

Advances In Dental Local Anaesthesia Delivery Devices

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Abstract: The safest and most efficient medications available today for the treatment and control of pain are local anesthetics. Since the first amide local anesthetic (LA), lidocaine HCl, was introduced in 1948, providing profound anesthesia for an extended period of time has been all but guaranteed. Researchers are searching for novel and improved ways to treat pain. The majority of research efforts are concentrated on developing anesthetic drugs, delivery systems, and associated techniques. Newer technologies have been created to help dentists provide improved pain management with less painful injections and fewer side effects.

Keywords: Dental anesthesia; local anesthesia delivery device; computer controlled local anesthetic delivery system

INTRODUCTION

The ability to administer local anesthesia (LA) safely and effectively is the most crucial competency required of all dental professionals. The most common cause of patient anxiety is likely the administration of local anaesthetic. [1][2] Pain is a negative sensory and emotional feeling that is connected to existing or potential tissue damage or is expressed as such harm. Algiatry, another name for pain management, uses an interdisciplinary strategy to lessen suffering and raise people's quality of life. [3] Although Cook developed the contemporary dental syringe more than a century ago, several advances have only lately been introduced to the conventional drug delivery devices. These include the wand, vibrato-tactile tools such as the VibraJect, Accupal, Dental Vibe, Syringe Micro Vibrator, Jet Injections, and intra-osseous anesthetic systems such as the Stab Dent, X Tip, Interflows, Safety Dental Devices, Dent Patches, etc. [4]

RECENT ADVANCES IN LOCAL ANESTHESIA DELIVERY DEVICES [5]

- Vibrotactile devices
 - Vibraject
 - DentalVibe
 - Accupal
- Computer- Controlled local anesthetic delivery systems
 - Wand/ Compudent system
 - Comfort control syringe
- Jet Injectors
 - Syrijet
 - MED- JET H III
- Safety Dental Syringes
 - Ultra Safety Plus XL Syringe
 - Ultra Safe Syringe
 - HypoSafety Syringe
 - SafetyWand
 - RevVac™ safety syringe
- Devices for Intra- Osseous Anesthesia
 - Stabident
 - X- Tip
 - IntraFlow

Vibrotactile Devices:

- VibraJect: It is a tiny, battery-powered add-on that attaches to the common dental syringe. It sends a strong enough high-frequency vibration to the needle for the patient to feel. [6]
- DentalVibe: DentalVibe, a freshly created device, vibrates when dental injections are given to stimulate the mechanoreceptors and minimize pain. The handheld, cordless device has a U-shaped vibrating tip that transmits percussive micro- oscillations to the injection site. [7]
- Accupal: It is a cordless device that uses pressure and vibration to treat the mouth mucosa. Michael Zweifler is the one who developed this device. Accupal applies pressure in addition to vibrating the injection site 360 degrees in the area where the needle punctured and shut the "pain gate." After being placed at the injection site, the unit vibrates and light pressure is applied. The needle, which is inserted into a hole and has a disposable tip head, is attached to the battery-operated motor.[8]

Computer- Controlled Local Anesthetic Delivery System

The development of local anaesthetic delivery devices that used computer technology to regulate the anaesthetic solution's rate of flow through the needle started in the middle of the 1990s. Computer-controlled local anaesthetic delivery (CCLAD) is the name given to this idea nowadays. [9]

- Wand/ Compudent system: This technique allowed the operator to deliver the LA with a foot-activated control and precisely manipulate needle placement with fingertip accuracy. In comparison to a conventional syringe, the lightweight handpiece is held in a pen-like grip, giving the user more tactile sensation and control. Computer-controlled available flow rates for LA administration ensure consistency from one injection to the next. [10] [11]
- Comfort-Control Syringe: It consists mostly of a base unit and a syringe. Many of the unit's operations, most notably injection and aspiration, may be managed directly from the syringe, which might make it simpler for medical professionals used to the conventional manual syringe to get the hang of using it. The Comfort Control Syringe may be used for all injection procedures and has five pre-programmed speeds for various injection techniques. Specific applications, blocks, infiltration, PDL, IO, and Palatal areas govern these accordingly. [12]

Jet Injectors

By using mechanical energy to create pressure, jet-injection technology forces the solution through the aperture. It is quick and simple to administer, causes little to no discomfort, causes less tissue damage, has a faster rate of drug absorption, and reduces the risk of infection at the location. Due of their lower bone density, children are its primary users. [13]

- Syrijet: It allows the administration of a variable volume of solution ranging from 0 to 0.2 mL and is fully autoclavable. It accepts the standard 1.8 mL cartridges of LA solution to ensure the sterility of the solution. [14]
- MED-JET H III: Its capacity to use low pressure delivery techniques without sacrificing precision, convenience, and usability—while assuring patient comfort, environmental safety, and user affordability—is what makes the system special. [15]

Safety Dental Syringes

The safety needles protect the healthcare professional from needlestick injuries. As soon as the unique needle is taken out of the tissues, it is protected by a sheath. Safety needles like the Hyposafety syringe, Ultrasafety plus XL syringe, Ultrasafe syringe, SafetyWand syringe, and others are frequently used.[16]

The danger of an unintentional needle-stick injury to a dental healthcare professional after the administration of LA is reduced by using a safety syringe. These syringes have a sheath that 'locks' over the needle as it is taken out of the patient's tissues, eliminating unintentional needle sticks. [17]

Devices for Intraosseous Anesthesia

It entails injecting local anaesthesia right into the cancellous bone cavities next to the tooth or teeth that need anaesthetic. It offers pulpal anaesthesia with a quick onset. Stabident, X-Tip, and Intraflow are examples of devices frequently used in IO systems. Two methods can be used with these IO systems, which are two-step and one-step techniques. In two-step technique, a bur is first used to penetrate the bone using a slow speed handpiece, then local anaesthetic is placed. The one-step approach (IntraFlow™ Anaesthesia Delivery System) employs a slow-moving handpiece with a transfuser and perforator needle to penetrate the bone while simultaneously delivering anaesthesia. A foot pedal is used in the one-step approach to control the flow. [18]

CONCLUSION

One of the paediatric dentist's top priorities is pain management. The majority of patients typically fear needles and the agony they cause. The aforementioned strategies can be much more helpful for improving patient apprehension to overcome that. Additionally, it will raise the standard of care that the dentist can deliver. These methods can aid in fostering in children a pleasant attitude towards receiving dental care. Even if some of the methods require a lot of time and money, they are tried-and-true. It must be used in accordance with the treatment kind, viability, and user-friendliness.

REFERENCES

1. Milgrom P, Weinstein P, Getz T. Treating fearful dental patients. A patient management handbook. 2nd edition. Seattle (WA): continuing dental education, University of Washington. 1995.
2. Al-Omari WM, Al Omari MK. Dental anxiety among university students and its correlation with their field of study. Journal of applied oral science. 2009.
3. Hardy PAJ. Chronic pain management: the essentials. Greenwich medical media. 1997.
4. Ammal M. Advances in local anesthesia drug delivery systems- a review. Oral health and dentistry. 2017.
5. Saxena P, Gupta SK, Newaskar V, Chandra A. Advances in dental local anesthesia techniques and devices: An update. National journal of maxillofacial surgery. 2013.
6. Ogle OE, Mahjoubi G. Advances in local anesthesia in dentistry. Dental clinics of North America. 2011.
7. Ching D, Finkelman M, Loo CY. Effect of the DentalVibe injection system on pain during local anesthesia injections in adolescent patients. Pediatric dentistry journal. 2014.
8. Saxena P, Gupta SK, Newaskar V, Chandra A. Advances in dental local anesthesia techniques and devices: An update. National journal of maxillofacial surgery. 2013.
9. New Orleans, Louisiana, USA: 2008. Proceedings of the 1st annual computer- controlled local anesthesia delivery(C-CLAD) system meeting. Introductory remarks.
10. Gibson RS, Allen K, Hutfless S, Beiraghi S. The wand vs. traditional injection: A comparison of pain related behaviors. Pediatric dentistry journal. 2000.
11. Nicholson JW, Berry TG, Summit JB, Yuan CH, Witten TM. Pain perception and utility: a comparison of the syringe and computerized local injection techniques. Journal of general dentistry. 2001.
12. Tan PY, Vukasin P, Chin ID, Ciona CJ, Ortega AE, Antone GJ, et al. The wand local anesthetic delivery system: a more pleasant experience for anal anesthesia. Disease of the colon and rectum. 2001.

13. Singh N, et al. Painless anesthesia: a new approach. *Journal of dentofacial sciences* 2. 2016.
14. Clark TM, Yagiela JA. Advanced techniques and armamentarium for dental local anesthesia. *Dental clinics of north america*. 2010.
15. Malamed SF. Local anesthesia. *Journal of california dental association*. 1998.
16. Anderson Zn, Podnod SM, Shirley- King R. Patient satisfaction during the administration of local anesthesia using a computer-controlled local anesthetic delivery system. *Dermatology nursing*. 2003.
17. Malamed SF. %th edition. St Louis: Mosby-Year Book; *Handbook of local anesthesia*. 2004.
18. Remmers T, Glickman G, SpearsR, He J. The efficacy of IntraFlow intraosseous injection as a primary anesthesia technique. *Journal of endodontics*. 2008.

