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AN ADVANCEMENT IN THE DELIVERY OF LOCAL ANESTHESIA

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An Advancement in the Delivery of Local Anesthesia

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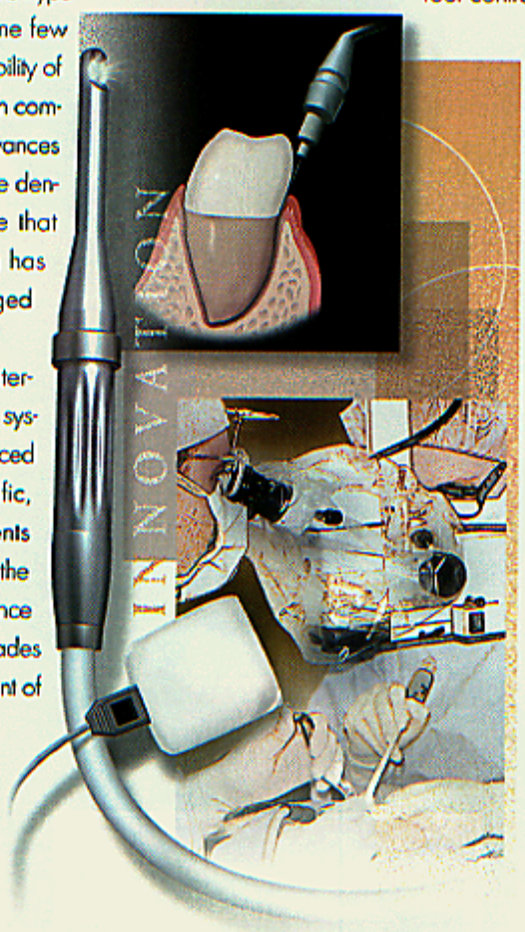
A comprehensive review of the literature indicates that the hypodermic syringe was first invented in 1853, and that local anesthesia was subsequently performed (using cocaine) over 30 years following its inception. While a local anesthetic cartridge and syringe combination was introduced in 1920, the hypodermic syringe has undergone few modifications aside from the ability of a modern syringe to aspirate. In comparison with the numerous advances in technology elsewhere in the dental industry, it is remarkable that the cartridge-syringe design has remained relatively unchanged for more than 75 years.

A revolutionary computer-regulated anesthetic delivery system has recently been introduced (the Wand, Milestone Scientific, Livingston, NJ); this represents the first significant advance in the local delivery of anesthesia since the syringe was invented decades earlier. The primary improvement of this system in comparison with the traditional syringe is the microprocessor-controlled delivery of anesthetic solution at a regulated pressure and volume. This precise control allows clinicians to administer injections with accuracy and ease, and without patient discomfort (Table 1).



Computer-Regulated Local Anesthesia

The computer-regulated anesthetic delivery system consists of two components: a sterile, disposable handpiece set and a computer-controlled drive unit. The system utilizes a standard local anesthetic cartridge that is linked by sterilized tubing to a disposable, lightweight plastic handle that facilitates the attachment of a Luer lock needle. The computer-regulated system is actuated by a foot control that automatically standardizes the flow rate and volume of local anesthesia, which results in a comfortable, effective injection experience. The clinician's ability to maintain an ideal flow rate of anesthetic solution in combination with a slow needle insertion (anesthetic pathway) facilitates a virtually pain-free anesthetic injection. Traditional blocks, palatal and infiltration injections are similarly administered with ease, precision, and enhanced patient comfort.

A recent clinical study indicated that 48 of 50 dentists who volunteered to receive palatal injections with the computer-regulated anesthetic delivery system experienced a significant decrease in the level of discomfort compared to a traditional syringe for the identical injection.[1] The operators also experienced reduced stress levels during the administration of the palatal injection with this novel system.

The computer-regulated anesthetic delivery system has also demonstrated the capacity to deliver traditional inferior alveolar and maxillary nerve block injections.[2] During penetration, the tactile control of the needle is heightened by a pen-grasp on a disposable handle, which allows the operator to concentrate on the precise

Table 1

Five Important Components of the Injection System

- Nonthreatening appearance, reduces patient anxiety and fear.
- Enables comfortable needle insertion.
- Efficient suffusion ensures rapid onset of anesthesia.
- Delivery of site-specific anesthesia eliminates facial numbness.
- Computer-controlled pressure/volume ensures predictable anesthetic delivery.

placement of the needle while the anesthetic solution is regulated by the computer. Additional benefits include the elimination of needle deflection (by rotating the needle during insertion), the infrequency of missed blocks, and a reduction by several minutes in the time required for onset of the anesthesia.

The Computer-Regulated Periodontal Ligament (PDL) Injection

The computer-regulated anesthetic delivery system distinguishes itself from a manual syringe by the generation of a precise anesthetic flow rate. Due to this capacity, it is routinely utilized to perform PDL injections with little physical exertion. The leakage of anesthetic solution is thereby greatly reduced, and the danger of cartridge explosion is eliminated. Two insertion sites are utilized for mandibular teeth; the first at the mesiolingual line angle and the second at the distolingual line angle. The individual tooth insertion sites for maxillary teeth are the distofacial and mesiofacial line angles.

The New Anterior Middle Superior Alveolar Nerve (AMSA) Block

A novel injection technique for the maxillary arch was discovered utilizing the computer-regulated anesthetic delivery system.[3] The clinician is able to anesthetize several teeth in the maxillary arch (extending from the mesiobuccal root of the first molar to the central incisor) by means of a single palatal infiltration. This injection technique has several significant benefits, including patient safety and comfort as well as operator ease and predictability. In addition, it may be possible to properly anesthetize a specific treatment site without affecting the surrounding facial features.

Computer-Regulated Anterior Middle Superior Alveolar (AMSA) Injection

The AMSA injection site is located at a point that bisects the maxillary first and second premolar midway between the crest of the free gingival margin and the midpalatine suture. Several seconds following the placement of the needle, a definitive blanching of the soft tissue surrounding the injection site can be observed. The blanching indicates that the anesthetic is actively suffusing through the connective tissues, periosteum, and cancellous bone. Approximately 3 minutes are required to administer the anesthetic solution necessary to achieve intrapulpal anesthesia of the central incisor through the second premolar. This is generally followed by a rapid onset of anesthesia that continues for a period of 60 to 90 minutes. The injection may require a longer time period, but onset is significantly faster and fewer injections are required in comparison to traditional methods.

The New Palatal-Anterior Super Alveolar Injection (P-ASA)

The computer-regulated anesthetic delivery system has demonstrated to numerous clinicians that precise control of the anesthetic fluid dynamic is capable of rendering injections that are significantly less painful than previous methods. While the P-ASA is similar to an incisive or nasopalatine nerve block, the operator attempts to enter the incisive canal with the needle after the initial phase of the injection used to anesthetize the incisive papilla. Although textbooks on anesthesia indicate that an incisive block is an extremely painful procedure,[4] computer-regulated P-ASA techniques can be virtually painless. The slow and steady flow rate allows the operator to

Table 2

Computer-Regulated Anesthetic Injection Protocols

- The computer-regulated periodontal ligament (PDL) injection.
- The new anterior middle superior alveolar nerve (AMSA) block.
- Computer-regulated AMSA injection.
- The new palatal-anterior super alveolar injection (P-ASA).

comfortably administer the desired portion of anesthetic at the incisive block. The volume of administered anesthetic generally results in profound, bilateral, pulpal anesthesia of the incisors and canines. The major benefits of this procedure are that a single injection efficaciously results in the bilateral anesthesia of multiple teeth. The palatal soft tissue is anesthetized, and a moderate degree of facial gingival anesthesia is often observed. The lips, face, and muscles of expression are unaffected, however, rendering this an optimal injection protocol for aesthetic restorative dentistry in which smile-line assessments are paramount.

Conclusion

The computer-regulated anesthetic delivery system outperforms traditional syringes for the majority of injections. This new system generates a precisely controlled anesthetic flow rate that eliminates the manual pressure required of the operator to administer the injection. The lightweight handle results in greater tactile feedback, precision, operator ease, and patient comfort. Its greatest advantage may be in the novel techniques that it is capable of performing (Table 2). The AMSA and P-ASA techniques are often able to anesthetize the teeth targeted for treatment without the complications of facial numbness. In addition, traditional inferior alveolar blocks are completed more accurately with the computer and often faster than with a traditional syringe. The computer-regulated anesthetic delivery system is a viable alternative to traditional local anesthetic administration that reduces the fear and anxiety of dental patients, as well as offering an exciting advance in technology and technique for local pain control.

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