

## SUPPLEMENTAL INJECTIONS

Supplemental injections are essential when, as frequently occurs, anesthesia from conventional injections is inadequate and the pain is too severe for the endodontist or dentist to proceed. There are three such supplemental techniques—the intraligamentary injection, the intraosseous injection and the intrapulpal injection.

If the patient has *profound lip numbness and experiences pain upon endodontic access*, repeating the inferior alveolar nerve block does not help the problem. Clinicians may think that another injection is helpful because the patient sometimes achieves pulpal anesthesia after the second injection. However, the patient may just be experiencing slow onset of pulpal anesthesia. That is, the second injection does not provide additional anesthesia—the first injection is just “catching up” due to the slow onset of pulpal anesthesia.

### **Intraligamentary Injection**

#### *Success as a Primary Injection*

For use as a primary injection, good success rates have been reported for restorative procedures. However, when compared to the inferior alveolar nerve block, the primary intraligamentary injection resulted in higher pain scores during treatment.<sup>114</sup> There is more difficulty in achieving adequate pain control in extractions and endodontic treatment.<sup>115, 116</sup> Malamed<sup>116</sup> reported a 50% success rate in endodontics when the intraligamentary injection was used as a primary technique. Kaufman et al,<sup>117</sup> using a high-pressure syringe, found a 79% success rate in performing vital pulpectomies. Higher success rates have been shown in posterior teeth than anterior teeth.<sup>77, 118</sup>

#### *Success as a Supplemental Injection*

The success of supplemental intraligamentary injections in achieving pulpal anesthesia for endodontic procedures has been reported to be 50 to 96%.<sup>12, 119, 120</sup> Walton and Abbott<sup>119</sup> reported a 63% success rate of the supplemental intraligamentary injection during endodontic and restorative procedures. Re-injection, if the first intraligamentary injection failed, was shown to be successful in 71% of the patients for an overall success rate of 92%. Smith et al<sup>120</sup> reported similar results. Cohen et al<sup>12</sup> studied endodontic patients with irreversible pulpitis and found that a supplemental intraligamentary injection was 74% successful. Re-injection increased success to 96%. The intraligamentary injection will not be successful in mandibular anterior teeth.<sup>77, 118</sup>

### **New Technology for the Intraligamentary Injection—The Wand®**

Recently, a computer-controlled local anesthetic delivery system (CCLAD) has been introduced that can be used to administer an intraligamentary injection. The Wand® or CompuDent® (CompuDent®, Milestone Scientific Inc., Deerfield, IL) local anesthesia computer-controlled injection system accommodates a standard local anesthetic cartridge that is linked by sterile microtubing to a disposable, pen-like handpiece with a Leur-Lok needle attached to the end. The device is activated by a foot control, which automates the infusion of local anesthetic solution at a controlled rate. A slow or fast flow rate is initiated and maintained by a foot pedal control. The fast rate delivers 1.4 mL of solution in one minute.

The slow rate delivers 1.4 mL of solution in approximately 4 minutes and 45 seconds. The slow rate is used for the intraligamentary injection.

*Success of the Intraligamentary Injection, Using the Wand<sup>®</sup>, in Asymptomatic, Vital Teeth*

Recently, an experimental study <sup>121</sup> compared the anesthetic efficacy of the primary intraligamentary injection of 1.4 mL of 4% articaine with 1:100,000 epinephrine and 1.4 mL of 2% lidocaine with 1:100,000 epinephrine administered with a computer-controlled local anesthetic delivery system in the mandibular first molar. Successful pulpal anesthesia (two consecutive 80 readings with an electric pulp tester) was obtained 86% of the time with the articaine solution and 74% of the time with the lidocaine solution. There was no significant difference between the articaine and lidocaine solutions. The duration of pulpal anesthesia for the first molar ranged from 31 to 34 minutes, which is longer than the 10 minutes recorded in a similar study using a pressure syringe and 0.4 mL of a lidocaine solution. <sup>118</sup> Therefore, there is an advantage to using the computer-controlled local anesthetic delivery system to increase the duration of pulpal anesthesia. However, the clinician must be aware that anesthesia does decrease slowly over the hour.

*Success of the Intraligamentary Injection, Using the Wand<sup>®</sup>, in Symptomatic, Vital Teeth*

Nusstein et al <sup>122</sup> determined the anesthetic effectiveness of the supplemental intraligamentary injection administered with a computer-controlled anesthetic delivery system in mandibular posterior teeth diagnosed with irreversible pulpitis when the conventional inferior alveolar nerve block failed. Success of the intraligamentary injection (none or mild pain upon endodontic access or initial instrumentation) was obtained in 56% (30 of 54) of the patients. The results were somewhat disappointing because the computer-controlled anesthetic delivery system should have been capable of delivering approximately 1.4 mL of anesthetic solution via the intraligamentary injection by consistently maintaining a precise flow rate.

**Intraligamentary Injection, Using Single-Tooth Anesthesia Technology**

The STA device uses dynamic pressure-sensing technology that allows continuous feedback during the intraligamentary injection.<sup>123</sup> Lights on the STA unit give audible and visual indicators that indicate the correct pressures involved to deliver the anesthetic solution by intraligamentary injection. Therefore, it transforms a “blind” intraligamentary injection with a syringe into an accurate pressure-sensing injection with the STA unit. However, no studies have been performed to evaluate this new technology.