DentalVibe Injection System:A Paradigm Shift in Local Anesthesia Techniques

INTRODUCTION

A pediatric dentist's primary goal is to get a youngster to cooperate during numerous pediatric procedures in the dental clinic. Giving anesthetic to young patients demonstrates to be the process's most difficult component. Painful local anesthetic (LA) injections are the child's true phobia during a pediatric surgery. The simple sight of needles and syringes can induce psychological stress in children, making it difficult to control their conduct. By lowering the child's fear of discomfort during LA injections, the dentist can win the child's trust and get their cooperation throughout treatment.(1)

Therefore, many methods have been recommended to lessen the discomfort while administering local anesthetic agents. These methods include applying various anesthetic gels, using distraction techniques, warming the anesthetic agents, slowing down the injection rate, and buffering the local anesthetic agents.(2)

The goal of the current evaluation of the literature's findings is to provide dentists with reliable information regarding the usage of the Dentalvibe injection system and its strategies for reducing anes thesia administration pain and improving patient comfort.

HISTORY

1965 – 2008 -Pain Management Through Vibration Theory Developed

Dr. Steven Goldberg develops and improves the idea of vibration to reduce injection pain, focusing on DentalVibe®, based on the Gate Control Theory of Pain proposed by Dr. Ronald Melzak (1965).

January 2009- Dr. Steven G. Goldberg, the inventor, starts working on DentalVibe® Generation 1
Working with Bressler Group in Philadelphia, PA, inventor Dr. Steven Goldberg created the initial DentalVibe® concept in January 2009.

January 2010-DentalVibe® Generation 1: First 500 Units Constructed

The first 500 Generation 1 DentalVIbe Pain-Free Injection Appliances are built in China by Bressler/Sambor in January 2010.

February 2010-The first DentalVibe® Generation 1 was introduced to the dental industry in Chicago.

DentalVibe® attended its first trade exhibition, the 145th Midwinter Meeting of the Chicago Dental Society, in February 2010.

August 2010-First Nationwide Marketing Campaign for DentalVibe®

In August 2010, the first national marketing campaign is launched by DentalVibe® in association with Zimmerman advertising and 5WPR. 48 dentists gave local news stations a demonstration on how to utilize DentalVibe®.

April 2010-DentalVibe® Generation 2 is created by Bressler.

April 2010, Bressler created DentalVibe® Generation 2

April 2011-DentalVibe® Generation 2 Ships To Clients

April 2013-DentalVibe® hired Boston Engineering Corp. in April 2013 to manage quality control and enhance the device's mechanical and electrical designs.

Gen 3 DentalVibe® manufacturing is taken up by Columbia Tech of Boston, MA in April 2013. Nowadays, all DentalVibe® production is done in the US.

Jan 2014-Clinical Study: DentalVibe Injection System's Impact on Adolescent Patients' Pain During Local Anesthesia Injections

December 2014-New Smart Tip Technology Included in the Release of DentalVibe® Generation 4

End of 2014 4th Generation DentalVibe® launched, featuring brand-new electronics and Smart Tip technology. Designed by Boston Engineering Corp. and produced by Columbia Tech. With the release of DentalVibe® Generation 4, Newly developed application methods: The injection eliminates the need for topical medication after ten seconds of vibrations.

January 2019-DentalVibe® Unveils Personalized Flexi Tips

January 2019: In response to tremendously good feedback from dental professionals and patients, DentalVibe®'s customizable flexi tips are introduced.

January 2021-In an effort to promote DentalVibe® Certified Anxiety-Free Dentists, DentalVibe® launches the DentalVibe Dentists directory.

In an attempt to help certified DentalVibe® dentists expand their practices by highlighting their continued dedication to anxiety-free dentistry, DentalVibe® releases a brand-new website in January 2021 that includes the Anxiety-Free Dentists dental directory.(3)

PRINCIPLE OF DENTALVIBE INJECTION SYSTEM

The gate control hypothesis of pain explains DentalVibe's functionality. Ronald Melzack and Patrick Wall originally suggested it in 1965. This implies the existence of a neurological "gate" that is situated in the trigeminal ganglion, which is the substantia gelatinosa of the dorsal horn of the spinal cord. This "gate" is said to have the ability to either block or permit pain impulses to reach the brain. According to the hypothesis, different types of nerve fibers exist depending on how quickly and how big they can conduct an impulse. The A [ά] delta fibers are myelinated, moderately big fibers with a diameter of between 1 and 22 µm. They activate pain receptors, which quickly alert the body to the presence of pain. The brain and spinal cord receive these impulses, which are typically perceived as sudden, intense pain.

The dorsal root does not contain the B fibers, which are the second class of fibers. The C fibers, or third kind of fibers, are tiny, unmyelinated nerve fibers with a diameter of 0.05 to 1 micron. These can transmit pain at a speed of 0.5 to 2 meters per second, which is known as slow or second pain.

According to the Gate Control Theory, the nervous system has an action system. It claims that when counterstimulation—specifically, the vibration technique—is used during an uncomfortable event—a dental injection, for example—the brain experiences the vibrations' sensation first, which closes the pain gate to the injection's pain.(4)

Figure 1 Dentalvibe Injection System

DENTALVIBE IN PEDIATRIC DENTISTRY

DentalVibe is a handheld, rechargeable, cordless device that applies pulsed micro-oscillations to the injection site. There is no need to alter the conventional anesthetic method in any way.

Figure 2 Flexi tip

DentalVibe's design allows the buccal or labial mucosa to retract. It is lightweight and readily manipulated with the non-working hand, freeing up the working hand to deliver the injection. Faster and deeper anesthesia is achieved by using the VibraPulse technology to massage the injection site. This minimizes swelling brought on by the anesthetic solution's bolus and helps it dissipate. Its integrated light source makes the injection site easier to see.(4)

To activate the mechanoreceptors and reduce pain, a newly created device called DentalVibe vibrates while dental injections are being administered.

The two U-shaped DentalVibe heads were lightly pressed into the mouth mucosa at each location while under local infiltration anesthetic. The needle was put into the tissue five seconds after the gadget was turned on.
The needle was held in this position for ten seconds in order to gauge the degree of pain experienced during insertion. Within 60 seconds, the anesthesia was then injected. Five seconds after the injection and needle extraction were finished, DentalVibe was taken away.

For IANB, the pterygomandibular depression was originally found by routinely touching the anterior border of the ramus with a finger. After releasing the pressure from the fingers, the DentalVibe device's retracting portion was positioned over the injection site to create vibrations.DentalVibe gave the same amount of pressure as a dental mirror to retraction of the lips and cheeks. In accordance with the manufacturer's instructions, the needle was positioned as near to one of the device's tips as feasible without touching it.
The vibrations persisted for five seconds until needle was placed into the tissue between the pterygomandibular raphe and the internal oblique ridge until it got to the bone.
Then, for 60 seconds, the anesthetic medication was injected. In 5 seconds, DentalVibe was eliminated, once the needle has been removed .
The effect of DentalVibe on adult patients' feelings of pain and anxiety during local anesthetic injections was examined by Ungor et al. They discovered that DentalVibe decreased local anesthetic injection pain without making patients more anxious.(2)
The pain of inserting a needle with a dentalvibe and a traditional syringe was compared by Gupta G et al.The results of the investigation indicate that dental vibe reduces discomfort and anxiety with a localized area of numbness at the needle insertion site(5)

In order to investigate the effectiveness of dental vibe and benzocaine gel in reducing pain associated with injections of mandibular nerve blocks, Rahaf Dak-Albab et al. The

advantages of the DentalVibe vibration technique at the injection site differed significantly (P=0.002) from topical benzocaine 20% gel. The effectiveness of the DentalVibe (DV) and VibraJect (VJ) comfort systems with Topical Anaesthesia (TA) (20% benzocaine) in easing children's pain associated with local injections is compared by Mohamed Nagy Hamdy Khalil et al. This study found that VJ and DV reduced discomfort during LA injection without causing anxiety when compared to traditional injection. (6,7)

Teenagers receiving normal injections with and without the DentalVibe Injection Comfort System were studied by David Ching et al.Adolescents in this study self-reported far less discomfort during local anesthetic injections while utilizing DentalVibe as opposed to a conventional syringe technique.(8)
Osama Felemban et al. assess the efficacy of DentalVibe versus a conventional injection. Compared to conventional methods, DentalVibe showed no discernible effect on pediatric patients' pain, discomfort, or time. Age and sex probably had a greater impact on children aged 6 to 12 years perceptions of pain than did the use of a vibration device. Regardless of age or method of anesthesia administration, women were more likely to report pain and discomfort scores during local anesthetic administration.(9)

M. Elbay et al. use a DentalVibe Injection Comfort System (DV) or a traditional syringe (TS) to gauge how uncomfortable injections or needle insertions for inferior alveolar nerve block (IANB) anesthesia are for young patients. The FLACC (Face, Legs, Activity, Cry, Consolability) scale discovered that patients pain levels decreased with age after receiving anesthetic medication injections using the DV.(10)

Specifically, NABIH RASLAN et al. sought to determine how much pain three different types of anesthetic injections generated and how Dentalvibe affected injection discomfort. There was no statistically significant difference between the subjective and objective evaluations using the TR method, independent of the injection site.However, for the majority of injections, the pain scores using the (DV) methodology were lower than those using the standard method.(11)

ULKU Sermet Elbay and colleagues examined the discomfort differences between the DentalVibe (DV) Injection Comfort System and a conventional syringe (TS) when administering supraperiosteal (SP) anesthetic to children's maxilla and mandibles.For both arches, the neighboring tooth was given a DV, while one of the molars was given a TS. Regardless of a child's gender or jaw size changes, using a TS and the DV under SP anesthesia resulted in pain that was comparable. In children, DV was less common than the conventional method. (12)

In order to compare children's clinical experiences with injection discomfort, Jennifer Tung et al. used three different approaches.DentalVibe®, manual stimulation, or no stimulation is the option.The amount of pain that each injection kind induced did not differ statistically significantly. There was no change in the heart rate of the DentalVibe® group.(13)

Among others, Shilpapriya and Mangalampally A universal pain assessment method was used to record and statistically analyze the rating of pain with and without vibration during the injection of local anesthetic. The impact of vibrating stimuli on the discomfort that patients felt following injections of local anesthetic was investigated. Using a universal pain assessment approach, the results of the pain evaluation—both with and without vibration—were documented and statistically analyzed during the local anesthetic's administration.

According to the results, vibration therapy may be useful for easing pain while giving a local anesthetic in the mouth.(14)

CONCLUSION

Therefore, dentalvibe greatly reduces discomfort during anesthetic injection and needle insertion.
On the level of pain experienced during needle insertion and the injection of the anesthetic, there was no significant relationship between the site of injection, the order in which DentalVibe was used, the patient's gender, or their age.
As a result, DentalVibe appears to be an effective tool for controlling pain in pediatric patients during the process of needle insertion and injections of anesthetic.

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