Implant Exposure Using Radiosurgery

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 hemostasis. Radiosurgery is a common and now well-respected word in the field of dentistry. This form of surgery evolved from electrosurgery, and prior to that electrocoagulation. It is a learned skill that takes time and practice to master. The common use of radiosurgery is due in part to the advancement of the technology as well as the increased research in the field over the years.

BACKGROUND

The original electrosurgical equipment developed by Coles, Martin, and Eilmann has been downsized with the development of more sophisticated waveforms and cutting tips. Dr. Irving Eilmann developed the fully filtered waveform combined with a frequency of 3.8 MHz, while Dr. Maurice Oringer wrote the first textbooks on the subject. Dr. John Flecken of UCLA was one of the original educators who brought electrosurgery in the form of participation courses to dental schools and the dental profession. In 1977, Dr. Arthur Goldstein published a thesis on Radiosurgery in Dentistry. There existed confusion, still prevalent today, regarding the differences between high-frequency and low-frequency devices. Dr. Goldstein realized that there was a need to differentiate the new, higher frequency device that produced lower, cooler temperatures from the low-frequency, higher temperature-producing instruments. There is a difference between the 4-MHz radio wave device and the lower frequency, higher temperature electrosurgical machines. Dr. Goldstein understood the potential for misuse and patient injury by mistakenly using low-frequency electrosurgical devices in the oral cavity. Therefore, he coined the term “radiosurgery” to clearly describe the 3.8- to 4-MHz radio wave device.

Radiosurgery is the removal of soft tissue with the aid of a radio signal. This radio signal operates within the frequency of 3.0 to 4.0 MHz. The older electrosurgical instruments, while performing similar procedures, operated at a frequency of 1.0 to 2.9 MHz. Research has shown that these low frequencies produced more lateral heat to the surrounding tissues and should be avoided when in close proximity to bone. Electrosurgery should be considered contraindicated for periodontal surgery, implant exposure, and delicate surgery, and should be updated to the newer, higher frequency radiosurgery. Radiosurgery at 3.8 to 4 MHz in frequency offers the advantages of a safe, fast, and efficient microincision with an excellent field of visibility.

For proper cutting as well as coagulation it is necessary for the instrument to be tuned for the best possible results. Cutting should be smooth and easy with no or only minimal sparking being seen. The tissue should be incised with no tissue sticking or curling to the electrode tip. Sparking on cutting is indicative of too much power, while drag or tissue sticking is indicative of an inadequate power setting. With proper power tuning the electrode will move rapidly through the tissue, making a clean, odorless, microsmooth incision and producing a painless, rapidly healing incision with no or minimal patient discomfort.

Lateral heat is the heat produced to the tissue on either side of the electrode tip. This heat is produced by the resistance of the tissue to the radio wave being transmitted through it. The control of lateral heat to the tissue surrounding the electrode tip is a...
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must. When making an inci-
sion, the radio signal should be applied to any one point for a period of 1 to 2 seconds followed by a waiting or cooldown period of 5 to 10 sec-
onds. The tissue can also be cooled using the air-water syringe or central suction, e-
liminating the waiting peri-
od. We can also minimize lateral heat by using the fully filtered waveform for mak-
ing the most delicate inci-
sions in close proximity to the osseous tissue or implant. Research has shown that this waveform produces the least lateral heat of the 4 available waveforms.

Lateral heat can be mini-
mized by proper instrument power tuning, proper wave-
form selection, and by using a high frequency radiologi-
cal instrument operating be-
tween 3.8 and 4.0 MHz, ver-
sus the old 1.0- to 2.9-MHz
low-frequency electrosurgical instruments. The high-fre-
quency radio signal has been shown through research and testing to produce the least possible tissue alteration. Published research studies confirm adjacent non-target tissue alteration at 15 to 30
μm with the 4-MHz device. The patient experiences a pressureless incision with a minimal amount of bleeding, which often requires no su-
turing and reduces bacteria, healing time, and discomfort. The radio wave produces a finer, less traumatic incision, and therefore has seen in-
creased usage in all forms of delicate periodontal, oral, im-
plant, and cosmetic surgery.

The Elman Radiolase II (Elman International) does offer 3 different waveforms, a frequency of 4 MHz, and auto claveable, radiofrequency-matched micro electrodes and handpieces. A new silver-
agon alloy electrode has just been developed to reduce tissue damage and heat generated to the surgical site. The sil-
er alloy electrode has been shown to produce thermal damage no greater than 10
μm in comparison to tungsten electrodes, which have pro-
duced thermal damage as high as 50 μm. One impor-
tant advantage of the silver-
agon alloy electrodes is their ability to not stick to the electrode tip. This ensures a clean cutting

Figure 5. Immediately postopera-
tive, showing the fully exposed implants. The transfer copings can be fully seated without any tissue im-
plimentation to ensure an accurate impression.

Figure 6. Transfer copings fully seat-
ed without any tissue implantation.

Figure 7. 3M ESPE Express impres-
sion material being injected around the transfer copings.

Figure 8. Bloodless impression with the transfer copings accurately in position.

Figure 9. Sixth month postoperative photo showing healthy tissue healing.

Figure 10. Elman’s Surge-on-Vac for removal of surgical plume.

high-frequency radiosurgery has numerous clinical applications in the dental practice, from performing precise surgical inci-
sions to establishing hemostasis.

CLINICAL TECHNIQUE

When making incisions for tissue removal and implant exposure, the fine, straight-
wire Vari-Tip No. 118 elec-
trode (Elman International) is used in monopolar, or the parallel, straight-wire elec-
trode is used for bipolar sur-
gery. Radiosurgery offers the fully re-
curved waveforms and can be finely tuned, and when used with the filtered wave-
form, can produce micro-
smooth incisions and perform the most delicate of periodont-
l procedures. The fully rec-
ned waveforms are useful in all forms of tissue removal that are superficial and not close to the bone. A partially recurred wave is used only for hemostasis of the soft tissue and never to make an incision.

Bipolar surgery has made an appearance in the dental literature. There is some con-
fusion among practitioners as to the difference between monopolar and bipolar sur-
gery. Radiosurgery offers the ability to perform as both a monopolar and bipolar in-
strument. In the monopolar mode, the incision is made with a microfine, single-fre-
quency-switching surgical wire. This mode is used to delicate-
ty and precisely remove or re-
contour soft tissue. The bipo-
lar mode is used for precise, pinpoint coagulation during microsurgery. Bipolar coagu-
lation uses an electrode with 2 wider tip wires parallel to each other. The signal travels between the wires, establish-
ing coagulation.

The Radiolase II is an in-
strument that is both mono-
polar and bipolar. The clinici-
ian who is familiar and com-
fortable with monopolar ra-
diosurgery can continue to use this modality for all gen-
eral dental procedures. When treat-
ment is in close proximity to implants or large metal restorations, the bipolar mo-
dality can be readily used.

The instrument developed by Elman International comes equipped with different hand-
pieces, which can be used to prevent accidental use of the wrong modality. This in-
strument has been designed with all the international safety standards, has an adjustable

bore with a dedicated inlet nozzle. Presently, most dental offices are using a central evacuation system to remove smoke and heat. The evacuators were designed for the suction and removal of water, and use a lower volume of air without filtration. Dedicated smoke evacuators work with an increased vol-
ume of air needed to remove the smoke plume and send it through a filtration system. The Surg-e-Vac (Elman International) was developed primarily for the radioelect-
ro laser surgeon. Tests have shown that the Surg-e-Vac has a very high efficiency in airborne particle removal. This is due to the capture velocity of the unit, which is 150 feet per minute at the inlet wand tip. The filter is designed as a Quad Filtration System (Elman International), which includes a macro and micro particle trapping section, a HEPA filter for vi-
rus removal, as well as a char-
coal filter section for odor con-
trol. To ensure filtration effi-
ciency, radiofrequency identi-
fication technology has been incorporated into the circuitry to ensure monitoring of the filter function and lifespan.

A postoperative dressing is indicated for all areas of radiosurgery. Areas of mini-
mal tissue removal such as expo-
sing subgingival decay, tugging crown prepara-
tions, or exposing implants can be protected by irrigating the surgical area with Perio-
dex (Zila), or Listerine (Pfi-
zer). A coating of Iodent (El-
man International) can also be applied to protect the surgical area. More extensive tissue
removal, as for pre-prost-
thetic surgery, would warrant a periodontal pack such as

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Introducing

RADIOLASE® II

the latest innovation in
Soft Tissue Dental Surgery

PATENTED HYBRID MONOPOLAR & BIPOLAR
HIGH FREQUENCY/LOW TEMPERATURE RF ENERGY SOURCE.

The most advanced surgical technology available in dentistry today.

The ellman Radiolase® II affords Dentists and Oral Surgeons the ability to utilize both monopolar and bipolar modalities at 4.0Mhz, the frequency scientifically and clinically proven to produce the least amount of lateral heat and tissue alteration.

This technology goes beyond the laser and beyond bipolar in terms of tissue preservation and safety, all at a very affordable price.

BEYOND LASERS FOR SOFT TISSUE MANAGEMENT.

The ellman ACe-Tip™ electrodes are designed to reduce resistance/impedance which in turn will reduce thermal damage. The interface between these electrodes and the tissue is biologically stable. Iso-Dent™ is used predominately to control bleeding, in turn minimizing suture needs. Surgery time is hastened, as the application provides an excellent hemostatic effect.

CONCLUSION
High-frequency radiosurgery has numerous clinical applications in the dental practice, especially for resective surgical incisions to establish hemostasis. This article has described the clinical protocol for using radiosurgery, and includes a case description that uses radiosurgery to expose implants for subsequent prosthetic restoration.

Sources


In-Harter JF, ed. Current Clinical Dentistry. vol 4, chap A.

