P-ASA Block Injection: A New Palatal Technique to Anesthetize Maxillary Anterior Teeth

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ABSTRACT: This technique article presents a new local anesthetic injection that is reported to produce anesthesia of the six maxillary anterior teeth, the anterior third of the palate, and the facial gingiva from a single-site injection. The injection is referred to as the palatal approach anterior superior alveolar (P-ASA) nerve block. The 0.9 to 1.4 mL dosage recommendation for this block injection is significantly less than for a traditional supraperiosteal approach. The primary advantage of this injection is that it allows the dentist to anesthetize the teeth and gingiva without collateral anesthesia to the lips, face, or muscles of facial expression. Therefore, the smile line is not distorted during the operative phase of an appointment, and the patient is more comfortable postoperatively.

CLINICAL SIGNIFICANCE: The P-ASA 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 injection technique prevents distortion of the smile line and enhances restorative procedures that use the lip line as an esthetic reference element.

This article describes a modified injection approach to anesthetize the six maxillary anterior teeth without concomitant collateral anesthesia of the face, lips, and muscles of facial expression. This single-site injection produces bilateral pulpal anesthesia, and it represents a convenient alternative to traditional methods of anesthesia in this region of the oral cavity. The administration of 0.9 to 1.4 mL of anesthetic is usually sufficient to anesthetize the central incisors, the lateral incisors, and the canine teeth for a period of 60 minutes or more. The palatal mucoperiosteum and gingiva associated with the anterior third of the palate also are anesthetized. This injection is referred to as the palatal approach anterior superior alveolar nerve block or P-ASA.

Since the P-ASA does not result in collateral anesthesia to the lips and muscles of expression, it is particularly beneficial for esthetic restorative dentistry when the unaltered lip line is needed as a critical reference for esthetic and phonation evaluations. In addition, the elimination of anesthesia to the surface of the face represents a substantial benefit for patient comfort during treatment and the postoperative recovery phase (Figure 1). The injection technique is easily mastered, comfortable for the patient, and may prove to be a valuable addition to the local anesthesia options for maxillary anterior teeth. Although the preliminary empiric findings on the P-ASA are encouraging, controlled clinical studies have yet to be conducted on the safety and efficacy of the technique.

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TRADITIONAL VERSUS NONTRADITIONAL METHODS OF ANESTHESIA FOR THE ANTERIOR MAXILLA

Dentists most often approach anesthesia of the maxillary anterior teeth with a supraperiosteal injection in the mucobuccal fold adjacent to the teeth to be anesthetized.[1-3] This safe and reliable technique takes advantage of the porosity of the maxillary cortical plate. Hydrostatic pressure and passive diffusion allow anesthetic solution ultimately to reach the dentoalveolar nerve branches within the medullary space.[1] When a sufficient concentration of anesthetic has enveloped the target nerve fibers, pulpal anesthesia is achieved. The duration of the anesthesia is partially dependent upon the concentration and volume of anesthetic solution in proximity to the mantle and core fasciculi bundles.[4] The dynamics of passive diffusion do not necessarily "guide" the anesthetic volume to a specific target. Some of the anesthetic that is injected into the mucobuccal fold is dispersed into interstitial tissues; removed by capillaries and lymphatics; hydrolyzed (ester-type anesthetics); and absorbed by fat, muscle, and other non-neural tissues.[1,5,6] When a mucobuccal fold injection is administered, it is reasonable to speculate that a certain volume of the anesthetic bolus will remain in the overlying soft tissues, making less of the drug available to diffuse through the osseous partition of the maxilla. This residual volume of anesthetic may affect both sensory and motor nerve fibers in the region. In some instances, anesthesia of the mucoperiosteum, mucosa, and gingiva in the area of the injection may be desirable. More often than not, inadvertent anesthesia of the muscle of facial expression and surface of the face are considered an unintentional consequence of injections in this region of the maxilla. This effect can be intensified when multiple supraperiosteal injections are administered. The temporary loss of motor function of the orofacial muscles can hamper the smile-line evaluation, an important parameter for restorative and prosthetic dentistry procedures (Figure 2).[7] Another implication of unintentional collateral anesthesia of the

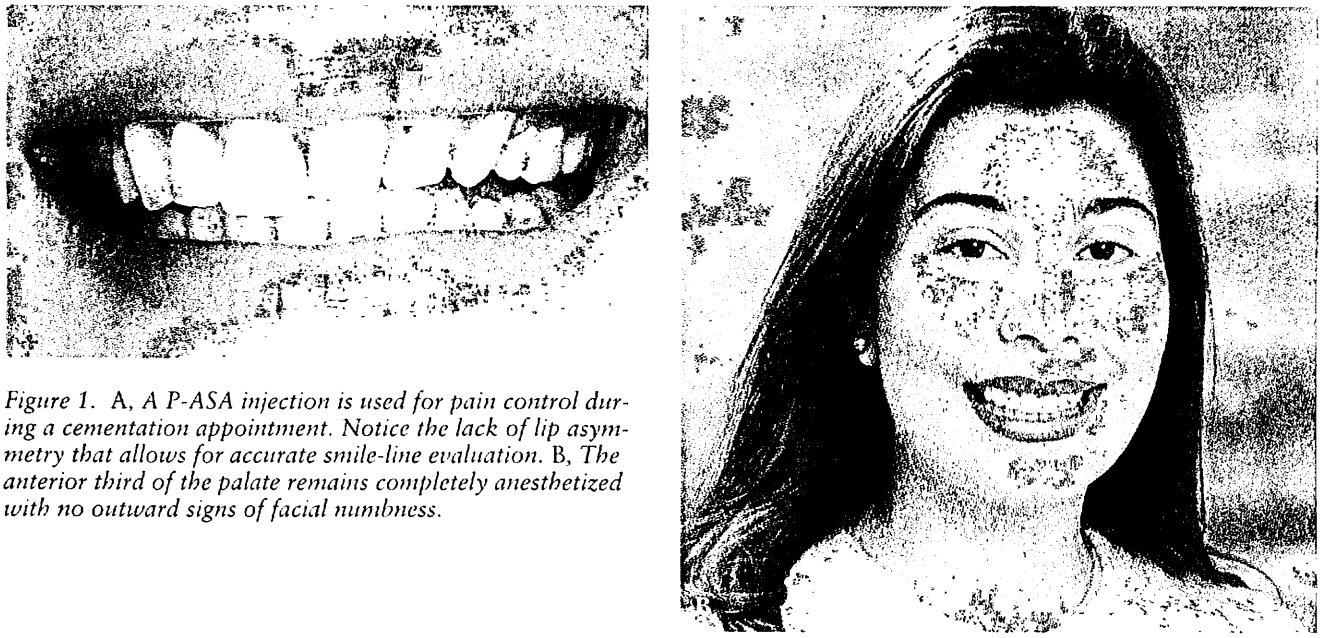

Figure 1. A, *A P-ASA injection is used for pain control during a cementation appointment. Notice the lack of lip asymmetry that allows for accurate smile-line evaluation.* B, *The anterior third of the palate remains completely anesthetized with no outward signs of facial numbness.*

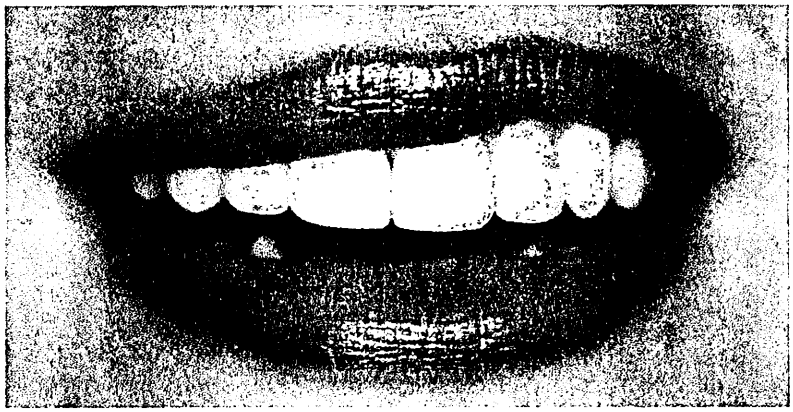

Figure 2. The resulting collateral anesthesia from traditional supraperiosteal injection in the mucobuccal fold distorts the smile line.

lips and the face relates to some patients' reactions to that sensation. Milgrom and co-workers have determined that a segment of the population avoid seeking dental treatment specifically because of their aversion to local anesthetic injections and the feeling of numbness associated with dental anesthesia.[8]

The experienced practitioner can take advantage of injections other than the supraperiosteal infiltration or field block for primary anesthesia of teeth in the anterior maxilla. These include the infraorbital nerve block, the pterygopalatine (V2) nerve block, the intraligamentary or periodontal ligament (PDL) injection, and the intraosseous injection. Each of these injections have particular advantages and disadvantages depending upon the operator's understanding and skill and the cooperation of the patient.[9-11] The aforementioned block injections anesthetize teeth on the ipsilateral side of injection and do produce collateral anesthesia of the face and the muscles of expression. A single-site block injection that produces bilateral pulpal anesthesia of maxillary anterior teeth with no collateral anesthesia to the face, lips, and muscles of facial expression will prove to be a valuable addition to the local anesthetic armamentarium. The P-ASA injection technique appears to meet these criteria.

EVOLUTION OF THE PALATAL APPROACH ANTERIOR SUPERIOR ALVEOLAR NERVE BLOCK

The P-ASA evolved in conjunction with the anterior middle superior alveolar (AMSA) nerve block described by Friedman and Hochman.[12,13] The P-ASA is similar to the nasopalatine or incisive nerve block, but also differs in several respects. The nasopalatine nerve block is described as a method to anesthetize the anterior palatal gingiva and mucoperiosteum.[12,14,15] It is usually employed when surgical procedures on the anterior palate are to be performed.[1,2] It is also advocated as a means of providing supplemental pulpal anesthesia to the incisor teeth.[1] In contrast, the P-ASA is recommended as a primary method to achieve bilateral pulpal anesthesia of the six maxillary anterior teeth, which is why it is referred to as the palatal approach anterior superior alveolar block. This injection also produces anesthesia of the gingiva and mucoperiosteum in the region of the anterior palate innervated by the nasopalatine nerve. In addition, a moderate degree of transient anesthesia of the facial gingiva associated with the anterior teeth also is observed from this injection. This makes the P-ASA injection an attractive alternative for local pain management prior to scaling and root planing, restorative

dentistry, endodontic therapy, and any minor surgical procedures involving the teeth and associated soft and hard tissues of the anterior region of the maxilla.

It is well recognized that a nasopalatine injection is associated with a significant degree of discomfort.[15–17] This may be due, in part, to the density of the connective tissues that comprise the incisive papilla and the compact neurovascular bundle that is penetrated during the injection process.[18] Although conventional topical anesthetics can be employed prior to the administration of the nasopalatine injection, some authors have questioned their effectiveness.[1,19] Modifications to the nasopalatine injection technique to reduce the discomfort of needle insertion have been described.[1,2,20] The most common method is simply to apply pressure to the injection site with a blunt instrument for 20 to 30 seconds prior to needle puncture.[1] Another method involves an injection into the labial soft tissues of the incisor teeth, followed by an interdental insertion directed toward the incisive papilla.[21] If necessary, a third insertion into the incisive papilla can be performed.[2] The inherent or anticipated discomfort associated with the nasopalatine injection may explain why it is not used more frequently for primary pulpal anesthesia. However, it has been demonstrated that a palatal injection can be administered comfortably, even in the absence of topical anesthetic or distraction techniques, if the anesthetic flow rate is controlled with precision.[22] A method of consistently controlling the anesthetic flow rate in conjunction with precise needle manipulation improves the practicality of employing palatal injections to anesthetize maxillary anterior teeth.

COMPUTER-CONTROLLED LOCAL ANESTHETIC INJECTIONS

Like the AMSA, the P-ASA emerged through the clinical development of a computer-controlled local anesthetic delivery system (The Wand™, Milestone Scientific, Livingston, New Jersey) (Figure 3). This system is reported to allow the operator to administer a virtually pain-free injection, even in the dense fibrous connective tissue of the palate.[13,23,24] The core technology of the system

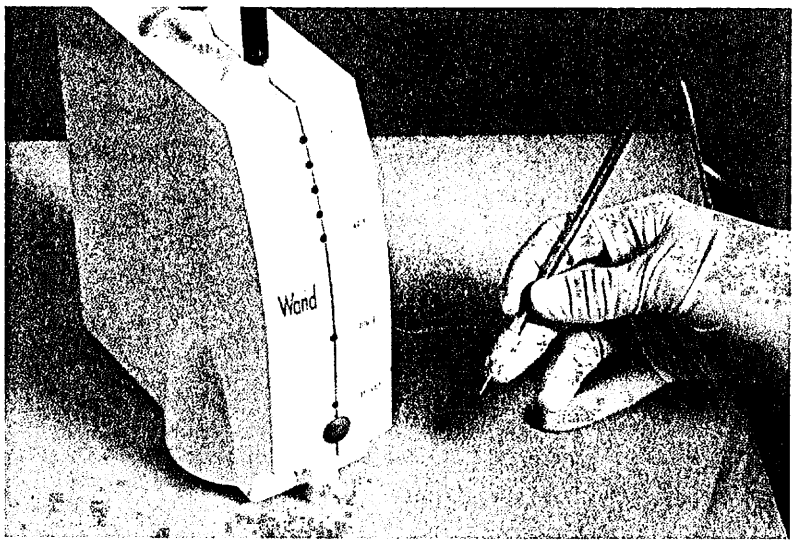

Figure 3. The Wand™ drive unit connects to an ultralight handpiece via microbore plastic tubing. Anesthetic flow is activated by a foot control.

is the ability to deliver and maintain a consistent flow rate of anesthetic fluid over a period of time, even in tissues of high density. A steady expression of approximately 1 drop of anesthetic every 2 seconds is maintained by the stepper motor in the drive unit of The Wand. The torque produced by the electronically controlled motor maintains this flow rate over the entire injection process. The exact fluid dynamics produced by a computer-controlled motor are difficult, if not impossible, to reproduce manually with a syringe. Although the dentist can inject slowly and carefully using a syringe, the precise flow rate (pressure and volume) is impossible to quantify. The resistance encountered when injecting into dense connective tissue causes the operator to increase force on the syringe plunger, thus increasing the anesthetic volume that distends the tissues, thereby resulting in pain.[14]

The high pressure and low volume characteristics of a computer-controlled device may account for reports of more comfortable palatal injections compared to a syringe.[13] An equally important element that makes this device easier to use than an aspirating syringe is the ultralightweight handpiece, which is held in a pen grasp rather than a palm grasp. This affords fingertip precision and control of needle penetration. This is particularly important when penetrating into the sensitive tissue of the incisive papilla. Minute forward movement can be accomplished with high accuracy and improved proprioception. The stepper motor and not the operator's thumb moves the anesthetic stopper within the cartridge. Therefore, the operator can focus his or her complete concentration on the accurate control and movement of the needle while activating drug delivery via the foot control.

The P-ASA injection is easily administered with The Wand system and the following technique assumes that the reader has familiarity with the operation of the device. Although a traditional syringe can be employed to administer the P-ASA injection, it may be associated with significant discomfort for the patient. In addition, the suggested manipulation techniques advocated to administer this injection are difficult to perform with a palm grasp; however, further clinical investigations in this regard are warranted.

TECHNIQUE

Since clear access to the incisive papilla is required for this injection, the patient should be in a supine position with the head tilted up and back without hyperextension. The objective of the injection is to gain entrance into the nasopalatine canal and maintain contact with the inner bony wall (Figure 4). The final target depth is approximately 0.6 to 1.0 cm or approximately the length of a 30-gauge extrashort needle. Exceeding the recommended penetration depth may inadvertently perforate the floor of the nose, resulting in an infection.[2] Although the entire penetration depth is minimal, the time required for proper insertion may be 30 seconds or more. The cumulative time from initial penetration to delivery of the recommended dosage of 0.9–1.4 mL may be 2 to 4 minutes. For this reason, the patient and the operator need to be comfortably positioned. The Wand unit needs to be easily accessed, and the operator must establish good finger-rest positions to avoid fatigue. Most importantly, the patient needs to be properly prepared for the extended time requirement for this injection to be completed. Since it takes significantly more time to administer than traditional injections, the preinjection verbal and nonverbal communication is critical. Trust and a warm relationship overrides the psychological factors that ordinarily create a maladaptive response to any injection. The first few minutes of an interaction are critical in creating that trust. A warm relationship should be generated at the greeting before the injection with a clear explanation of what the patient will experience during the injection.[25] This preparatory communication will enhance the success of the P-ASA, as it does with any injection experience.[26,27,28]

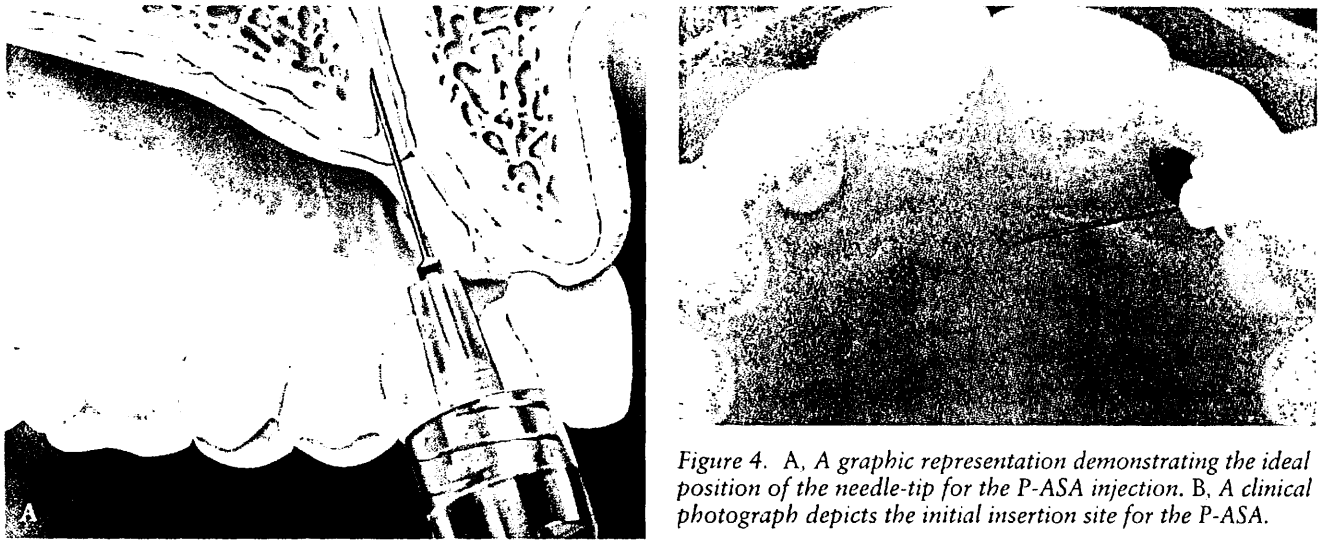

Figure 4. A, *A graphic representation demonstrating the ideal position of the needle-tip for the P-ASA injection.* B, *A clinical photograph depicts the initial insertion site for the P-ASA.*

Before the P-ASA is administered, the patient is informed that the injection will anesthetize the teeth and anterior palate, but not the face or lips. He or she is informed that the injection is computer-controlled and will take several minutes to administer, and that a beeping tone will be heard (if The Wand system is used), which is an auditory signal that the computer is in operation. The patient is advised that he or she may experience a mild, momentary sting, lasting 1 or 2 seconds, followed by a sensation of firm pressure. Topical anesthetic is recommended, but not necessary for a comfortable injection experience. Using it provides a nonverbal communication that the injection is about to commence, and it demonstrates to the patient that the operator is concerned for his or her maximum comfort. The most effective means of diminishing the initial discomfort of needle puncture with The Wand is a method the authors refer to as the pre-puncture technique.

The pre-puncture technique takes advantage of the high pressure gradient produced by the stepper motor of The Wand. It is speculated that the anesthetic solution can be forced into the palatal epithelium prior to actual needle penetration. The bevel of a 30-gauge extrashort needle is placed parallel to the lateral aspect of the incisive papilla, and a sterile cotton swab is positioned on top of the needle tip in an attempt to seal the bevel against the tissue. The Wand is activated on the slow flow rate while pressure is continuously applied with the cotton swab (Figure 5). This position is maintained for 6 to 8 seconds (6–8 beeps), allowing time for some anesthetic to penetrate the epithelial surface. The cotton-tipped swab absorbs excess anesthetic and prevents it from traveling to the posterior palate. After 6 to 8 seconds has elapsed, a slight back and forth rotation is initiated. This biaxial rotation helps the bevel enter the tissue in a precise movement. This gentle rotational insertion method advances the needle-tip forward in an extremely deliberate yet unhurried and controlled manner. Once penetration is achieved, the cotton swab is slowly removed to ensure that the needle-tip has penetrated below the surface epithelium of the incisive papilla. The papilla should demonstrate blanching, at which point the advancement is momentarily paused, but the slow flow of

anesthetic is maintained. After an additional 4 to 6 seconds, adequate anesthesia of the superficial connective tissue should be achieved, and slow forward advancement of the needle is resumed. Again, gentle rotation is initiated while the needle is guided into the canal at an angle that is parallel to the facial aspect of the anterior maxilla. If bone is contacted prematurely, the needle tip is redirected to ensure that it enters the canal. All movements should be maintained at a very slow pace of approximately 1 to 2 mm every 4 to 6 seconds. The final target position should be reached by the time approximately one-quarter of the anesthetic cartridge has been delivered (Figure 6). Although the incidence of a positive aspiration on a nasopalatine injection is low, the incidence on a P-ASA has yet to be determined, and aspiration is recommended. The slow flow rate is maintained (1 drop every 2 seconds) until 0.9–1.4 mL of anesthetic has been administered. When the injection is properly performed, blanching is observed on the palatal tissue as well as the facial tissues associated with the maxillary incisors. The onset of anesthesia is usually within 5 to 7 minutes of the injection, and the duration of anesthesia is 60 minutes or more, depending upon the type of drug, dosage delivered, and relative length of the roots of the anterior teeth. At the conclusion of the injection, the flow rate is discontinued, but the needle is maintained in position for several seconds to allow the fluid pressure to dissipate. It is helpful to have the dental assistant maintain suction nearby to catch any anesthetic drips that may occur during needle insertion and withdrawal. The authors have observed that some patients experience adequate anesthesia of the incisor teeth, but inadequate pulpal anesthesia on the canine teeth from the P-ASA. This may be due, in part, to the length of the canine roots. The route of administration and the recommended dosage may not allow a sufficient volume of anesthetic to reach that portion of the subneural plexus that innervates the canines. In such instances, it may be necessary to administer an additional 0.4 mL of anesthetic or resort to a supraperiosteal injection to adequately anesthetize the canines.

KNOWN RISK FACTORS

The dosage range for a traditional nasopalatine block injection is from 0.20 mL to 0.45 mL.[2] In sharp contrast, the dosage recommended for the P-ASA block injection is greater (0.9–1.4 mL). Since the injection site is composed of dense connective tissue, it is imperative that this

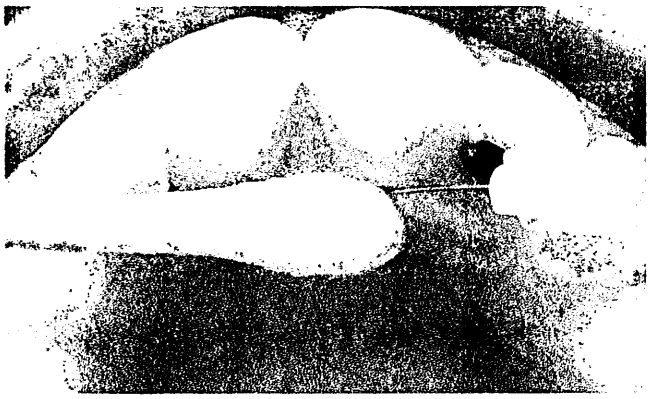

Figure 5. Pre-puncture technique provides a highly comfortable needle insertion in the absence of topical anesthetic.

Figure 6. Final needle position for the P-ASA injection. One cartridge is usually sufficient for one hour of anesthesia.

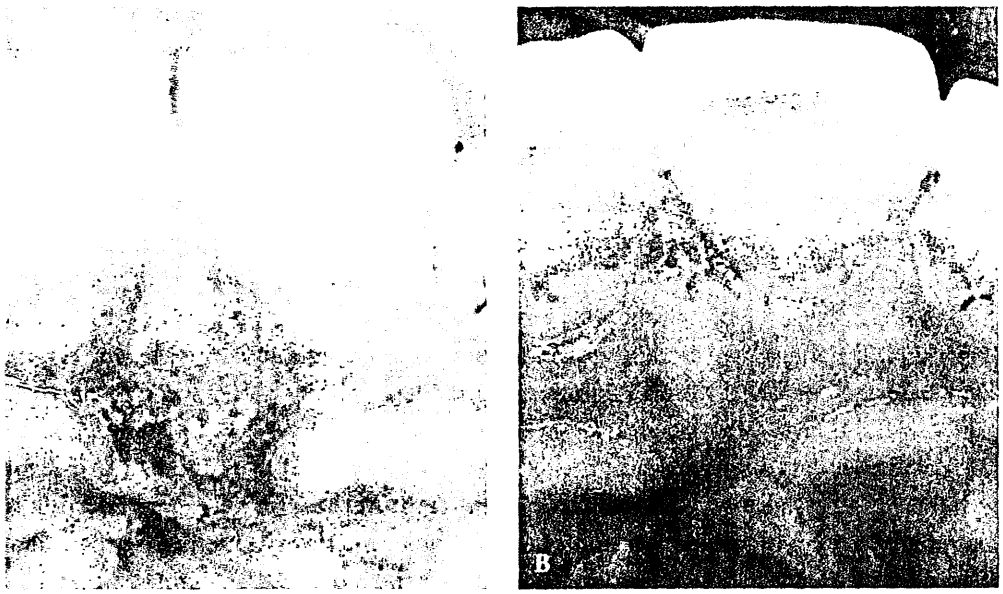

Figure 7. A, *A soft-tissue ulcer resulted 24 hours after a P-ASA injection of one cartridge of lidocaine 1:100,000 epinephrine. This is likely the result of excessive ischemia from too rapid a fluid delivery or a marked vasopressor effect.* B, *The soft tissue returned to normal physiologic health without intervention within 8 days of the initial injection.*

volume be administered slowly, to prevent excessive ischemia. It is recommended that the operator only use the slow (one drop every 2 seconds) flow rate of The Wand system. Too rapid a delivery of anesthetic can result in localized tissue damage. The use of anesthetic preparations containing vasopressor concentrations of 1:50,000 may increase this risk factor and is discouraged. If an ulcerative-type of lesion occurs at the site of injection, it should be treated symptomatically and will resolve within 10 to 14 days (Figure 7).

SUMMARY AND CONCLUSIONS

The P-ASA block injection is described as an alternative approach to traditional techniques for bilateral local anesthesia of the maxillary anterior teeth. This single-site injection achieves anesthesia of the teeth and associated gingival tissues, while at the same time eliminating collateral anesthesia to the face, lips, and muscles of facial expression. The injection can be administered in a comfortable and consistent manner, using a computer-controlled local anesthetic delivery system (The Wand). The authors recommend that additional studies be performed to ensure safety, validity, and reliability of this technique.

DISCLOSURE

Drs. Friedman and Hochman are consultants to Milestone Scientific, Inc. and hold stock in the company.

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