

Maximizing

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Pain Control

The AMSA Injection can provide anesthesia with fewer injections and less pain.

LOCAL ANESTHESIA is often required when performing scaling and root planing. It not only provides adequate pain management for patient comfort, local anesthesia also enables the clinician to thoroughly complete therapeutic procedures without fear of hurting the patient.

Until recently, providing maxillary anesthesia for therapeutic periodontal procedures required providing four or five separate block or infiltration (also called field block) injections to achieve the level of anesthesia required for scaling and root planing.¹ They include the anterior superior alveolar (ASA), middle superior alveolar (MSA), and posterior superior alveolar (PSA) infiltration injections for buccal anesthesia, and the greater palatine (GP) and nasopalatine (NP) blocks for lingual anesthesia. This series can be modified by substituting the infraorbital (IO) block for the ASA and MSA, thus reducing the number of injections required by one.

In 1997, Friedman and Hochman defined the AMSA (anterior, middle superior alveolar) nerve block.² This new field block produces anesthesia to multiple maxillary teeth as well as the associated gingival tissues from a single palatal insertion. Because it is administered from the palate instead of the muccobuccal fold, it does not produce the same collateral anesthesia associated with a

traditional ASA and MSA. Thus, the upper lip, face, and muscles of facial expression remain unanesthetized.

The AMSA successfully anesthetizes the teeth extending from the buccal roots of the first molar to the central incisor, the entire palatal gingiva to the mid-palate, and the buccal gingiva from the buccal roots of the first molar to the midline (Figures 1 and 2). Used in conjunction with the PSA, these two injections can completely anesthetize the maxillary arch and replace the entire series of injections previously described.

There are several potential advantages in reducing the total number of local anesthetic injections required for maxillary anesthesia including: decreased volume of dispensed local anesthetic and vasoconstrictor drugs,

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Figure 1) Extent of anesthesia created by the AMSA injection on the buccal of the maxilla demonstrated on a skull.

Figure 2) Injection site of the AMSA injection on the palatal bone of the maxilla demonstrated on the skull.

Figure 3) The computer-controlled local anesthetic device (The WAND, Milestone Inc).

Figure 4) Injection site for the AMSA injection on the lateral palate toward the midline.

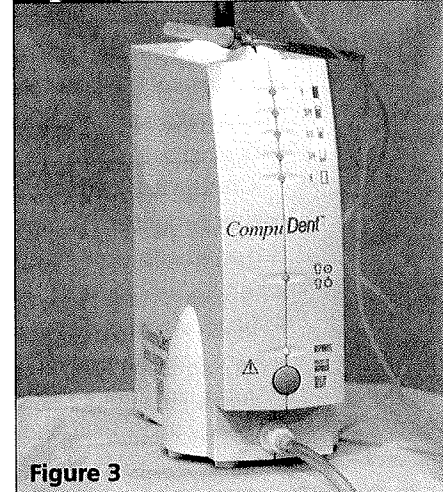
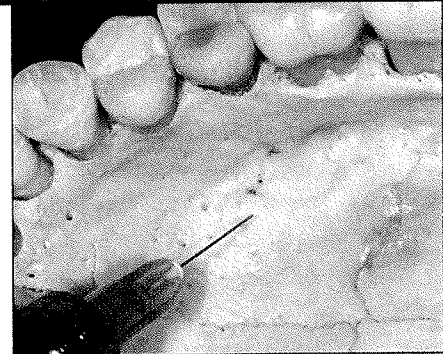
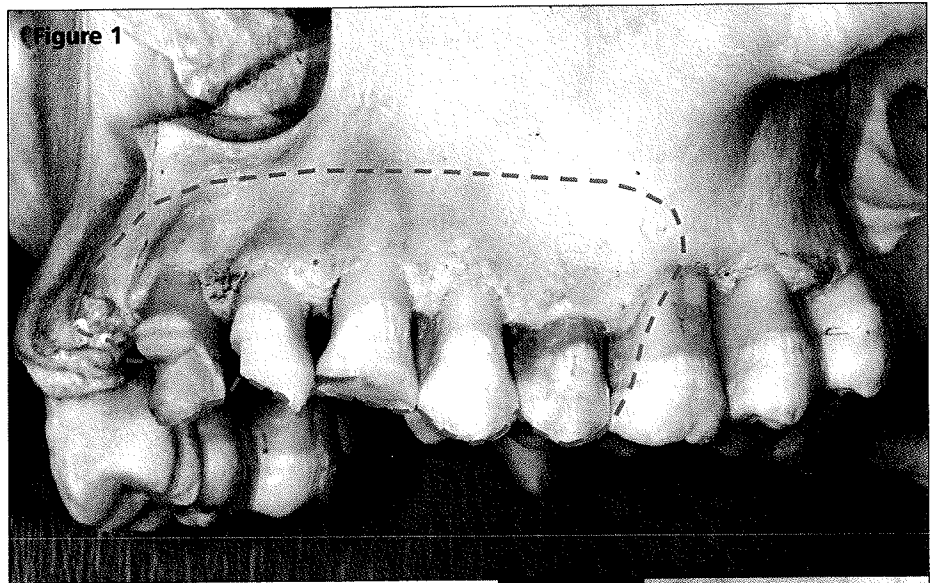


Figure 3

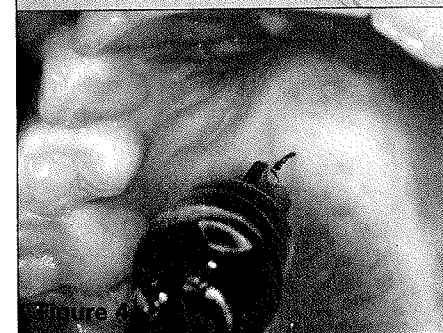


Figure 4

shortened overall injection time, and reduced patient and operator anxiety. Anxiety is increased for both patients receiving local anesthetic injections and for clinicians who routinely administer them.³ Replacing the conventional series of maxillary injections with the AMSA and PSA reduces the overall number of injections required for half-mouth maxillary anesthesia, and may contribute to a reduction in anxiety in relation to pain during treatment.⁴

MODE OF ACTION

The AMSA injection is administered in the mid portion of the anterior palate, through the fibrous palatal tissue. The anesthetic is deposited in close proximity to the palatal bone, which is porous enough to permit the anesthetic solution to diffuse through the tissues and anesthetize both the anterior and middle branches of the superior alveolar nerve. The successful deposition of the anesthetic solution through the fibrous tissue is best accomplished with a

computer-controlled delivery device that regulates the pressure and volume ratio of solution delivered. This device, The WAND (Milestone Inc, Livingston, NJ) provides constant delivery of anesthetic solution, regulating deposition depending on variation in tissue resistance.⁵ The computer-controlled device provides a reliable control of pressure and volume not readily attained with a manual syringe. In addition, the computer-controlled device is basically a needle with a tube connection to the device, controlled by a foot pedal, so no bulky anesthetic syringe is visible to alarm patients (Figure 3).

INJECTION TECHNIQUE

The injection technique for the AMSA is best described when using the computer-controlled anesthetic device because the device automatically incorporates pain reduction strategies. AMSA injections require a prepuncture technique, the development of an anesthetic pathway during penetration, and slow delivery of anesthet-

ic solution at the target site next to the bone.⁵ The four main steps required to effectively provide the AMSA injection incorporating these pain reduction techniques are (see Figure 4 for an illustration of the injection process):

1. *Needle placement and prepuncture technique.* The needle is oriented at a 45° angle to the palatal tissue, as in all palatal injections. The bevel of the needle is placed facing the tissue and the foot pedal is depressed to begin the flow of anesthetic prior to penetration at the injection site. Before beginning the injection, the dental hygienist must apply firm pressure with a cotton-tipped applicator to the tip of the needle, covering the bevel of the needle. This probably forces some anesthetic into the tissue prior to injection so the patient does not feel the insertion of the needle tip into the mucosa. Bevel placement against the tissue assures that the sharp tip of the needle penetrates the tissue first, causing the least tissue injury.

2. *Anesthetic pathway.* Using the computer-controlled anesthetic device requires gently rotating the needle back and forth to maintain a straight penetration path while advancing the needle tip. The dental hygienist rotates and advances the needle very slowly while the device regulates the flow of solution into the tissue. This slow progression of the tip and the regulated flow permits anesthetic solution to enter the tissue at a steady rate and precede the needle.

3. *Anesthetic delivery at the site.* Once the needle tip has reached the bone, the slow and steady delivery of anesthetic solution is continued, with the flow rate controlled by the device, permitting a sufficient amount of solution to be deposited and diffused through the tissue. Injection of 0.6 ml to 0.9 ml, one third to one half of a cartridge of anesthetic, takes 60 to 90 seconds.

4. *Withdrawal of the needle.* After a sufficient amount of solution has been deposited and the clinician clearly sees that the tissue has blanched in the palate, the needle is withdrawn straight out of the tissue. Some anesthetic solution may remain

on the palate so the oral cavity should be rinsed to remove any bitter taste.

DURATION AND SIDE EFFECTS

After approximately 2 minutes, the anesthetic solution will sufficiently diffuse to the nerve branches creating a profound palatal and gingival anesthesia that can last up to 90 minutes. There are usually no significant side effects to the AMSA injection. However, in rare instances, ulcerative lesions have appeared at the site of injection 24 to 48 hours after injection when the tissue had become completely ischemic. These lesions are most likely of a recurrent herpetic nature⁶ and occur for similar reasons following conventional palatal injections with an aspirating syringe. If excessive blanching occurs in the palate, slowing or stopping the injection for a few seconds to let the anesthetic solution dissipate will diminish the chance of this postoperative event.

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device for delivery of local anesthetic. The anesthetic pathway results from very slow and controlled injection of anesthetic solution permitting tissue anesthesia to precede the needle tip, which is very difficult to reliably achieve with an aspirating syringe. In addition, the palatal tissue is so dense that it is arduous to apply steady firm pressure with a conventional syringe for the minute or more it takes for an adequate amount of solution to diffuse through the tissues to provide profound anesthesia of the maxillary teeth and surrounding tissues.

EFFICACY

Several studies have examined the effectiveness and patient response to the AMSA injection and the computer-controlled injection technique. The results of the studies suggest that there is decreased pain perception for computer-controlled injections in contrast to manual syringe delivery of anesthetics.

We recently published a study where pain perception was compared by adult subjects using both conventional syringe injections and computer-controlled injections.⁷ At separate treatment appointments, subjects received half-mouth injections with one or the other injection method and pain was evaluated using visual analog scales and verbal ratings. The data showed that the AMSA injections given using the computer-controlled technique were significantly less painful than the maxillary injections administered using an aspirating syringe. Anesthesia was equally profound with either technique and no adverse events were reported.

Hochman et al also compared pain perceived by 50 subjects when given contralateral palatal injections using computer-controlled and conventional syringe

techniques.⁸ Subjects were blindfolded so they could not tell which device was being used and sounds made by the computer-controlled device were mimicked when conventional syringes were used. Immediately following each injection, pain was assessed using both written and verbal methods. It was reported that 48 of 50 subjects found the computer-controlled injections less painful and indicated that the computer-controlled injections were two to three times less painful than those administered with manual syringes.

Gibson et al compared pain related

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behaviors in children receiving local anesthetic injections.⁹ Randomly assigned manual or computer-controlled syringe techniques for maxillary anesthesia were assigned to 62 children. In the study, every effort was made to shield the devices from the children so the effects of simply viewing the syringe or needle were minimized and the subjects were unaware which anesthetic delivery system was being used. The results revealed that adequate levels of anesthesia were achieved in all cases and significantly more children cried and exhibited disruptive body movements when anesthetized using the conventional syringe compared to the computer-controlled device.

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APPLICATIONS

The AMSA injection has an important place in esthetic dentistry. Friedman and Hochman¹⁰ described using the AMSA injection during anterior esthetic dental procedures requiring trial and fitting of restorations. As with all esthetic procedures, patient acceptance is critical to the success of treatment. The AMSA injection provided the advantage of profound pulpal and gingival anesthesia while not anesthetizing the lip. The dentist and the patient could view the restoration prior to cementation with full range of lip motion. This permitted adjustments to be made with accurate assessments of the smile line, since the lip did not sag from anesthetic effects.

The AMSA injection has also been used during therapeutic periodontal scaling and root planing. We studied a sample of 20 patients with moderate periodontal disease characterized by 4 mm to 6 mm probing depths, and explorer detectable calculus.¹¹ One half of each subject's mouth was anesthetized using an aspirating syringe and scaled and root planed, and the other side of the mouth was anesthetized with the com-

puter-controlled device prior to scaling and root planing. Improvements in clinical attachment loss and probing depths at 1 month exit examinations were similar. The results of this study suggest that adequate anesthesia for therapeutic scaling and root planing was achieved using both devices.

SUMMARY

The AMSA injection delivered by a computer-controlled delivery device possesses two potential advantages over conventional syringes. It permits attaining maxillary anesthesia with fewer injections, two per half mouth compared to four or five for conventional syringe techniques, and is generally less painful than palatal injec-

tions delivered by conventional syringe techniques. In addition, the AMSA injection can facilitate placement of cosmetic anterior restorations because it does not anesthetize the maxillary lip, and by extension, provide a convenience for any dental patient not wishing to have a numb and immobile lip when leaving the dental office. Data from three clinical studies indicate that patients generally find the palatal computer-controlled local anesthetic injections to be less painful than those delivered by conventional syringe.⁷⁻⁹ These advances in local anesthetic technique and delivery can be useful additions for the dental hygienist in the management of pain during dental procedures. ●

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