CO_2 Surgical Laser for Equine Veterinarians

By Robert Fleck, DVM
For The Education Series

I have been using lasers (CO_2 and diode) in my equine-only practice for the last six years. I have discovered many uses that have immensely expanded my surgical and therapeutic capabilities. While the diode is primarily used for endoscopic surgery of the upper respiratory and urogenital regions, most of my laser use involves the CO_2 surgical laser, which brings many benefits to my equine procedures.

The CO_2 laser's wavelength of 10,600 nm is highly absorbed by soft tissue[1]; this unique aspect of the carbon dioxide laser enables precise dissection and vaporization of soft tissue with minimum hemorrhage as well as reduced postoperative pain and swelling (due to the coagulation of nerve endings and lymphatics along the edges of incisions).

Whether doing incisions, excisions, dissections or ablations, CO_2 laser surgery is always noncontact; therefore it minimizes tissue trauma while providing a strong sterilizing effect by killing surface bacteria.

CO_2 Laser Uses

With my CO_2 laser, I have been impressed with the reduced inflammation and swelling of the surgery sites, especially in cases involving castration of the mature stallion. Small bleeders may be controlled by raising the handpiece away from the tissue, defocusing the laser beam and coagulating the affected surface of the vessel wall.

After performing closed castration in normal stallions (see Figures 1 and 2), we see horses returning to training very quickly and without the threat of evisceration. Further, my laser's flexible waveguide enables superior reach and ergonomics during operation in this area (more on this later).

I also use the CO_2 laser a lot for tumor debulking and ablation. Having used cryotherapy for tumor therapy for over 30 years, I now perform almost all treatments with the CO_2 laser. Tumors I regularly deal with include melanomas, squamous cell carcinomas, mastocytomas and equine sarcoids.


Figure 1


Figure 2

The 40 watt Aesculight CO_2 laser has impressive ability to treat large tumor masses. It is useful for treating cutaneous tumors in the horse, including equine sarcoid, squamous cell carcinoma and melanoma. Tumor debulking, ablation and dissection with limited hemorrhage are facilitated with the CO_2 laser.

It enables thermal coagulation of the surgical margins; the thermal effect assists in eliminating abnormal cells left by conventional surgical techniques. The laser thermally seals blood and lymphatic vessels by which the microscopic tumors spread; this, with decreased tissue manipulation, decreases the rate of tumor seeding and recurrence[2,3].

The use of the laser in treating melanomas in the gray horse is illustrated in Figure 3 (pre-operative), Figure 4 (intra-operative), and Figure 5 (immediately post-operative).

CO_2 Laser Power Settings

The power of the CO_2 laser is critically important for high quality incisions, excisions and dissections performed in one path with minimum thermal damage to the margins—the higher the power, the faster the incision can be performed without multiple back and forth movements of the laser beam.

Equally important is the power of the laser for large area ablations—the higher the power, the larger the area that can be treated in the minimum amount of time. Thus, higher laser power is preferred, especially for equine and large animal surgical procedures[1].

Last year I upgraded to a 40 watt Aesculight CO_2 laser. It is the highest power CO_2 laser for veterinary use, and it is the only flexible waveguide fiber laser on the market with extended reach appropriate for open field equine surgery, as illustrated in Figure 1.

Combined with fiber flexibility and a selection of different attachments, the 40 watt model is a long awaited upgrade most suited for large animal and equine surgeries. I have found that the higher wattage and Superpulse settings have made incisions a breeze (even with the horse's relatively thick skin).

Beam Delivery and Accessories

One of the best upgrades is the new flexible waveguide fiber, allowing easier handling of the laser handpiece with a greater control of beam spot size as well as the benefit of rapid defocusing for safety and versatility. My flexible fiber laser handpieces also have a relatively shorter tip-to-tissue distance, are more precise and offer multiple-spot sizes while articulated arm lasers do not. The flexible fiber is ergonomic and easy to use, unlike the heavier articulated arm laser that I previously owned.

There are several important laser accessories that I use regularly. In addition to a regular laser handpiece with interchangeable laser tips of different lengths and focal spot sizes (Figure 4), the new adjustable tipless handpiece, shown in Figures 1 and 2, allows for more options like changing the laser spot size intraoperatively without changing the handpiece.

The handpiece incorporates four spot sizes: 0.25 mm and 0.4 mm spot sizes for excisions, incisions and dissections; and 0.8mm and 1.4 mm for large-area surface ablations. The other tipless handpiece design with fixed, interchangeable spot size nozzles enables more visibility and improves handling ergonomics.

Also, Aesculight's exclusive "paintbrush" laser tip produces a 3 mm x 0.4 mm beam useful for ablating of large surface areas at the highest laser power settings.


Figure 3


Figure 4


Figure 5

Summary

The main advantages of the CO_2 wavelength technology (10,600 nm) for soft tissue surgery include reduced tissue trauma, precise dissection, sterilization of the tissue surface (as the laser beam kills surface bacteria), reduced operative hemorrhage, quickened healing and reduced post-operative pain. My clients regularly comment on how good the surgical sites look. ●

Dr. Fleck is a graduate of the University of California, Davis. He founded the Rainland Farm Equine Clinic in 1975 and has expertise in nuclear scintigraphy (bone scan), lameness examinations and breeding as well as reconstructive, laser and arthroscopic surgery.

FOOTNOTES...

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3. Lanzafame, RJ, et. al. Mechanisms of reduction of tumor recurrence with carbon dioxide laser in experimental mammary tumors. Surg Gynecol Obstet 1988 Dec; 167(6); pp. 493-496.

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