



Dentistry Today

## **Oral Surgery Simplified With Radiosurgery**

Written by Jeffrey A. Sherman, DDS Friday, 01 February 2008 00:00 Vol 27 #2

The general dentist, oral surgeon, and periodontist are all faced with a variety of procedures that need to be performed on a daily basis. Our day can include anything from exposing subgingival decay, to performing a gingivectomy or frenectomy, to exposing an impacted tooth. A knowledge-able and competent clinician can perform any of these procedures, but the ease of performing these procedures can be accomplished by radiosurgery. Radiosurgery can make the experienced surgeon even better and the neophyte more competent. Bleeding is minimized and visibility is in turn enhanced via the use of radiosurgery.

Radiosurgery is performed with the aid of a radiosurgical instrument, which is a radio transmitter that produces a variety of waveforms to establish cutting, cutting with coagulation, and just coagulation. Radiosurgery uses a 3.8 to 4 MHz radiosignal to produce a fine microsmooth incision with no lateral heat being sent to the surrounding tissues. This is extremely important for extensive areas of oral surgery where proximity to underlying soft and hard tissue requires a delicate incision. Traditional electrosurgical machines which operate at lower frequencies of 1.5 to 2.5 MHz produce higher temperatures in tissue, and are not recommended for advanced oral surgical procedures or even those that are in close proximity to underlying osseous tissue. The main advantage of radiosurgery is its ability to produce coagulation in an area which would often have extensive bleeding, and enhance the surgeon's vision and ability to perform a more accurate incision. The absence or minimal amount of bleeding during surgery allows the procedure to be performed more rapidly and with more confidence. The patient is less apprehensive due to the lack of bleeding, and thus has a decreased awareness that surgery is being performed.

Radiosurgery offers a variety of waveforms for making incisions. The Fully Rectified Filtered waveform is the waveform of choice for performing deep surgical incisions. This waveform mimics the cut of a scalpel blade, and thus cuts with only minimal coagulation. The Fully Rectified Filtered waveform when used with a Vari-Tip straight wire electrode produces the most delicate of incisions, and histologically offers the least amount of tissue alteration.

The Fully Rectified waveform produces an incision with concurrent coagulation. The advantage of using this waveform in comparison to the Fully Rectified Filtered waveform is that increased visibility is established due to the enhanced coagulation.

The Partially Rectified waveform is strictly a coagulating waveform and can be used to establish coagulation in areas of bleeding or oozing. Areas of extensive bleeding can be controlled with the aid of the Bipolar coagulating electrode or the Fulguration waveform on those instruments that don't offer bipolar capabilities.

Bipolar electrosurgery was initially used in medicine as well as dentistry, since coagulation could be accomplished in a field of blood. Bipolar electrosurgery is accomplished by having an electrode tip with 2 equal sized wires parallel to each other. The signal traversing the 2 electrode tips that are so closely located made pinpoint coagulation an easy task. The development of different shaped electrode tips paved the way for incisions to be accomplished.

The latest development is to couple the bipolar electrodes with the more desirable radiosurgical waveform. This waveform operates at a higher radio frequency of 4 MHz than does the bipolar electrosurgical signal of 1.8 MHz. Research has shown that high frequency radiosurgery produces less tissue alteration and lateral heat to the surrounding tissue than does the low frequency electrosurgical signal. Bipolar radiosurgery is a major advancement over the earlier bipolar electrosurgery.

Ellman International has taken bipolar surgery one more step by developing an instrument that is both monopolar as well as bipolar. The clinician who is familiar and comfortable with monopolar radiosurgery can continue to use this modality for all general dental procedures. When treatment is in close proximity to implants, large metal restorations, or osseous tissue, the bipolar modality can be readily used. The instrument known as the Radiolase II comes equipped with different handpiece styles and connections to prevent accidental use of the wrong modality. The instrument, which complies with all the international safety standards, has an adjustable audible tone when the in-instrument is activated to minimize any accidental incising of the tissue. Disposable single-use electrodes are included with the instrument; however, the autoclavable electrodes of earlier models can be used as well.

A new Proprietary Advanced Composition Alloy Electrode, known as the ACE Electrode, has recently been developed to reduce tissue damage and heat generated to the surgical site. The ACE Electrode has been shown to produce thermal damage in micrometers no greater than 10  $\mu\text{m}$ , in comparison to tungsten electrodes that have produced thermal damage as high as 30  $\mu\text{m}$ . Another important advantage of the ACE electrodes is their ability to minimize tissue sticking to the electrode tip. This ensures a clean cutting tip, providing a more precise microfine incision. The orange coloring of the protective sleeve easily identifies these electrodes.

With the new patent pending advanced alloy Rf electrodes and the patented 4 MHz high frequency Radiolase II device, tissue alteration has been shown to be less than CO<sub>2</sub> and diode lasers. In comparison to lasers and scalpel incisions, radiosurgery is easier to use, provides easy access to difficult to reach soft-tissue areas, and does not require the safety precautions that lasers require. Radiosurgery can incise, excise, plane, sculpt, and ablate soft tissue in a pure cut mode, cut and coagulate mode, or a coagulation only mode. Radiosurgery is affordable and offers significantly lower maintenance costs and downtime than today's lasers.

A postoperative dressing is required for all surgical procedures. In the surgical site several layers of tincture of Myrrh and Benzoin are applied with air-drying between the layers. This dressing is liberally applied to the area to protect the wound site. More extensive areas of surgery may require the use of a periodontal pack or the placement of a layer of Isodent (isobutyl cyanoacrylate) (Ellman International) as a protective dressing; 0.12% chlorhexidine gluconate or Peridex (OMNI Preventive Care/3M ESPE), or Listerine (McNEIL-PPC) rinses twice a day is prescribed.

## **CASE REPORT NO. 1**



**Figure 1.** A No. 108 U-shaped disposable electrode is used to expose an area of subgingival decay.



**Figure 2.** The incision is made with a Fully Rectified waveform to establish cutting with simultaneous coagulation.



**Figure 3.** The No. 108 U-shaped loop electrode is used to establish aggressive tissue removal and fully expose the area of decay. The electrode tip is bent to a 90° angle to provide better access to the surgical site.



**Figure 4.** The decay is exposed with the absence of bleeding due to the radiosurgery incision using the Fully Rectified waveform.



**Figure 5.** 3M L-Pop is used as a one-step application to prepare the tooth surface for the bonded restoration.



**Figure 6.** A flowable restorative is placed in the prepared tooth surface without any concern of blood contaminating the region.



**Figure 7.** The final restoration shows an aesthetic result due to the lack of bleeding from the use of radiosurgery.

A 41-year-old male reported to the office with decay on a lower right mandibular cuspid. The decay was a result of poor oral hygiene under the clasp of a mandibular partial denture. Radiosurgery was used to perform a gingivectomy, remove the inflamed tissue, and expose the subgingival decay.

A No. 108 U-shaped disposable electrode was used to expose an area of subgingival decay (Figure 1). The incision was made with a Fully Rectified waveform to establish cutting with simultaneous coagulation (Figure 2). The No. 108 U-shaped loop electrode was used to establish aggressive tissue removal and fully expose the area of decay. The electrode tip was bent to a 90° angle to provide better access to the surgical site (Figure 3). The decay was exposed with the absence of bleeding due to the radiosurgery (Figure 4). A No. 6 round bur was used to excavate the decay. L-Pop (3M ESPE) was used as a one-step application to prepare the tooth surface for the bonded restoration (Figure 5), then a flowable restorative was placed in the prepared tooth without any concern of blood contaminating the region (Figure 6), and the restoration was light-cured. An extra fine polishing diamond was used to finish the restoration. The final restoration showed an aesthetic result due to the lack of bleeding from the use of radiosurgery (Figure 7).

A coating of Isodent was applied to the tissue postoperatively, and a Listerine rinse was recommended. The CDT code for this procedure is D4211.

## CASE REPORT NO. 2



**Figure 8.** A pre-op photograph showing a lingual frenum that prevented movement of the tongue and impeded speech.



**Figure 9.** A Proprietary Advanced Composition Alloy (ACE) Vari-Tip Electrode is used with a Fully Rectified Filtered waveform to incise the frenum.



**Figure 10.** The Vari-Tip No. 118 electrode is used to widen the incision area and expose the underlying muscle.



**Figure 11.** The muscle is resected with ease and enhanced visibility, due to the use of radiosurgery.



**Figure 12.** A ball-shaped electrode and a Partially Rectified waveform is used to establish coagulation.



**Figure 13.** A No. 113F pencil-shaped electrode is used to establish coagulation with the fulguration waveform.



**Figure 14.** Several layers of tincture of Myrrh and Benzoin are placed over the surgical site as a postoperative dressing.



**Figure 15.** The surgical site is revisited 3 weeks postoperatively to remove additional muscle tissue to allow additional extension of the tongue.



**Figure 16.** The Vari-Tip No. 118 electrode is used to incise



**Figure 17.** A No. 136 ball-shaped electrode is used with

the remaining frenum area.



**Figure 18.** The No. 128 loop electrode is used with the Fully Rectified Filtered waveform to contour the wound bed.

the Partially Rectified waveform to establish coagulation.



**Figure 19.** A dressing of tincture of Myrrh and Benzoin is placed over the surgical site. Several coats of the tincture are placed with air drying between each layer.

A 46-year-old man reported to the office with ankyloglossia of the tongue since birth. He suffered with a lisp and had very limited tongue movement (Figure 8). After a thorough clinical and medical examination, it was decided to perform a lingual frenectomy with the aid of radiosurgery. The procedure was done over 2 appointments, with tongue stretching exercises being provided. The first step was to aggressively remove the frenum, and a subsequent procedure was performed to establish additional tongue freedom as healing progressed. The Dental CDT code for this procedure is D7960 while the Medical CPT code is 41115.

The ACE Vari-Tip Electrode was used with a Full Rectified Filtered waveform to incise the frenum (Figure 9). The Vari-Tip No. 118 electrode was used to widen the incision area and expose the underlying muscle (Figure 10), and the muscle was resected with ease and enhanced visibility due to the use of radiosurgery (Figure 11). A ball-shaped electrode and a Partially Rectified waveform was used to establish coagulation (Figure 12), and a No. 113F pencil-shaped electrode was used to establish coagulation with the fulguration waveform (Figure 13). Several layers of tincture of Myrrh and Benzoin were placed over the surgical site as a postoperative dressing (Figure 14).

The surgical site was evaluated 3 weeks postoperatively to remove additional muscle tissue to allow additional extension of the tongue (Figure 15). The Vari-Tip No. 118 electrode was used to incise the remaining frenum area (Figure 16), and a No. 136 ball-shaped electrode was used with the Partially Rectified waveform to establish coagulation (Figure 17). A No. 128 loop electrode was used with the Full Rectified Filtered waveform to contour the wound bed (Figure 18), and a dressing of tincture of Myrrh and Benzoin was placed over the surgical site; several coats of the tincture were placed with air-drying between each layer (Figure 19).

## Conclusion

Radiosurgery is a valuable modality that can be used to expose subgingival decay, perform a gingivectomy or frenectomy, expose an impacted tooth, and many other clinical applications.

Bleeding is minimized and visibility is enhanced via the use of radiosurgery. This article has presented 2 clinical cases demonstrating the clinical technique and advantages of radiosurgery.

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