

Effect of vibrotactile device during injection of local anaesthesia in Pediatric patients: A Systemic Review

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Type of Publication: Review Article

Conflicts of Interest: Nil

Abstract

Aim: The aim of this systemic review was to evaluate effect of vibration during injection of local anaesthesia in children.

Material and Method: Electric search of scientific paper were carried out on the PubMed, PubMed Advanced Search, MEDLINE, National Library Medicine include papers published between January 2010 to April 2020. Studies were included only if patients age is below 18 years.

Conclusion: During injection of local anaesthesia vibration is an effective to reduce the needle prick pain

compare with conventional method and different type of topical agent.

Keywords: Vibration; Dental Vibe; Local anaesthetic injection; Pain.

Introduction

Fear and anxiety are frequently associated with the first dental examination of the children and have a negative effect on the psychology of the child. In 1895 McElory has wonderfully explained that, “While operative dentistry can be ideal, appointment is a disappointment when a child leaves in tears,” emphasising the value of behavioural management over technical excellence in

pediatric dentistry¹. Local anaesthetic injection is the primary cause of fear, especially in children and adolescents, as it is predominantly associated with pain and discomfort², and admirable excuse for refusing any dental therapy³. Consequently, the management of pain and fear is critical clinically in dental practise during local anaesthetic injections⁴.

The most widely used approach for controlling needle discomfort is the use of a topical anaesthetic drug⁵. Several methods had been utilized in past to manage pain of needle prick, including topical anaesthetics, anaesthesia buffering, gradual injection, transcutaneous electrical nerve stimulation (TENS), computer-assisted local anaesthesia (such as Wand) and vibration⁴. Vibration therapy is one of the non-pharmacological approaches used to minimise excessive stimulation with local anaesthetic injection⁶. It is a product that looks like a mirror, which can be administered to paediatric patients in a comfortable manner⁷.

Various studies had been conducted in past to evaluate that vibration concurrent would decreased pain and anxiety levels during needle insertion, so the present systemic review, evaluate the effectiveness of vibration delivery system with different topical anaesthetic material in relieving pain during needle insertion.

Materials and Method

Literature searches on the following sites PubMed, PubMed Advanced Search, MEDLINE, National Library Medicine include papers published between January 2010 to April 2020. The terminology used to check parameters

included key words needle pinch pain, vibration device, dental vibe, topical anaesthetic agent. Manual search has also been undertaken.

Criteria for inclusion in this review: clinical study using vibration design, split mouth procedure, randomised clinical experiment, Randomised clinical trial, Cross sectional stud, age below 18 years.

Nonrandomized research was excluded, trials in which patients beyond 18 years old were not involved or in which the age of enrolment was not specified.

The search yield of 1829 paper by electronic search and 85 paper by Additional records identified through other sources, retrieved from the search 21 papers were chosen for the full text examination in which 6 papers were included in this systematic analysis and 15 were omitted as the studies did not follow the inclusion criterion.

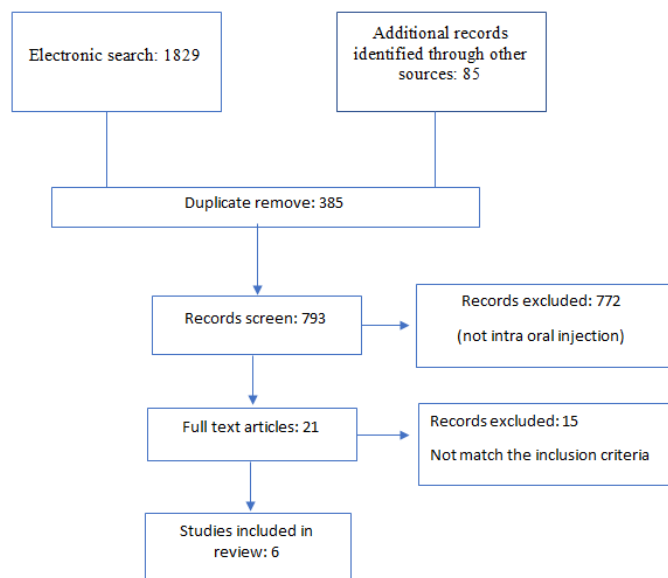


Figure 1: Study selection flow chart

Table: 1 Author, Type of Study, And Interventional Details for the 6 Studies Included in The Review

Author and year	Type of study	Age of patients	Compare group (topical anaesthesia)	Name of vibration device use	Injection area	Pain scale	Result	Conclusion

Sandeep Tandon et al. 2018	Cross sectional study	6-11 year	Topical precaine	RUSH mucosal vibrator	Mandibular nerve block	SEM FPR	Local anaesthetic injection and vibration of the mucosa Ends in considerably less discomfort relative to Injections without the application of mucosal vibration.	Mucosal vibration can be used as an important method of decreasing pain sensitivity in dentistry during local anaesthetic injection.
Tung et al. 2018	Randomised clinical trial	7-14 year	20% benzocaine topical anaesthetic gel	Dental vibe	Maxillary infiltration Inferior alveolar block and long buccal	Wong-Baker	The FACES score in the Dental Vibe group decreases statistically dramatically in compared with the control and manual stimulation groups	Dental Vibe can minimise pain in paediatric patients receiving dental injections.
Rahaf Dak-Albab et al 2016	A Randomised clinical trial	8-12 year	20% benzocaine topical anaesthetic gel	Dental vibe	Mandibular nerve block	FLACC	Important variations were observed (P=0.002) for the value	The study indicates that the Dental Vibe Vibration method can be used as a simple

							of the stimulation technique for Dental Vibe at the injection site relative to the 20% topical benzocaine gel.	and effective way to reduce pain associated with dental injections relative to conventional topical analgesic gels.
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Table: 2 Authors, Type of Study, And Interventional Details for the 6 Studies Included in The Review

Author and year	Type of study	Age of patients	Compare group	Name of vibration device use	Injection area	Pain scale	Result	Conclusion
Gholam Hossain Ramazani et al 2017	A split mouth Randomised clinical trial	5-7 year	Conventional method	Dental vibe	Inferior alveolar block	Wong-Baker	Of the 20 participants, 65% recorded a lower level of pain on the device; 25% equally scored pain on both sides; 10% reported a higher level of pain on the control side.	Dental Vibe has been shown to be a valuable and effective aid to relieve pain when injecting anaesthesia locally.
N. Raslan & R. Masri	Split mouth crossover design	6-12 year	Conventional method	Dental vibe Gen 3	Buccal and palatal infiltration	FLACC and Wong-	(DV) pain values were less than	The conventional approach

2018					in maxilla IANB	Baker	conventional in most procedures	used to treat children with comparable discomfort at both injection sites. The dental vibe did not minimize pain and was not tolerated further by children.
P H. Hassanein et al. 2020	Randomised clinical trial	5-7 year	conventional method	Dental vibe	Mandibular nerve block	FLACC and Wong- Baker	Both scales showed statistically significant differences between the two group in favour of dental vibe (p < .001)	Compare to the traditional method, Dental Vibe reduced pain sensation during mandibular nerve injection in pediatric patients.

Discussion

Dolor is characterised as an uncomfortable sensory and emotional experience resulting from or represented in terms of real or possible tissue damage. In pediatric dentistry, pain is caused by sensations like drill sound or needle contact during the local anaesthetic procedure⁸. The sense of needles and syringe has a negative influence on the development of children as well as interfere with appropriate dental management⁹. The topical application

of local anaesthesia are liquids, anaesthesia sprays, gels or adherent patch, which are used to relieve discomfort from local anaesthesia injection⁸.

Vibration anaesthesia was identified for the first time over half a century ago and has demonstrated to be an efficient addition for enhancing relaxation during dental treatments for local and regional anaesthesia¹⁰. Vibration technique are based on gate control theory which is introduced by Melzack and Wall in 1965, in which stimulating fibres

that provide non-noxious stimuli decrease pain sensitivity¹¹⁻⁴. The use of pressure or stimulation to induce greater A-beta fibres will disrupt nociceptional signals and thereby decrease pain sensitivity. The counter-stimulus triggered by sensation was observed to enter the brain when an anaesthetic agent was being administered before pain was felt⁴. The present study was conducted to check the effect of vibrotactile device during injection of local anaesthesia in pediatric patient. All the 6 studies included for final review were RCT with split mouth design and cross-sectional design. 4 studies were RCT while Sandeep Tandon et al. 2018 and N. Raslan & R. Masri 2018 followed cross sectional design. The age of the subjects reported in included studies ranged from 5-14 years. Among the 6 included studies, 3 reported a compare the vibration device with conventional method to injecting the local anaesthesia while 2 studies compare the vibration device with 20% benzocaine topical anaesthetic gel and only the study by Sandeep Tandon et al. 2018, reported comparison of vibration device with topical precaine.

Type of injection: Only mandibular nerve block was evaluated in the study by Sandeep Tandon et al. 2018⁸, Rahaf Dak-Albab et al 2016¹², P H. Hassanein et al. 2020⁷. Infiltration in maxilla with IANB were evaluated in the studies by N. Raslan & R. Masri 2017¹³. Both infiltration in maxilla and IANB along with long buccal were evaluated in the studies by Tung et al. 2018¹⁴. Only IANB were evaluated in the studies by Gholam Hossain Ramazani et al 2017.

Outcome evaluated were subjective and objective pain experiences during the administration of local anaesthetic injection with vibration device, topical anaesthetic agent and conventional method.

Comparison of subjective pain in subject: Out of 6 studies 5 studies evaluated self-reported pain. 4 studies

evaluated subjective pain on Wong- Baker FACES scale and other one studies show FPR scale. Only the study by N. Raslan & R. Masri 2018, reported no significant difference in Wong- Baker FACES scale score (mean \pm standard deviation) between traditional method 1.48 ± 2.12 and DV 1.61 ± 2.23 ; $p > 0.05$. The 4 studies state that significant lower subjective pain with DV in compare with topical anaesthetic gel and traditional method. According to Sandeep Tandon et al. 2018: with mucosal vibration FPR score 1.4 ± 0.68 vs topical anaesthetic FPR score 3.2 ± 0.79 ; $p < 0.001$, Tung et al. 2018; Wong-Baker FACES score in DV 2.22 ± 2.2 , manual stimulation 2.70 ± 2.5 and control group 3.56 ± 2.9 ; $p < 0.001$, Gholam Hossain Ramazani et al 2017 Average pain levels in the experimental and control sides were 1.95 ± 1.57 (95% CI: 1.22 to 2.68) and 0.65 ± 0.81 (95% CI: 0.27 to 1.03), respectively. P H. Hassanein et al. 2020 Wong-Baker FACES score in DV 2.40 ± 3.46 vs traditional method 2.80 ± 3.00 ; $p \leq 0.05$. In conclusion, most studies reported lower pain associated with the DV compare to the topical anaesthetic gel and conventional method.

Comparison of objective pain in subject: 4 studies out of 6 evaluate the subjective pain score. Only by Sandeep Tandon et al. 2018 evaluate the SEM score: with mucosal vibration 1.4 ± 0.68 vs topical anaesthetic gel 3.2 ± 0.79 . Rahaf Dak-Albab et al 2016, N. Raslan & R. Masri 2017 and P H. Hassanein et al. 2020 evaluate pain reaction on the FLACC scale. In which N. Raslan & R. Masri 2017 reported no significant difference in objective pain with vibration device in compare with topical anaesthetic gel and conventional method. Rahaf Dak-Albab et al 2016 and P H. Hassanein et al. 2020 reported lower objective pain with vibration device in compare with compare with topical anaesthetic gel and conventional method. ([N. Raslan & R. Masri 2017; DV FLACC score 0.9 ± 0.85 vs traditional method 1.06 ± 0.8 ; $p > 0.05$] [Rahaf Dak-

Albab et al 2016; DV FLACC mean score 3.36 vs topical anaesthetic gel 5.57; $p < 0.05$] [P H. Hassanein et al. 2020; DV FLACC score 3.40 ± 2.70 vs traditional injection 2.87 ± 1.81 ; $p \leq 0.05$]. In conclusion, lower pain reaction was observed in vibration device in comparison with the topical anaesthetic gel and conventional method.

Conclusion

Based on the discussion following conclusion can be drawn, during local anaesthetic injection, needle prick pain was decreased by vibrotactile device when compare with conventional method and use of different type of local anaesthetic agent.

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