Original Article

Painless Analgesia: A Review

Dr. Rachita Arora[1*], Dr. Sayan Chattopadhyay[2], Dr. Amitava Bora[3]

[1*]Assistant professor, Department of Pediatric and Preventive Dentistry, Burdwan dental college and hospital, WB.
[2]Assistant professor, Department of Oral medicine and Radiology, Burdwan dental college and hospital, WB.
[3]Assistant professor, Department of Pediatric and Preventive Dentistry, Burdwan dental college and hospital, WB.

***Corresponding Author:** Dr. Rachita Arora

*Assistant professor, Department of Pediatric and Preventive Dentistry, Burdwan dental college and hospital, West Bengal, Email: rachita.arora1@gmail.com Ph. No. 9431342682
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Abstract

"Pain is such an uncomfortable feeling that even a tiny amount of it is enough to ruin every enjoyment." Nothing done by a dentist for a patient is of greater importance than the administration of a drug that prevents pain during dental treatment. Yet, it is unfortunate that the very act of administering a local anesthetic frequently induces great anxiety and pain in the recipient. Needle sticks are the most common and the greatest source of procedural pain in the world. Though practiced, the conventional techniques of local anesthesia have failed considerably in providing complete relief from pain. Thus, several alternative techniques are continuously designed and devised for an effective and efficient delivery of local anesthetic. Knowledge of these techniques may broaden the dentist's ability to provide appropriate, painless local anesthesia efficiently. This review article highlights the popular techniques of painless analgesia.

INTRODUCTION

Pain is a highly complex and multi-dimensional phenomenon that energizes the organism, regardless of real or apparent tissue damage, to act in relieving or alleviating its presence. The sensation of pain is not necessarily dependent on tissue damage; it may also be generated by conditioned stimuli such as the sound of the drill or a gentle touch of the needle during local anesthetic injection. One of the most distressing aspects of dentistry for the average dental patient is the fear and anxiety caused by the dental environment, particularly the dental injection, referred to as "Needle-phobia" or "Blenophobia". Many children and even adults are afraid of syringes and needle insertions. This procedure is considered unpleasant from physical, chemical and psychological standpoints.

Consequently, research has continued, in both medicine and dentistry, to seek new and better means of managing pain associated with many surgical treatments. Much of the research has focused on improvements in the area of local anesthesia-safer needles and syringes, more successful techniques of regional nerve block, and newer drugs.

JET INJECTORS

The first jet injector was developed by Mr. Banker who succeeded in developing the Med-E-Jet injector used in the mass immunization of more than 1 billion people during two decades following the World War II. It is based on the principle that liquids forced through very small openings, called jets, at very high pressure can penetrate intact skin or mucosa.[1]

Although the anesthetic injection with jet injection was envisioned, the disposal anesthetic drug that could have been used by the Med-E-Jet injector was not available. The current success of the design of jet-injector syringes, which are disposable and relatively inexpensive, will lead to worldwide use of jet injection techniques of anesthesia and local jet anesthesia of the skin.[2] The most used jet injectors in dentistry are the Syrijet Mark II, and the Madajet. The Syrijet holds any 1.8 ml dental cartridge of local anesthetic and is calibrated to deliver 0.05 to 0.2 ml of solution at 2000psi.[1]

Advantages

The multiple advantages of a new JI syringe are:
- The initial high cost of jet injectors is eliminated[2]
- Rapid onset of anesthesia[3]
- Predictable topical anesthesia of soft tissues[3]
- Controlled delivery of anesthetic dose[3]
- High patient acceptance, especially in instances of needle phobia[3]
- No needles are used for filling the JI syringe or to inject the patient; therefore no transmission of infection to the patient from healthcare workers, or vice versa, can occur.[2]
- Jet injection causes no pain or stress reaction; hence multiple injections can be given over several hours to patients undergoing ambulatory surgey, with little or no discomfort.[2]
- Once the JI syringe is used and emptied of CO_2 gas, it cannot be reused by addicts.[2]
- The reduction in AIDS and Hepatitis epidemics can be achieved by the needle less syringes.[2]

- It is completely autoclavable[4]

Disadvantages

- Regional nerve blocks or supraperiosteal injections may still be necessary for complete anesthesia.[1]
- Relatively expensive when compared with traditional syringes[1]
- Have the potential to frighten the patients with the sudden noise and pressure sensaton that occurs on delivery of local anesthetic[3]
- The intrusive appearance of the device[3]
- The possibility of small residual hematomas and damage to periodontal tissues[3]
- Leakage of the anesthetic and questionable efficacy for pulpal anesthesia.[3]
- Topical anesthetics, applied properly, serve the same purpose as jet injectors at a fraction of the cost and with minimum risk.[1]

Applications [5]

The clinical uses that can be employed with the jet injector are:-

- Placement of rubber clamps
- Placement of retraction cords
- Creation of drainage incisions for abscesses
- Placement of orthodontic bands or space maintainers
- Extraction of deciduous teeth
- Curettage and scaling
- Minor gingivectomies
- Exposed pulp anesthesia
- Removal of residual spicules
- Pre injection anesthesia in maxillary and mandibular areas
- Pre injection in palatal area

Additionally, jet injector has been used in root canal procedures by removing the distance cone (plastic tip) and position the tip of the nozzle over the canal and firing anesthetic directly into the canal.
For the extraction of deciduous teeth, the technique employed is to inject at the inter-apical areas from the lingual and buccal aspects.

Studies on tissue penetration characteristics produced by jet injection indicate that the circumferential spread and depth of solution is a function of the volume solution injected and the nozzle pressure. The Syrijet Mark II has a nozzle pressure of 2000 pounds per square inch, and at this pressure it was found that jet injection provides penetration and infiltration roughly comparable to that produced by needle injections to near 1 cm depth, with quantities upto 0.2 ml per injection.[5]

Side Effects[4]

Most of the side-effects encountered are based on misuse of the instrument by the operator. The biggest single problem seems to be an attempt by many operators to duplicate with the Syrijet the conditions of injection when using an ordinary syringe and needle. As a result, the operator incorrectly points the instrument towards the apex of the tooth (often at an angle, as with a needle syringe), and, because he feels that the success of the injection is directly related to the amount of anesthetic solution deposited in the tissues, he may turn up the volume setting on the instrument as high as he can. Since a jet injection device propels local anesthetic solution into tissue very rapidly by means of mechanical spring pressure and operates quite differently from a conventional needle and syringe, a reorientation in approach to instrumentation is required on the part of the operator in order to get maximum effectiveness.

Precautions[4]:

- The instrument should rest firmly in the hand, with the fingers around it.
- Since pressure against the tissue is contraindicated, a finger rest can be used on the undersurface.
- The nozzle should be directed at the attached gingiva as high as possible at right angles to the tissue.
- Except for palatal injections, all injections should be in attached gingiva. The nozzle should rest gently against the tissue, and not be pressed up firmly against it.
- There is also some tendency to move the instrument away from the tissue or direct it at an angle at the time of injection, in which case a blasting or slicing effect would be created.
- The lip should be lowered around the instrument so as not to stretch the tissue during the injection, and kept lowered immediately following the injection.
- The site should be dried just prior to the injection, since dry tissue will accept solution more readily, and dry tissue will inhibit the instrument from sliding and going off at an angle.
- It is not necessary to inject more than the optimal quantity of solution-no more than 0.1 cc is required for upper anterior teeth, 0.15 cc for lower anteriors or a mental nerve injection, and 0.05 cc for all lingual or palatal injections.
- Whenever necessary, multiple injections can be made using the quantities indicated, and any local anesthetic solution with a vasoconstrictor can be used. Using higher quantities of solution does not yield better results, but instead can cause bleeding, ballooning and tearing of tissue as well as postoperative soreness.

- While jet injection procedures are "needleless" with regard to the patient, there is a needle inside the instrument which pierces the rubber diaphragm of the cartridge of local anesthetic solution. It is important not to bend this needle, because if the needle is bent it may bring the bevel of the needle up against the glass wall of the vial, causing an incomplete filling of the liquid chamber upon cocking, as well as the production of air under pressure in the well.
- The cartridge of anesthetic solution should be inserted into the cartridge well parallel to the long axis of the instrument and then moved up onto the needle, instead of being inserted at an angle onto the needle. This same procedure, in reverse, should be used in removing the cartridge.

ELECTRONIC DENTAL ANESTHESIA

An alternative method of pain control, which has received little attention in dentistry, is **Transcutaneous Electrical Nerve Stimulation** (TENS) also known as Electronic Dental Anesthesia (EDA). Although the concept of TENS is not new in medicine, it has yet to gain widespread acceptance in dentistry.
The use of TENS in dentistry was first described by Shane and Kessler in the year 1967.[6]
Malamed *et al* used the term Electronic Dental Anesthesia (EDA) when referring to the applications of TENS to dentistry.[1]
EDA is non-invasive, safe and well accepted by the patients. It has been shown that EDA is a viable mode of pain control during some dental procedures in pediatric dentistry and it appears to be a substantial alternative to the other conventional local anesthetic techniques.[7]

Mechanism of Action [8]

The use of TENS is based on several interrelated theories on the mechanism of pain transmission and the blocking of these mechanisms.

The first of these theories is the gate control theory proposed by Melzac and Wall. Another explanation for the effectiveness of TENS is that the electric stimulation causes a release of endorphins, which attaches to opiate receptors and blocks transmission of painful stimuli.

Another theory is that serotonin, dopamine, and norepinephrine are produced, which have roles in the effects of stimulation produced analgesia and that an increase in serotonin has a direct relationship with the analgesic effect produced by TENS.

The exact mechanism of pain control with electronic anesthesia remains unknown and may be combination of one or more theories.

Indications [1]

- Needle phobia
- Ineffective local anesthesia
- Where local anesthetics cannot be administered

Dental procedures to prove successful with EDA are (in descending order of anticipated success)
- TMJ/MPD (chronic pain)
- Administration of local anesthesia
- Non surgical periodontal procedures (acute pain)
- Restorative dentistry (acute pain)
- Fixed prosthodontic procedures (acute pain)
- Endodontics (recommended with local anesthetics/N_2O/O_2)

Contraindications [1]:

- Cardiac pacemakers
- Neurological disorders
- Pregnancy
- Immaturity as in very young pediatric patient/older patients with senile dementia or those with language communication difficulties
- Dental phobics

Advantages [1]:

- No need for needle
- No need for injection of drugs
- Patient is in control of the anesthesia
- No residual anesthetic effect at the end of the procedure
- Residual analgesic effect remains for hours

Disadvantages [1]:

- Cost of the unit
- Training

- “Learning curve”- initial success may be low but increases with experience
- Intraoral electrodes: weak link in the entire system.
- Tingling sensation of the electric current
- Increased salivary flow, which makes moisture control difficult[9]
- Absence of vasoconstrictor which helps to control bleeding in soft tissue procedures[9]
- A small shock could occur on contact of metallic instruments on the mucosal surfaces internal to the electrode pad.[9]

Uses of EDA [9]:

Croll TP has used the EDA in his private pediatric dentistry practice for the following clinical conditions:
- Pain control for anesthetic injections
- Pain relief from rubber dam retainers
- Class I, II, III, and V dental restorations
- Preventive resin restorations of permanent first molars
- Class I, II, III, IV and V restorations of permanent teeth not involving close proximity to the pulp.
- Extraction of primary teeth having much root resorption
- Space maintainer cementation in patients who complain of gingival discomfort
- Placement of retraction cord
- To assist in pain control for older, mentally handicapped patients.
- For anxious but cooperative needle phobic children.

Munshi and associates reported on 40 children, between 5-12 years, who received EDA for minor extractions, restorations and pulpal therapy and concluded that EDA, besides offering safety and psychological advantages, may also be a promising alternative to the conventional methods of local anesthesia.[7]

EUTECTIC MIXTURE OF LOCAL ANESTHETICS (EMLA):

Intact skin is an impervious barrier to the penetration of drugs, including topical anesthetics. For years a drug or technique was sought that would permit needles to be inserted painlessly through intact skin. The development of an oil-in-water emulsion containing high concentrations of lidocaine and prilocaine in base form resulted in EMLA, which has been seen to provide anesthesia of skin profound enough to permit venipuncture to be performed painlessly.[1]

Composition:

Each gram of Eutectic mixture of local anesthetics contains Lidocaine 25 mg and prilocaine 25 mg in the ratio of 1:1 by weight. Lidocaine and Prilocaine have melting points of 66-69˚C and 36-38ºC respectively. However, when these agents are combined in eutectic form, the melting point of the mixture is lowered to 17ºC. This new physical property allows the anesthetic agent to form oil at mouth temperature (37ºC) and thus facilitate absorption of the local anesthetic agents.[10]

Various investigators have used different timings for EMLA application viz. 2 minutes, 3 minutes, 5 minutes and 10 minutes. 5 minutes of application time is considered to be the tolerable limit of practical usefulness in the oral cavity.[11]

Advantages [1]:

- Popular among pediatric populations and needle phobic adults.
- Inexpensive
- Can be left upto 4 hours and duration of action continues for 1 hour after removal.
- Depth of anesthesia increases upto 6 mm during prolonged application.

Disadvantages [1]:
- Toxicity with prilocaine
- Methemoglobinemia
- low viscosity, difficult to localize at the application area
- high cost
- part of the cream may be absorbed into the gauze used for isolation
- unacceptable bland taste

Toxicity of prilocaine has been said as one of the reasons for using EMLA with caution. Two of the metabolites of prilocaine 4-hydroxy, 2- methyl aniline and o-toluidine, are capable of oxidizing hemoglobin to methemoglobin, thus EMLA has potential risk of inducing methemoglobinemia.[12]

Normally, the small amount of naturally formed methemoglobin in healthy adults and children is reduced by Nicotinamide Adenine Dinucleotide Dehydrogenase (NADH) methemoglobin reductase. The amount of this enzyme in 40-60% of the adult values in the umbilical cord blood; levels increase to those of the adults within first 3 months of life.

Hence the increased potential risk of methemoglobinemia has led to the EMLA cream being contraindicated in infants less than 3 months of age.[13]

To date, only one clinically significant case of methemoglobinemia (methemoglobin concentration of 28%) has been reported following the use of EMLA cream. This occurred in a 12-week-old premature infant who received concomitant trimethoprim sulphamethoxozole, a therapy that is also capable of inducing methemoglobin formation.[14]

Subsequently three prospective studies designed to investigate methemoglobin levels have been conducted in children and infants in which methemoglobin levels assess upto 8 hours after the application, were all within a normal range. [15,16,17]

Vickers et al[10] measured plasma levels of lidocaine and prilocaine after intra-oral application of 8 gms of EMLA for the time of 30 min and found highest concentration of lidocaine to be 0.42 g/ml at 30 mins. whereas it was 0.22 g/ml at 30 mins. for prilocaine.

On November 15, 2002, AstraZeneca ceased distributing EMLA cream to drug wholesalers and direct buying retail pharmacies. The product is being redesigned into child resistant closure (CRC) tubes. EMLA with CRC is now available.[1]

Although the drug package insert stated originally that “EMLA is not recommended for use on mucous membranes”, several clinical trials have been published that demonstrated satisfactory results.[1]

Munshi and associates reported on the use of EMLA cream in 30 pediatric patients undergoing a variety of clinical procedures, including extraction of mobile primary teeth, root stumps, and pulpal therapy procedures in the primary teeth using EMLA as the sole anesthetic agent and observed that the use of EMLA could to some extent eliminate the use of needle in procedures performed in pediatric dentistry.[12]

It is suggested that, if EMLA impregnated intraoral patches impermeable to saliva, similar to the ones available for dermal use, are available then it would be a major advance for its use intraorally.

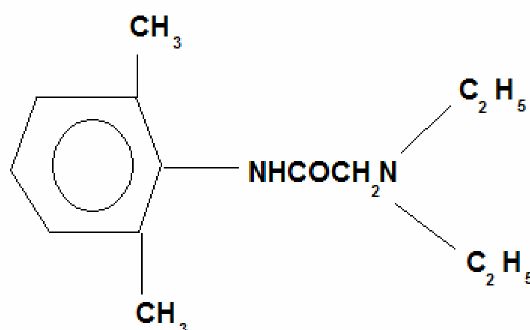
INTRAORAL LIDOCAINE PATCH

Anesthetic patches containing lidocaine base that is dispensed through a bioadhesive matrix and applied directly to the oral mucosa have been approved by the U.S Food and Drug Administration and are commercially available (DentiPatch lidocaine transoral delivery system, Noven Pharmaceuticals Inc.)

These patches are available in 10 and 20 percent concentrations, each containing approximately 23 and 46 milligrams of lidocaine base per 2 square centimeters of patch, respectively.[8]
The lidocaine contained in the matrix diffuses directly through the mucosa while the patch is affixed.

Composition [18]

The active ingredient lidocaine is chemically designated as 2-(diethylamino)-N- (2,6-dimethylphenyl)- acetamide, and has the following structural formula:



The molecular formula of lidocaine is $C_{14}H_{22}N_2O$. The molecular weight is 234.34.
Each unit is sealed in a paper polyethylene –foil pouch.

Mechanism of Action[18]:

The Drug Delivery System (DDS) is applied to the buccal mucosa to provide topical anesthesia by releasing Lidocaine which stabilizes the neuronal membrane by inhibiting the ionic fluxes required for the initiation and conduction of impulses, thereby effecting local anesthetic action.

Onset and Duration of Action [18]:

Anesthesia occurs usually within 2.5 minutes of application, is present for the duration of a 15-minute application period, and persists for approximately 30 minutes following removal.

METABOLISM [18]

Absorption:

Although the total content of lidocaine base contained in each 2 square cm system is 46.1 mg, the total amount of drug absorbed during 15 minutes of application is limited as drug delivery is confined to a fixed surface area. Corresponding blood levels of lidocaine following application are less than 0.1 µg/ml. Assuming the toxic range of lidocaine is approximately 5µg/ml, the maximum plasma concentration achieved from the patch is, therefore, approximately $1/100^{th}$ of this value.

Indications [18]

Production of mild topical anesthesia of the accessible mucous membranes of the mouth prior to superficial dental procedures

To reduce the pain associated with injections of local anesthetic into the gingival tissues.

Contraindications [18]:

Patients with a known history of hypersensitivity to local anesthetics of the amide type or to any other component of the adhesive system.

Precautions [18]:

The DentiPatch system should be used with extreme caution if there is sepsis or extremely traumatized mucosa in the area of application, since under such conditions there is the potential for rapid systemic absorption.

Adverse Reactions [18]:

In the majority of instances, no localized adverse reactions was observed while in controlled clinical trials, the most frequently occurring adverse experiences irrespective of causality were taste perversion, stomatitis (including erythema and other types of mucosal reactions), headache and gingivitis.

Other adverse experiences reported following the administration of lidocaine are similar in nature to those observed with other amide local anesthetic agents like lightheaded-ness, nervousness, apprehension, euphoria, confusion, dizziness, drowsiness, tinnitus, blurred or double vision, vomiting, sensations of heat, cold or numbness, twitching, tremors, convulsions, unconsciousness, respiratory depression and arrest. Drowsiness following the administration of lidocaine is usually an early sign of a high blood level of the drug and may occur as a consequence of rapid absorption:

Cardiovascular manifestations are usually depressant and are characterized by bradycardia, hypotension, and cardiovascular collapse, which may lead to cardiac arrest.

Allergic reactions are characterized by cutaneous lesions, urticaria, edema or anaphylactoid reactions. Allergic reactions may occur as a result of sensitivity either to the local anesthetic agent or to other ingredients in the formulation.

Overdosage[18]:

Acute emergencies from local anesthetics are generally related to high plasma levels encountered during therapeutic use of local anesthetics.

Management of local anesthetic emergencies: The first consideration is prevention, best accomplished by careful and constant monitoring of cardiovascular and respiratory vital signs and the patient's state of consciousness after each local anesthetic administration. At the first sign of change, oxygen should be administered.

If not treated immediately, both convulsions and cardiovascular depression can result in hypoxia, acidosis, bradycardia, arrhythmias and cardiac arrest. If cardiac arrest should occur, standard cardiopulmonary resuscitative measures should be instituted.

Dosage and Administration [18]

When the DentiPatch® system is used concomitantly with other products containing lidocaine, the total dose contributed by all formulations must be kept in mind.

Wu SJ and Julliard K compared the pain, acceptance, and preference associated with 2 topical anesthetics: benzocaine gel and lidocaine patch (Denti Patch). At the first visit, 80% of subjects selected Denti Patch; 60% of subjects made their choice based on appearance. Younger children more than older children were influenced by appearance in their selection. The gel had greater scores than the patch for the Sounds pain value and for the SEM scale composite score. The lidocaine patch was associated with some objective evidence of reduced pain compared to the gel and was preferred by most children. [19]

COMPUTER CONTROLLED LOCAL ANESTHETIC DELIVERY SYSTEM:

The standard dental syringe is a simple mechanical instrument that dates back to 1853 when Charles Pravaz patented the first syringe. Due to the drawbacks associated with various conventional syringes; in 1997, the first computer controlled local anesthetic delivery (CCLAD) system was introduced into dentistry termed as: the Wand (recently renamed: the Wand/Compu Dent; Milestone scientific, Inc., Livingston, NJ) to improve on the ergonomics and precision of the dental syringe.[1]

This system enables the operator to accurately manipulate needle placement with fingertip accuracy and deliver the local anesthetic with a foot-activated control.

Hochman and associates were the first to demonstrate a marked reduction in pain perception for injections using CCLADs.[1]

At present, two CCLADs are available in North America: the Wand/CompuDent system and the Comfort Control Syringe. Another system, the Quick Sleeper, is marketed in Europe. Similar devices, such as the Anaject, are marketed in Japan.

THE WAND/COMPUDENT:

Components [3]:

- Pump unit
- Power cord
- Foot pedal
- Transfuse tubing
- Disposable handpiece assembly
- Cartridge holder
- A Luer-Lock needle.

A conventional medical Luer-Lok needle is attached to the handle. Luer-Lok needles are available in lengths and gauges similar to conventional dental needles.

The handle (the “Wand”) attaches to a cartridge holder via a 60 inch microtube, the inner diameter of which is 0.013 inch and can hold a volume of less than 0.2 ml of fluid. The cartridge holder accepts any standard 1.8 ml dental anesthetic cartridge.

The Wand system administers local anesthetic at two specific rates of delivery. The slow rate is 0.5 ml/min and the fast rate is 1.8 ml/min. An aspiration test can be activated at anytime by simply releasing the pressure on the foot-rheostat starting a 4.5 second aspiration cycle.[1]

Advantages:

This system offers several advantages over conventional syringes:

- Excellent tactile sensation afforded by the light weight plastic handle[20]
- Wand handpiece is less threatening to the patient compared with other injection devices.
- The pen like grasp has the additional advantage of allowing the operator to rotate the handpiece during penetration and insertion, producing a “core” penetration that minimizes needle deflection.[1,20]

Hochman and Friedman demonstrated that rotation of the handpiece and needle minimizes both needle deflection and the force necessary for tissue penetration during needle insertions.[1]

- Greater accuracy can be obtained for injections such as the inferior alveolar block injections where deeper tissue penetration is necessary.[1]
- The system delivers a controlled rate of flow and controls the pressure developing within the tissues irrespective of the type of tissues into which the local anesthetic is to be deposited. Therefore, even tissues with low elasticity receive a constant pressure and rate of flow, resulting in a more favorable outcome and reduced pain perception especially in areas of high tissue resistance (hard palate, attached gingival, periodontal ligament).[1]
- All techniques of local anesthesia, such as maxillary and mandibular infiltration, mandibular block, intraligamentary, and anterior middle superior alveolar injection(AMSA) can be performed with the Wand system.[8]
- Anesthetic solution gently pumped into the soft tissue can be absorbed at the same rate by soft tissue in the Wand system. The theory is that when the needle is advanced slowly, the drops of solution anesthetize the tissue ahead of the needle.[21]
- Automatic aspiration[1]

Disadvantages [20]:

- The physical equipment is approximately $1000 and there is a per use cost of $1.25 for the tubing and luer lock needle tip.
- The Wand requires significantly more time to administer anesthesia.
- Additional armamentarium is required.

COMFORT CONTROL SYRINGE[2]:

Introduced several years after the Wand, the Comfort Control Syringe (CCS) system attempts to improve on the CCLAD concept.

The CCS system is an electronic, preprogrammed delivery device that provides the operator with the control needed to make the patient's local anesthetic injection experience as pleasant as possible.

The CCS is a two stage delivery system; the injection begins at an extremely slow rate to prevent the pain associated with quick delivery. After 10 seconds, it automatically increases speed to the preprogrammed injection rate for the technique selected.

There are five preprogrammed injection rates for specific injections.

The handpiece controls are:-

Front button- controls the start/stop function.

Middle button- aspiration function

Rear button- initiates double rate. It doubles the preprogrammed injection rate

Advantages[1]:

- Familiar "syringe" type of delivery system
- Easy to see exactly how much local anesthetic solution has been dispensed.
- Inexpensive disposables (~50 c/use)
- All controls at fingertips
- Less costly than other CCLADs
- Allows selection of various rates of delivery matched to the injection technique utilized.

Disadvantages[1]:

- Requires additional armamentarium
- More bulky than other computer controlled or manual local anesthesia delivery devices.
- Vibration may bother users.
- Cost

AMSA AND P-ASA INJECTION:

CCLAD technology has led to the development of two newly described nerve block techniques that have been reported; the anterior middle superior alveolar (AMSA) injection and palatal approach- anterior superior alveolar (P-ASA) have been described by Friedman and Hochman using the CCLADs.

AMSA INJECTION:

First reported by Friedman and Hochman in 1997, this technique provides pulpal anesthesia on multiple maxillary teeth (incisors, canine and premolars) from a single injection site[22].

The AMSA provides pulpal anesthesia from the central incisor through the second premolar and the palatal tissue associated with these teeth with one needle penetration using three-quarters of a cartridge of anaesthetic.[1] A bilateral AMSAI anaesthetizes 10 maxillary teeth extending from the second premolar to the contralateral second premolar and the associated palatal tissue.[22]

P-ASA INJECTION [23]:

The technique was described by Friedman and Hochman.

The palatal approach-anterior superior alveolar (P-ASA) nerve block is a new block injection technique that provides anesthesia of the maxillary anterior teeth from a single injection without numbness of the face, lips, and muscles of facial expression.

This technique allows anesthesia of the six maxillary anterior teeth, the anterior third of the palate, and the facial gingiva from a single site injection.

The 0·9–1·4 mL dosage recommendation for this block injection is significantly less than for a traditional supraperiosteal approach.

The injection is performed with a 30-gauge, ultra-short needle.

The needle bevel is placed against the palatal tissue, without puncturing the tissue, and a plain cotton roll is firmly pressed on the needle tip for the prepuncture phase of needle insertion. The Wand is activated at a slow rate and the needle is slowly advanced approximately 1-2 mm.[FIG.6]

The handpiece is then reoriented to an angle parallel to the facial aspect of the maxilla to gain entrance into the incisive canal. The needle is axially rotated at 45 degrees and slowly advanced into the canal.

The aspiration cycle is activated by tapping the foot pedal. The needle is inserted to a depth of atleast 3 mm and no more than 5 mm. Approximately 1 mL of anesthetic solution is delivered and aspiration is activated again. .

Palatal injections reportedly are less painful when the Wand device is used instead of conventional syringes. A more recent study, however, evaluated three types of injections (that is, middle superior alveolar infiltration, palatal infiltration of maxillary first premolars and inferior alveolar block) in 40 subjects with a split-mouth design. Overall, the Wand

produced less pain than a traditional syringe in 15 (83 percent) of 18 statistical comparisons, but statistical significance was found in only four (27 percent) of these 15 comparisons. Because the mean ratings for both injections were mostly “mild” pain, the authors advised that the clinical significance of the results should be interpreted with caution.[20]

Liberman’s impression of the WAND on paediatric dental patients, was that they found the method most comfortable, and it was a good tool for building positive dentist–patient relationships.[8]

Studies on the Wand system have mainly been conducted on adult patients, with only one study conducted on children. In this study a group of children who received a conventional injection were compared with other children who received local anaesthesia delivered with the Wand. No significant difference was found between pain perception following conventional injection and use of the Wand system.[8]

Vibrotactile devices like Vibraject (Miltex Inc, York, PA) and Dentalvibe (Bing Innovations, LLC, USA) use vibrations or pressure to relieve pain. Vibrations or pressure act as non noxious stimuli that interfere with pain signals by closing the neural gate of cerebral cortex. The cerebral cortex gets focused on vibration which inturn causes distraction from pain.[24]

INTRA-OSSEUS AIDS FOR ANESTHESIA:

The Intraosseous (IO) injection involves placement of a local anesthetic directly into the cancellous bone adjacent to the tooth to be anesthetized, and is used primarily in endodontic practice for patients with irreversible pulpitis and/or acute periradicular inflammation
It involves placement of local anesthetic directly in the cancellous bone adjacent to the tooth that needs to be anesthetized. It is primarily used in endodontic practice. This is a supplemental anesthesia that delivers high dose of anesthetic closer to the apex of the tooth.[25] Commercially available intra osseus delivery systems are Stabident and Xtip.
The main disadvantage of this system is it requires a lot of precision and training and is difficult to perform in posterior areas with limited accessibility and thicker bone in mandible.[24]

CONCLUSION

Credit for the revived interest in these non conventional routes and local anesthetic delivery methods probably goes in large part to the device manufacturers in their attempt to simplify delivery techniques. As the information illustrates, there are benefits and limitations inherent with each technique. The trend towards evidence-based dentistry mandates that our therapies be based on sound scientific knowledge whenever possible. Consequently, when electing to enhance the local anesthetic arsenal, the clinician must be knowledgeable beyond the marketing hype that usually accompanies any new product.

The ultimate safety and effectiveness of local anesthetic injections is still predicted on basic concepts and constructs that have become well-established over many years. Without knowledge and, more importantly, without adherence to the basic tenets, the likelihood of therapeutic misadventure is greatly increased.

It is hoped that dental investigators will appreciate the importance and initiate appropriate clinical trials where scientific studies to substantiate the non conventional techniques are lacking.

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