

THE CLINICAL SIGNIFICANCE OF 4.0 MHz

The **PRECISION** you require
with the **VERSATILITY** you need
to be successful.

The Clinical Significance
for 4.0 MHz High Frequency
Radiosurgery®

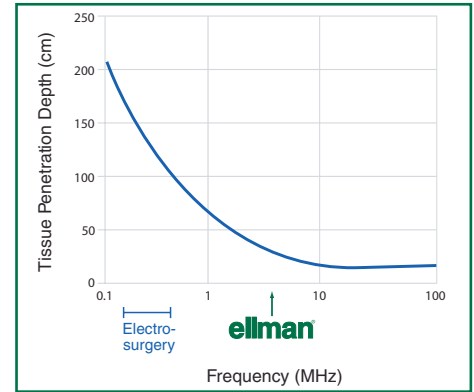


ellman[®]
Experts in Precision Surgery

The Physics of ellman® Radiowave Technology

There is an inverse relationship between frequency and how deeply RF energy penetrates tissue. (figure 1)

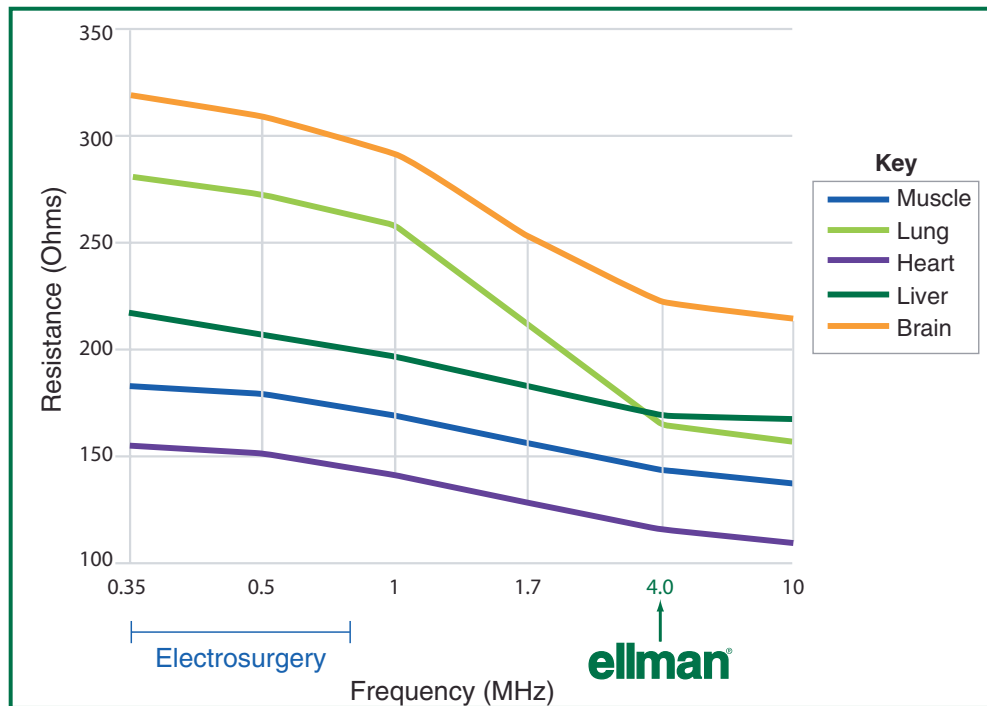
figure 1



Source: Golio, JM, et al, "RF and Microwave Applications and Systems", [The RF and Microwave Handbook](#), p21-2.

There is also a relationship between the frequency used and tissue's resistance to the energy. (figure 2) The high frequency of ellman® Radiosurgery® encounters less tissue resistance and shallower penetration than lower frequency electrosurgery. This means less heat is generated in the tissue. The low frequency of electrosurgery encounters high resistance and deeper penetration. This generates more heat, which contributes to more cellular destruction along the path of the incision.

figure 2



Source: IEEE Transactions on Biomedical Engineering, Jan 1975

We design our products, such as the Surgitron® Dual, to optimally perform at 4.0 MHz, and to properly balance minimal thermal damage with outstanding cut/coagulation properties.

Conclusions

- The decrease in resistance means that tissue stays cooler with ellman® Radiosurgery® than with conventional electrosurgery.
- The higher temperature of conventional electrosurgery causes more thermal damage, which can be measured.

73% Less Thermal Damage with ellman® Radiowave Technology

A study at the University of Iowa compared ellman® radiowave technology to two leading low frequency electrosurgery generators⁶. The purpose of the study was to accurately measure the thermal damage between all three generators.

Each generator used the same electrode model, the ellman® Vari-Tip™ electrode, with a 0.007 inch diameter wire. Ellman manufactured the Vari-Tip™ electrode to fit in the ellman® Surgitron® Dual generator along with the Bovie® 1250 and ValleyLab® Force Fx generators. Each generator was set by the research staff to the optimum power setting to minimize drag on the tissue.

All skin incisions were made on a porcine abdomen. All of the incisions from the ellman®, Bovie® and ValleyLab® generators looked similar with the naked eye.

However, when the tissue samples were histologically examined with Hematoxylin Eosin stain, a dramatic difference was seen.

	ValleyLab® Force Fx	Bovie® 1250	ellman® Dual
Thermal Damage (Average)	190 µm	190 µm	110 µm
Standard Deviation	40 µm	40 µm	20 µm
Standard Error	10 µm	10 µm	10 µm
Number of Samples	15	13	7
P-value (vs. ellman®)	<0.001	<0.001	
Frequency of Generator	390kHz	350-800 kHz	4 MHz

Conclusion

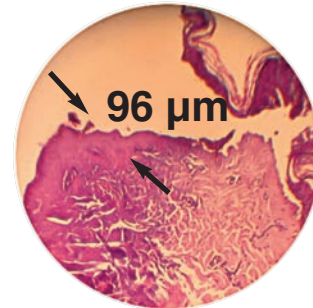
The results show a statistically significant advantage for the ellman® Surgitron® Dual. There was **73% less** thermal spread with ellman® than with the Bovie® or ValleyLab® low frequency generators.

Additional Studies Support Less Thermal Damage with ellman® Radiowave Surgery Technology

Other studies support the conclusion that the ellman® 4.0 MHz generator produces less thermal damage than electrocautery or laser generators. In 2004, Dr. Stan compared the histology of incisions made with ellman® versus ValleyLab® Force Fx. Under similar cutting conditions, he found that ellman® had **84% less thermal damage** than ValleyLab® Force Fx.



**ellman® Surgitron® Dual
4.0 MHz**



**ValleyLab® Force Fx
0.390 MHz**

Researchers are finding that ellman® high frequency radiowave surgery products have outstanding patient outcomes when compared to other modalities, such as conventional electrocautery and lasers. Although the amount of thermal damage will vary based upon the type of tissue and the doctor's technique, Ellman radiowave technology consistently produces less thermal damage than conventional electrocautery under similar conditions.

Clinical Benefits for ellman® 4.0 MHz Radiowave Technology

- **Quick Recovery** With less tissue destruction, healing is hastened and your patients will recover quickly²
- **Decreased Post-Operative Pain** Radiowave surgery causes less trauma³
- **Decreased Post-Surgical Edema** Low temperature = less tissue destruction⁴
- **Less Burning or Charring of the Tissue** Radiowave surgery minimizes burning of tissue, unlike laser or electrocautery⁵
- **Value** Our patented technology is a high return on investment (ROI) purchase for both the hospital and office environments
- **Expand Your Office Procedures** No other energy-based technology has the surgical versatility of ellman®⁶

Clinical Citations

1. Dr. Constantin Stan, Data on file.

3. Ericsson, E et al, The Laryngoscope (2007); vol 117, p654.

5. Olivar, AC, et al, Ann Clin Lab Sci. (1999); 29(4): p281-5.

2. Bridenstine, J.B., Derm Surgery (1998); vol 24, p397-400.

4. Aferzon, M, Derm Surgery (2002); vol 28, p735-738.

6. Data on file.

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