Soft-tissue cutting with laser versus electrosurgery

Gordon J. Christensen, DDS, MSD, PhD

Three methods of cutting oral soft tissue are used commonly in dentistry: scalpel, electrosurgery and laser. Each of these methods works. However, they are different from the standpoints of hemostasis, healing time, cost of instruments, width of the cut, anesthetic required and disagreeable characteristics, such as smoke production, the odor of burning flesh and undesirable taste.

Laser has received significant commercial emphasis in the past few years. It is my observation that dentists are confused as to the comparative value of laser versus electrosurgery for cutting soft tissue.

Cutting soft tissue with a scalpel is a technique used by every dentist. All practitioners know of the negative characteristics associated with cutting soft tissue with a scalpel, including excessive blood flow and inadequate visibility caused by blood in the operating field. However, dentists also know that there are desirable aspects of using a scalpel for soft-tissue cutting, including ease of use, low cost and relatively fast and uneventful healing.

In this article, I compare laser use with electrosurgery for cutting soft tissue, and I make some clinical conclusions about the advantages and disadvantages of each of these two soft-tissue cutting methods on the basis of comparisons in the literature and from my own clinical observations. (A note: Electrosurgery also is called "radiosurgery." In my opinion, the term "radiosurgery" is more acceptable to patients, and I encourage dentists to use it instead of "electrosurgery" when speaking with patients. However, because dentists commonly use "electrosurgery," I will use it in this article.)

ELECTROSURGERY

Since 1914, electrosurgery has been used routinely in various aspects of medicine, including dentistry. Most dentists use electrosurgery successfully on a routine basis. When reviewing the overall medical (nondental) literature, I noted that an argument still exists regarding which method is best for soft-tissue cutting—electrosurgery or laser.[1-7]

Electrosurgery is a controlled, precise application of heat to the soft-tissue site to be cut, achieved by means of carefully designed electrodes. The result is a controlled, irreversible thermal alteration of the soft tissue.

There are two basic types of electrosurgery. In monopolar electrosurgery units, the current begins with the electrosurgery device and travels along a wire to the oral site, then to an indifferent plate placed behind the patient's back. As the surgical electrode contacts the patient's oral soft tissues, heat is produced and controlled cutting is achieved. Smoke and pain also are produced as the tissue is cut, necessitating the use of anesthetic.

Bipolar electrosurgery devices have two electrodes on the cutting tip. The current flows from one electrode to the other, making a broader cut than does the monopolar unit, but eliminating the need for the indifferent plate. Both types of electrosurgery units achieve their intended purposes well, but monopolar electrosurgery is used more often than is bipolar electrosurgery (R. Goldman, vice president, Clinical Products, Parkell, Edgewood, N.Y., oral communication, May 6, 2008).

Currents used in oral electrosurgery are fully rectified filtered (usually called "cut" or "filtered" on the devices), fully rectified (usually called "coagulate," "coagulate/cut," "coagulate/hemostasis" or "unfiltered" on the devices) or partially rectified (usually called "coagulate" or "fulgerate" on the devices). Judging from my experience, most dentists use fully rectified current on a medium setting so the electrode tip cuts but does not drag.

Research and observations in the area of electrosurgery suggest the following uses for electrosurgery[8-15]:
- gingivectomy;
- gingivoplasty;
- tissue management for fixed prosthodontics;
- increasing access for restorations and crown build-up;
- crown lengthening;
- tuberosity reduction;
- reduction of soft tissue in numerous areas;
- periodontal pocket reduction;
- operculectomy;
- frenectomy;
- biopsy, if enough healthy tissue is removed to provide wide margins, thus avoiding damage to questionable tissue.

According to the previously referenced articles,[8-15] these are the advantages of electrosurgery:
- the units cost much less than do lasers;
- the electrode cuts on its sides as well as on its tip;
- the electrode may be bent to meet the clinical need;
- cuts are made with ease when the device is set correctly;
- hemostasis is immediate;
- cutting is consistent;
- the wound is nearly painless after the procedure;
- the soft tissue has minimal trauma;
- the tip is self-disinfecting.

According to the previously referenced articles,[8-15] these are the disadvantages of electrosurgery:
- anesthetic is required for cutting;
- both the name and the use of electrosurgery cause fear in some patients;
- there is an unavoidable burning-flesh odor;
- the operator has only a low tactile sense of exactly what is being cut;
- the heat developed by monopolar electrosurgery units does not allow for their use around implants (careful use of bipolar electrosurgery is acceptable around implants because it produces less heat);
- bone can be damaged;
- electrosurgery is dangerous in an explosive environment;
- although this issue is controversial, electrosurgery may disrupt the action of pacemakers[16];
- patients who have undergone irradiation, have diabetes or have blood dyscrasias can experience poor postoperative healing.

LASER

Laser light is monochromatic and is one specific wave length. Laser light is coherent and organized, directional, strong and concentrated. It is not like a typical flashlight, which releases light in many directions. There are many different types of lasers. The medium for light transmission can be solid, gas, liquid or semiconductor. In my observations, the most popular type of laser in American dentistry is semiconductor, specifically diode, at a wavelength of 800 to 980 nanometers. Among the other items in which diode lasers are used are laser printers, compact disc players and laser pointers. Because of the popularity of diode lasers in American dentistry, I will concentrate on that type of laser in this article. However, publications on lasers overall[17-31] indicate several types of lasers for soft-tissue cutting and present numerous soft-tissue uses for lasers, as well as advantages and disadvantages of their use.

Research and observations in the previously referenced articles about laser use[17-31] suggest the following soft-tissue uses for laser:
- gingivectomy;
- gingivoplasty;
- biopsy;
- gingival troughing;

- crown lengthening;
- subgingival curettage;
- operculectomy;
- frenectomy;
- apthous ulcers;
- leukoplakia;
- elimination of open pockets;
- reduction of tuberosity;
- vestibuloplasty;
- uncovering implants.

According to the previously referenced articles,[17-31] these are the advantages of lasers for soft-tissue cutting:

- their use requires minimal or no anesthetic;
- they do not harm dental hard tissues;
- their judicious use does not injure the dental pulp;
- because of low or no heat production, they can be used around dental implants;
- they are antimicrobial;
- they remove endotoxins from root surfaces;
- there is growing evidence that laser use may be positive therapy for periodontal disease;
- laser technology is considered state of the art by the lay public, so patients are more accepting of its use in their treatment than of electrosurgery.

According to the previously referenced articles,[17-31] these are the disadvantages of lasers for soft-tissue cutting:

- the cost of laser is significantly higher than that of typical electrosurgery units;
- most of the techniques suggested for laser overlap with those for the much less expensive electrosurgery;
- because of the potential hazard of laser light, laser use requires a learning period and strict precautions;
- laser can cause eye damage, so protective glasses are required during its use;
- cutting with lasers usually is slower than that with electrosurgery;
- there is a burning flesh odor;
- some techniques are time consuming;
- combustible gases must be turned off during laser use;
- laser plume requires use of a high-filtration face mask, because of the possible presence of pathogens in the plume.

TABLE

Comparison of three methods of cutting soft tissue.*

MEASURE	TISSUE-CUTTING METHOD		
	Scalpel	Electrosurgery	Diode Laser
Hemostasis	No	Yes	Yes
Healing Time	Least	Moderate to long	Moderate to long
Cost	Least	Moderate	High
Width of Cut (Average)	Least	Moderate	Widest
Smoke Produced	None	Yes	Yes (laser plume)
Anesthetic Needed	Yes	Yes	In some cases

* Based on research[1-4] and the author's clinical observations.

CHOOSING BETWEEN LASER AND ELECTROSURGERY

After observing the suggested uses of laser and electrosurgery for soft-tissue cutting, I find that their suggested uses overlap considerably, and that both modes of cutting are effective. It also should be apparent that a few potential uses do not overlap. The table[1-4] shows some of the characteristics of both modes of cutting and makes comparisons between the two, as suggested in the literature.[32-41]

Use of laser, especially diode laser, continues to increase. Dentists would not continue to buy lasers if they were not working and providing a service in their practices. There is no question that lasers attract patients, probably because of their significant use and the visibility of procedures such as laser-assisted in situ keratomileusis (LASIK) eye surgery. Additionally, laser cutting can be performed around implants. This is a significant advantage, because most dentists are involved at least with implant prosthodontics. Laser requires the use of less anesthetic solution, which may or may not be a significant advantage.

On the contrary, electrosurgery units are far less expensive than the least expensive diode lasers. Are the advantages of diode laser use significant enough to compensate for the additional cost? That decision is up to the individual dentist.

SUMMARY

Both diode lasers and electrosurgery units work well for simple cutting of oral soft tissues. Commercial advertisements have stimulated use of dental lasers by expressing their advantages. Numerous wave lengths of lasers other than diode are available and are being used for soft-tissue cutting. Because of its popularity, I emphasized diode laser in this article. A comparison of diode laser with electrosurgery reveals significant overlap of potential uses and effectiveness. The decision regarding which modality to use is up to individual dentists. I know of many dentists who are using both electrosurgery and diode laser, in acknowledgment of the desirable characteristics of both. ■

Dr. Christensen is the director, Practical Clinical Courses, and co-founder and senior consultant, CR Foundation, Provo, Utah. He also is the dean, Scottsdale Center for Dentistry, Scottsdale, Ariz. Address reprint requests to Dr. Christensen at CR Foundation, 3707 N. Canyon Road, Suite 3D, Provo, Utah 84604.

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