

# High frequency radiosurgery in general dentistry

**Jeffrey Sherman**  
explains the benefits  
of high frequency  
radiosurgery

Today, the general dentist is faced with a wide range of daily procedures. These can range from routine restorations to advanced forms of periodontal or oral surgery. The general dentist must constantly update his/her base of knowledge for the rapidly changing procedures and materials becoming available.

The private general dental practice usually features a component of



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**Figure 1: The Ellman Dento-Surg Radiolase is a radiosurgery instrument operating at 4MHz that offers three different cutting and coagulating waveforms. The instrument has autoclavable handpieces and electrodes and complies with all IEC specifications**

periodontal therapy as well as the restorative and crown and bridge elements. Effective soft tissue management is fundamental to success in these disciplines. The choices of tissue removal are by curette, scalpel, electrosurgery, laser and, now more commonly, with higher frequency radiosurgery.

**Radiosurgery instrument**

High frequency radiosurgery is one of the most important and versatile instruments in dentistry today. Its numerous uses range from performing precise surgical incisions to establishing haemostasis. It is a learned skill that takes time and practice to master. The radiosurgery instrument should be readily available in each operator for ease of set up and use. Many dentists now prefer the radiosurgery

modality for its safety, versatility and predictability for the effective removal of tissue.

Radiosurgery is the removal of soft tissue with the aid of a radio signal. This radio signal operates within the frequency of 3.0-4.0 megahertz (MHz). The older electrosurgical instruments performing similar procedures operate at a frequency of 1.0-2.9MHz.

Research has shown that these low frequencies produce more lateral heat to the surrounding tissues and should be avoided when in close proximity to bone.

Electrosurgery should be considered as contraindicated for periodontal or delicate surgery and updated to the newer, higher frequency radiosurgery.

Radiosurgery at 3.8-4MHz in frequency offers the

advantages of a safe, fast and efficient micro incision with an excellent field of visibility. Published research studies confirm adjacent non-target tissue alteration at 15 to 30 microns with the 4MHz device.

The patient experiences a pressureless incision with a minimal amount of bleeding, which often requires no suturing and reduces bacteria and healing time. The radiowave produces a finer, less traumatic incision and, therefore, has seen increased usage in all forms of delicate periodontal and cosmetic surgery.

**Soft tissue procedures**

The use of the high frequency radiosurgery instrument allows the doctor to perform a larger variety of soft tissue procedures more quickly and with more predictable results. These procedures are more affordable for both the dentist and patients.

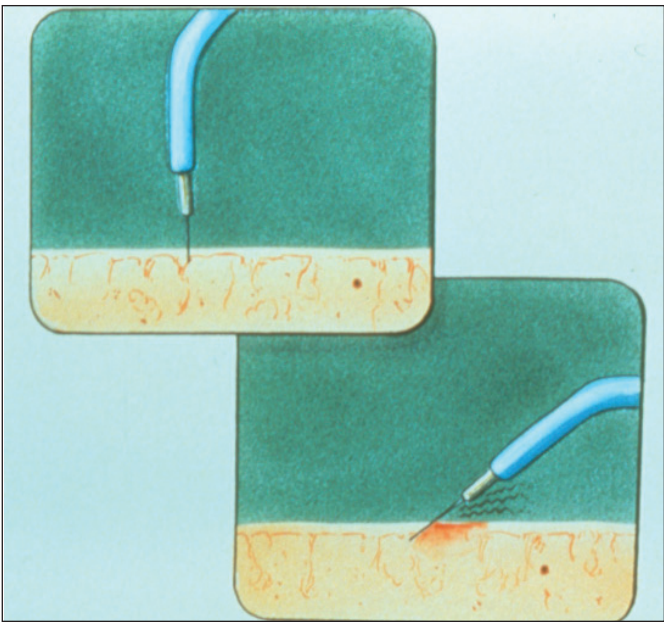
The Ellman Dento-Surge Radiolase (Figure 1) offers three different waveforms, a frequency of 4MHz and autoclavable RF matched micro electrodes and handpieces. I prefer to use and teach radiosurgery at 4 MHz in my own practice because of its precision, control, ease of use and consistently predictable results.

The waveforms include 'filtered' for incising tissue and 'fully rectified' for incising tissue with concurrent coagulation being performed.

The filtered waveform is used for any incisions that may be deep or in close proximity to the bone.

The radiosurgical instrument can be finely tuned and, when used with the filtered waveform, can produce micro smooth incisions that can perform the most delicate of periodontal procedures.

The fully rectified waveform is useful in all



**Figure 3: The electrode should be placed perpendicular to the soft tissue, as seen in the top drawing. The angle of the electrode in the lower drawing prevents concentration of the radio signal at one point**

forms of tissue removal that are superficial and not close to the bone. A partially rectified waveform is used only for haemostasis of the soft tissue and never to make an incision (Figure 2).

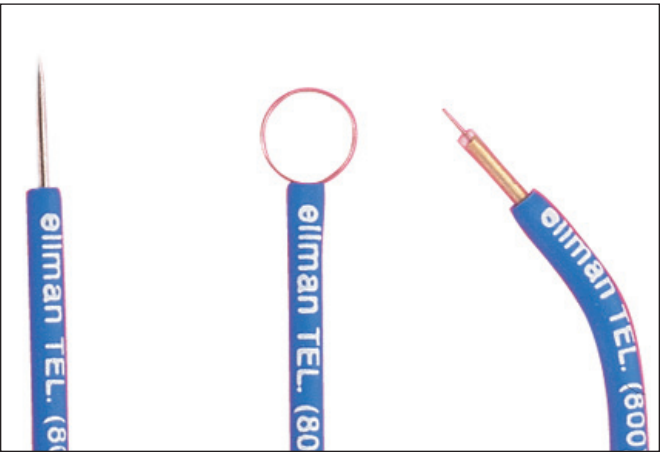
With a scalpel blade, the point of application is the precise point at which the incision is made. Similarly, with the high energy radio waves of the radiosurgery electrode tip, the incision is visible at the point of application, with the energy reducing rapidly as it is dispersed into the tissues

from the high intensity at the applied tip. This means that the effect of the application can be accurately observed to allow fine judgement and tuning of the instrument for optimum performance and tissue safety (Figure 3).

Radiosurgery offers the ability to perform an incision with a micro fine, single frequency matched surgical wire (Figure 4).

These straight or loop electrodes are used with either of the two cutting modes to remove or recontour, delicately and

**Figure 4: A Pencil Point #113F coagulating electrode, a Loop #128 tissue planning electrode and a Vari-Tip #118 incising electrode (left to right). Radiosurgery uses a micro fine, single surgical tungsten wire to make the delicate incisions**



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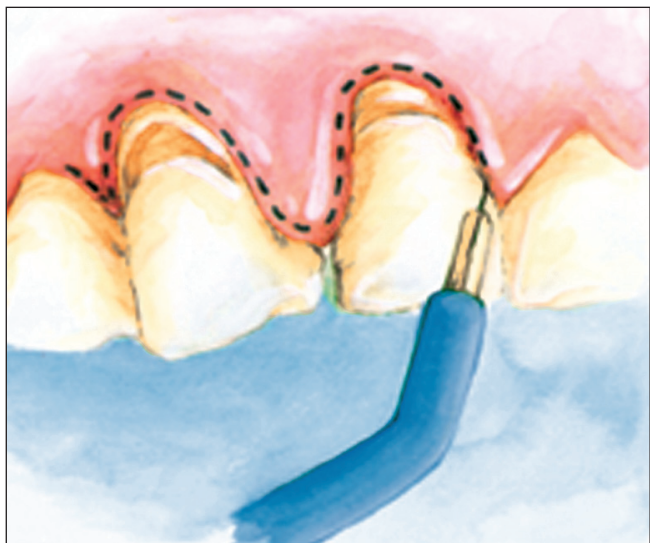
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**Figure 5: Line drawing depicting gingivectomy to expose subgingival decay**

precisely, soft tissue.

The fine pencil point electrode is used for precise, pinpoint coagulation during microsurgery.

In the general dental practice, radiosurgery is used throughout the day for a number of very common soft tissue procedures.

Radiosurgery is used to expose subgingival decay, leaving a clear field in a relatively blood-free environment (Figures 5 to 9).

This blood-free preparation facilitates the placement of aesthetic bonded restorations with rapid healing. This procedure eliminates the need for using retraction cord and haemostatic agents for haemostasis.

Radiosurgery is used to perform more predictable crown preparations. The tissue in the sulcus is removed to form a subgingival impression

funnel or trough around the finish line of a crown preparation.

The removal of the inner sulcular epithelium permits better visibility of the finish line and facilitates its improvement. The soft tissue funnel or trough created permits a more accurate impression due to the haemostatic abilities of the radiosurgery.

The use of retraction cord, as well as haemostatic agents, can be eliminated, since the radiosurgical trough accomplishes this.

The trough is also used to enhance porcelain laminate veneer preparation and placement.

#### Advanced uses

Gingivectomies, gingivapicoectomies, pulpotomies and biopsies are just some of the more advanced uses of radiosurgery (Figure 10).

The most common procedures performed by the general dentist are gingivectomies and gingivoplasties.

These procedures are performed to expose subgingival decay, establish a more cosmetic smile line prior to veneer or crown placement and cosmetically increase the crown to root ratio. The tissue is incised with either the filtered or fully rectified waveforms.

The filtered waveform is used in areas where the tissue is delicate and minimal tissue alteration is desired.

The fully rectified waveform is used where the tissue is thick and fibrotic or in areas of hyperaemia that require immediate haemostasis. Haemostasis can also be established with the aid of the partially rectified waveform. This waveform is most important in ensuring a dry, blood-free environment for placement of a more aesthetic bonded restoration.

When making incisions for tissue removal, the fine straight wire Vari-Tip #118 electrode is used.

The tip is placed in close proximity to the tissue before the power is activated. The tip is kept parallel to the tooth to prevent removal of excessive tissue height. The incision is made in layers, waiting 10 seconds before re-entering the same surgical site (Figure 11).

After adequate tissue removal, any necessary haemostasis can be accomplished with the use of the pencil-shaped electrodes

#113F and #117. These electrodes are used with the partially rectified waveform.

Broad areas of haemorrhage not involving interproximal tissue can be accomplished with the aid of the ball-shaped #135 and #136 electrodes.

A post-operative dressing is indicated for all areas of radiosurgery. Areas of minimal tissue removal, such as exposing subgingival decay or for troughing crown preparations, can be protected by irrigating the surgical area with 0.12% chlorhexidine gluconate or Peridex.

A coating of Isodent (tissue adhesive) can also be applied to areas of minor surgery.

More extensive tissue removal, as for pre-prosthetic surgery, would warrant a periodontal pack such as Coe-Pak, Zone or Barricade.

The increased number of procedures that can be performed with high frequency radiosurgery will more than compensate the doctor for the time and expense in becoming proficient with the technique.

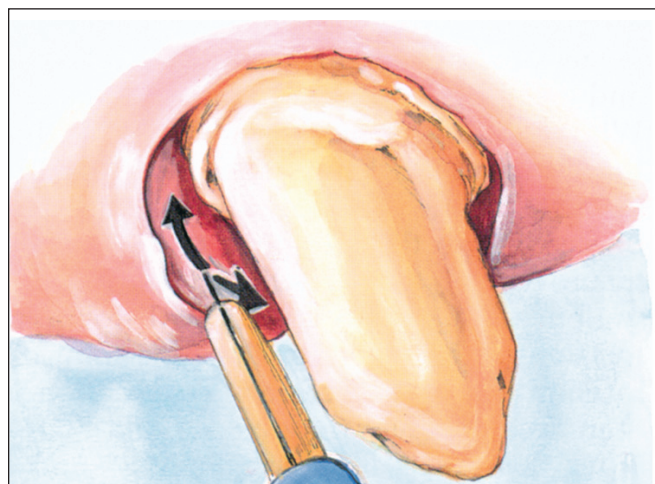
The procedures are reimbursable. These fees vary from region to region and can be obtained by speaking with a local periodontist or oral surgeon.

Radiosurgery is a modality that belongs in every general dental office. It is safe, easy and predictable.

I strongly recommend taking a participation course to become fully versed in the use of radiosurgery.



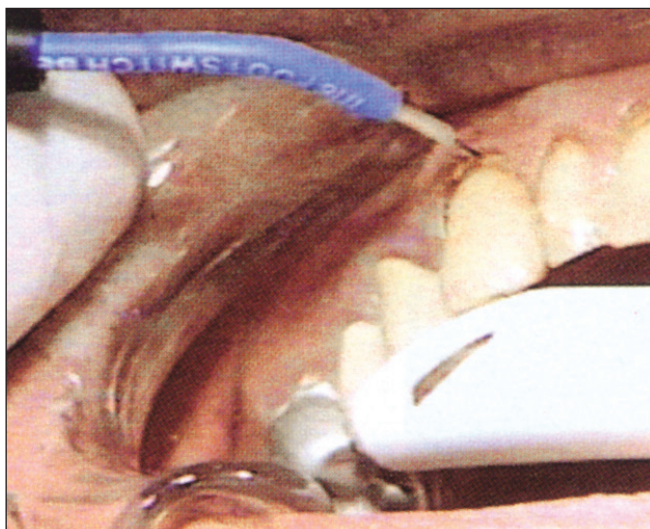
**Figure 10: A delicate incision to remove a specimen for biopsy performed with a fully filtered waveform and a Vari-Tip #118 electrode**



**Figure 11: The electrode is kept parallel to the tooth when removing tissue. This prevents cutting the height of the tissue and assures predictable healing**

#### References

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**Figure 6: Vari-Tip #118 electrode exposing subgingival decay. The waveform used was a Fully Rectified to establish coagulation during tissue removal**



**Figure 8: Composite placement is simplified with the aid of radiosurgery. Haemostasis allows the composite to be placed without compromise of bleeding**



**Figure 7: The tissue is removed following the contour of the tooth and fully exposing the decay**



**Figure 9: The tissue is irrigated with a 0.12% chlorhexidine gluconate or Peridex solution post-operatively**

Dr. Sherman is available to work with dental school faculties that are interested in adding radiosurgery to their curriculum, either as a required course or as an elective. His textbook *Oral Radiosurgery and the Video Atlas* are both available from Ellman UK.