Radio Microsurgery Update

Troughing and Impression Taking

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Dr. Irving Ellman, electrical engineer, inventor, and doctor of dental surgery, patented in 1976 a high-frequency radio wave generator using 3.8 MHz and a fully rectified current. For centuries, man has used sharpened instruments to incise tissue. After the advent of electricity, various electric modalities were applied to tissue for hemostasis and incision. The use of electricity in dentistry and medicine has come a long way from spark gap generators (1907),[1] electrocautery (1909),[2] and electrosurgery (1928).[3]

In 1972, after having worked with the new Ellman High Frequency 3.8 MHz Radio Wave Generator, I created the International Academy of Radiosurgery and defined the word *radiosurgery* as the use of high-frequency radio waves of 3.8 MHz to incise, sculpt, ablate, or coagulate tissue. Until 1972 the "advantages" of electrosurgery (high heat, hot electrode) were that one could operate with some control of coagulation. The emphasis was on coagulation, not on incision. With the advent of Ellman technology it became possible to incise with an electrode as with a scalpel, which was not possible with electrosurgery.[4,5] Hence, dental office closets were filled with discarded electrosurgical units.

Ellman state-of-the-art technology today uses patented generators of 4 MHz (Figure 1) and new alloy electrodes (advanced composite electrodes [Ace]) that create a harmonic field, resulting in physiologically compatible tissue vaporization and negligible tissue alteration. The electrode is cold. Leaders in surgical innovation throughout the world in all surgical disciplines—arthrosurgery, ophthalmology, facial plastic surgery, dermatology, pediatric neurosurgery, endoscopic spine surgery, otolaryngology, gynecology, proctology, and dentistry—are using Ellman technology, which continues to evolve by responding to requirements and wishes of those who experience the satisfaction of relaxed, successful, anxiety-free practice.[6-22]

Troughing with the Ellman high-frequency/low temperature RF energy source and new low-heat proprietary Ace electrodes is a safe, predictable, economic, and stress-free technique to prepare gingival tissue for impressions...

TROUGHING

Troughing by definition is the preparation of gingival tissue by cell vaporization prior to taking impressions of teeth that have been prepared to receive a dental prosthesis. Whether taking impressions with a dental impression material or with optics, it is very stressful, both for the dentist and the patient, to miss a margin and have to redo an impression or a finished prosthesis. I remember in the past using dental plaster to take impressions in the mouth, breaking the plaster in the mouth, then reattaching it to make a working model. If one did not want to use plaster, there were always copper tubes with a compound material, which was a long, tedious procedure necessitating multiple transfers, and it was not always kind to the gingival tissue. As often as not, the periodontal attachment was impinged upon. All of this was very time consuming, often frustrating, and always stressful. With the introduction of elastomers life became a bit easier, but the problem of reproducing multiple preparation margins in a manner that did not impinge upon the periodontal attachment as with the time-consuming, frustrating use of cotton cords with or without some vasoconstrictor and/or coagulating agent was not solved. Very often gingival contraction after prosthetic cementation occurred due to injury of the gingival attachment during the placement of "retraction cords" (Figure 2).

Troughing with radiosurgery (low heat, controlled coagulation) has "destressed" that which was always an anxious, stressful experience. With radiosurgery it is possible to expose with ease tooth preparation margins for excellent, predictable elastomer or optical impressions.

Troughing Guidelines[23,24]

1. Electrode Movement:
   - Use finger rest or hand support.

Figure 1. Dento-Surg 90 F.F.P.

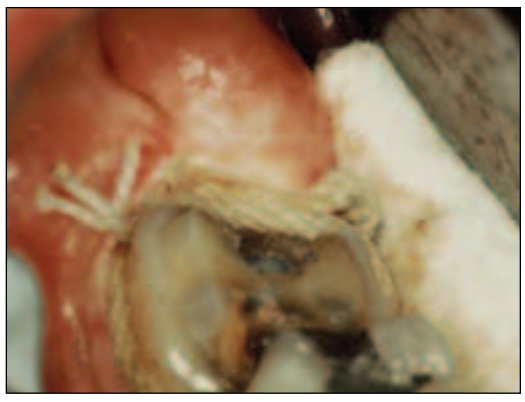

Figure 2. Retraction cords.

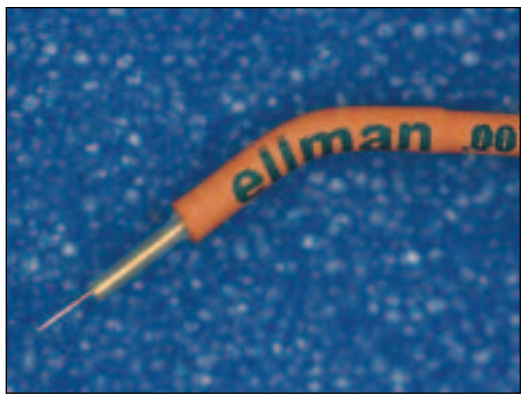

Figure 3. Ace Vari-Tip 0.007 electrode.

Figure 4. Troughing 1.

Figure 5. Troughing 2.

Figure 6. Troughing 3.

Figure 7. Troughing 4.

Figure 8. Troughing 5.

Figure 9. Prepared and troughed.

Figure 10. Ten days after impression.

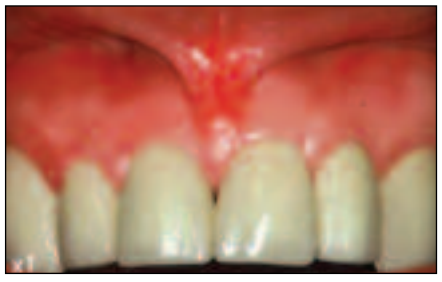

Figure 11. Five years postoperative.

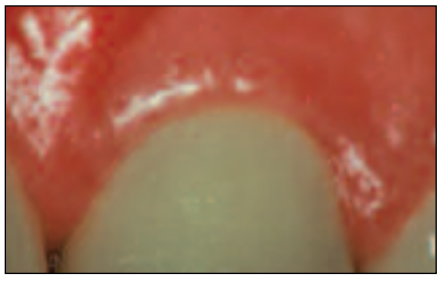

Figure 12. Five years postoperative; closeup of Figure 11.

• Use short, precise, perpendicular strokes.

• Use light "brush-like" strokes.

• Do not remain motionless in tissue.

• The slower the movement, the more lateral heat and coagulation.

2. Electrode selection:

• Anterior teeth—depending upon tissue thickness an Ellman new proprietary Ace Vari-Tip 0.007 to 0.010 electrode (Figure 3). *Do not destroy epithelial attachment.*

• Posterior teeth—depending upon tissue thickness an Ellman new proprietary Ace Vari-Tip 0.010 to 0.014 electrode.

Probe the sulcus depth with a nonactivated Vari-Tip electrode and adjust the electrode tip to a depth just short of the sulcus depth while resting the Teflon tube of the Vari-Tip on the finish line of the tooth preparation. Wipe the gingival tissue on the inside of the gingival sulcus (Figures 4 to 8) with the energized electrode. *Do not destroy epithelial attachment.*

3. Do not trough in hyperemic tissue. To do so would be "periodontal treatment" with subsequent tissue retraction upon healing.

4. Use a fully rectified filtered frequency wave and control coagulation with speed of electrode movement, energizing the electrode prior to tissue contact.

5. Use the minimum amount of current necessary to vaporize the tissue easily. If tissue vaporizes "white" or "sticks" to the electrode, there is insufficient current. If there is sparking, there is too much current. Set the Ellman Radiolase II unit in monopolar mode to "cut" and 1.75. Adjust the current amplitude up or down from there.

6. Injecting a local anesthetic directly into the tissue immediate to the troughing site will increase the amount of electrolyte in the tissue, thereby reducing the amount of current required for optimal tissue vaporization.

7. Irrigate the troughed area with 5% volume hydrogen peroxide, rinse carefully with water, lightly air dry, and take impression with elastomer material or optics.

8. Apply Ellman Corporation Tincture of Myrrh and Benzoin (a liquid bandage) to troughed area prior to cementation of the temporary prosthesis.

CONCLUSION

Troughing with the Ellman high-frequency/low temperature RF energy source and new low-heat proprietary Ace electrodes[25] is a safe,[26] predictable, economic, and stress-free technique to prepare gingival tissue for impressions, be it with elastomers or optics. Margins of preparations are clearly visible and accessible (Figures 9 to 12). It should not be performed with high-heat, low-frequency electrosurgical units. The new low-heat proprietary Ellman Ace electrodes are not compatible with other brand generators, as the subsequent harmonic fields do not lend themselves to optimal tissue vaporization. ✦

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