., 2011].**[8] Furthermore, according to them, the design of the device may be an important factor in pain perception. Dental vibe was applied with an automated electric syringe with a dental needle. Since the dental needle is integrated in dental vibe and both of them are applied simultaneously, it was difficult to hide the needle from paediatric patients. Dental vibe with cartridge has higher efficacy than disposable needle.

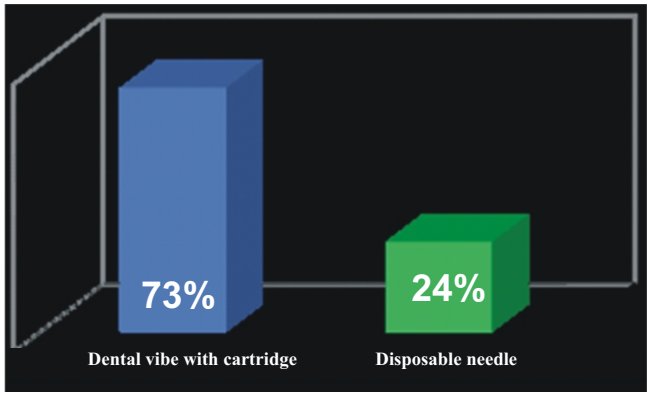

Figure 3: Efficacy of dental vibe with cartridge vs disposable needle

Conclusion

The results of this study showed that paediatric patients experienced higher level of pain during infiltrate administered with a traditional syringe and lower level of pain with the dental vibe. The procedure preferred was dental vibe by children.

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