

# State of the Art Laser Surgery

## [What Pet Owners Say About Laser Surgery](#)

### What is a laser?

LASER stands for Light Amplification by Stimulated Emission of Radiation. A laser is an opto-electronic device that produces highly concentrated light rays. Laser power may range from milliWatts (in CD-ROM drives and laser pointers) to dozens of Watts (industrial and medical applications) and over trillions of Watts (pulsed lasers in scientific and military applications).

### What is laser surgery?

Interaction of laser light with tissue provides a fundamentally different approach to surgery. In laser surgery, a highly focused laser beam can efficiently ablate (either vaporize or chip away) the living tissue. At the same time, it seals (welds) capillaries, small blood vessels, lymphatics, and nerve endings, with significant benefits to both patients and surgeons.

### What is the most efficient soft-tissue surgical laser?

Soft Tissue Laser Surgery is different from Hard Tissue Laser Surgery (bones and teeth in dentistry) and Laser Eye Surgery (eye sight corrective surgeries) by particular types of lasers. Lasers differ from each other by the wavelength of light they produce. The most commonly used surgical laser in soft tissue surgery is the CO<sub>2</sub> laser. The CO<sub>2</sub> laser wavelength (10.6 micrometers) is highly absorbed by water contained in soft tissue. Because of its outstanding versatility and precision, the CO<sub>2</sub> surgical laser is the most efficient and dominant soft tissue surgical laser since the 1960s. Laser surgery is widely practiced in many applications of human as well as veterinary medicine.

### Laser surgery benefits for patients

**Less Bleeding:** As it cuts, the laser seals small blood vessels. This drastic reduction in bleeding enables a number of new surgical procedures that are not practical with conventional scalpel.

**Less Pain:** The CO<sub>2</sub> laser beam seals nerve endings and lymphatics, resulting in less edema and pain. The patient experiences a far more comfortable post-operative recovery.

**Reduced risk of infection:** This is one of the unique features of the CO<sub>2</sub> laser beam. It efficiently kills bacteria in its path, producing a sterilizing effect.

**Quicker recovery time:** Reduced risk of infection, less bleeding, less pain and less swelling often allow the patient a far quicker recovery after the surgery.

### Laser surgery benefits for surgeons

**Unique surgical capabilities:** Laser surgery improves many surgical procedures by making them simpler and reducing risk. This enables surgeries that are not practical with conventional methods.

**Enhanced visibility of the surgical field:** The laser light seals capillaries and small blood vessels as it cuts, thereby dramatically reducing bleeding. This results in a much clearer and drier surgical site.

**Increased precision and control:** The focal spot size of the beam may be adjusted down to a small fraction of a millimeter or expanded for a much wider coverage. The laser power may be set for rapid removal of relatively large tissue amounts, or adjusted to remove only one cell layer at a time.

**Reduction of surgery time:** The hemostatic effect of the laser beam and the improved visibility of the surgical field often reduce the duration of the surgery.



Laser Scalpel



[Aesculight Veterinary Laser](#)



[Veterinary Laser Surgery](#)

# Veterinary Laser Surgery

## General surgery procedures:

Traumatic wound debridement, Perianal tumors, Toe Nail Lasing, Amputations, Tumor bed ablations, Ceruminous adenocarcinoma, Vaginal Fold Excision, Chemodectoma Chronic, Mast cell tumors, Colorectal tumor debulking or resection, Cranial cruciate ligament rupture debridement, Granulation tissue shaving, Cystotomy, Deep mass removal, Everted sacculle resection, Vital pulpotomy, Fibrosarcoma, Graft bed preparation-infected wounds, Hemangiopericytoma, Hepatic carcinoma - hepatic lobectomy, Lipoma & Liposarcoma resections, Operculectomy, Perianal urethrostomy stricture revisions, Pericardectomy, Rhabdomyoma of flank, Subtotal prostatectomy, Tendon sheath tumors hemangiopericytoma, SCC and infiltrating lipoma, Thyroidectomy, Enterotomy, Transitional cell carcinoma of bladder, Perianal fistulas, Tumor/mass removal, Urethral prolapse resections, Urinary bladder polyps, Vaginal tumor excisions - leiomyoma, SCC and fibrosarcoma, Anal saculectomy.

"...laser surgery offers better hemostasis and visibility, less post-operative swelling, and decreased post-operative pain. In certain procedures, better hemostasis and visibility will reduce overall surgical time."

Timothy L. Holt, DVM and Fred A Mann, DVM, MS

"Soft Tissue Application of Lasers"

Vet Clin Small Anim 32 (2002) 569-599, Elsevier Science (USA)

"The carbon dioxide laser is a very effective tool for treating diseases of the perianal region. The skin of the perianal region is thin and sensitive. The carbon dioxide laser offers a 'no touch' method of excising these lesions, which helps decrease postoperative discomfort and irritation. The carbon dioxide laser is very effective in controlling hemorrhage from vessels smaller than 0.5 mm. This is sufficient in controlling

most hemorrhage caused from the rich blood supply of the perianal region. The perianal region is contaminated with bacteria. The carbon dioxide laser photothermally vaporizes bacteria, so that bacterial numbers are decreased, which helps reduce the risk of postoperative infections. These factors help the patient recover quicker and return to function sooner.

The light emitted from a carbon dioxide laser has a wavelength of 10,600 nm, which is in the far-infrared light spectrum. This wavelength of light is highly absorbed by water, creating a thermal effect. Because all soft tissues in the body are composed mainly of water, the carbon dioxide laser penetrates very shallow into tissue, and there is very little collateral thermal damage. This interaction makes the carbon dioxide laser a useful tool for incising, excising, and photoablating soft tissue and allows for fine, controlled dissection of tissue. The axiom of 'what you see is what you get' applies to the properties of the carbon dioxide laser. Finally, the carbon dioxide laser seems to have a lower learning curve when compared with other types of lasers."

Bert A. Shelley, DVM, MS

"Use of the carbon dioxide laser for perianal and rectal surgery."

Vet Clin Small Anim 32 (2002) 621-637, Elsevier Science (USA)

## Ophthalmology surgery procedures:

Conjunctiva treatment, Cherry Eye, Distichia, Ectopic cilia, Lacrimal Punctotomy for Epiphora, Entropion, Meibomium Gland Excision, Eyelid tumor removal, Hemangioma removal, Scleral corneal mass removal, Keratectomy, Mast cell tumors, Squamous cell carcinoma removal, Epiphora.

"The CO<sub>2</sub> laser does have a valuable role for vaporization of eyelid masses, particularly when located adjacent to the medial canthus making scalpel excision and closure difficult; for treating diffuse eyelid papillomatosis; and for safely extending surgical margins after excision or debulking of neoplasms, such as fibrosarcoma and squamous cell carcinoma of the eyelid, limbus, or nictitans."

Margi A. Gilmour, DVM, ACVO

Vet Clin Small Anim 32 (2002) 649-672. Elsevier Science, (USA)

## ENT and oral surgery procedures:

Oral mass excision, Gingivectomy/plasty Incisional Biopsy, Aural Hematoma, Bulla curettage, Ear canal ablation, Correction of faulty ear carriage, Epulis removal, Gingival hyperplasia, Sublingual tissue, Laryngeal granuloma, Ventriculochordectomy, Laryngeal scar removal, Ear crop, Lymphocytic plasmacytic stomatitis, Nasal Hyperkeratosis, Nasal Planum Resection, Osteosarcoma of palate, Ear canal polyps, Partial mandibulctomies, Periodontal flap surgery, Partial maxillectomies, Proliferative otitis - sterilization and ablation, Laryngeal web revision, Ramulas, Salivary gland removal, Salivary mucoceles, Soft palate resection, Squamous cell carcinoma, Stenotic nares, Folds, Sublingual Sialocele, Acanthomastous Epulis, Tongue lesions, Tonsillectomy, Everted laryngeal sacculles, Thoroughing for crown impressions.

"Carbon dioxide (CO<sub>2</sub>) lasers are used in oral surgery for precisely cutting or vaporizing soft tissue with hemostasis. CO<sub>2</sub> lasers intended for dental applications are CW lasers. The CO<sub>2</sub> wavelength is absorbed by the water content of oral tissues. Thermal necrosis zones of 100 to 300  $\mu$ m at cut tissue edges are Thermal necrosis zones of 100 to 300  $\mu$ m at cut tissue edges are typical, providing better oral structure safety compared with other lasers (neodymium:yttrium aluminum garnet [Nd:YAG], argon, and diode), which may penetrate up to several millimeters.



With the CO<sub>2</sub> laser, 'what you see is what you get' compared with the Nd:YAG laser where no immediately visible change appears in the tissue surrounding the zone of vaporization. With the Nd:YAG laser, it is difficult to estimate the true extend of thermal necrosis. This advantage of replacing traditional excisional techniques with CO<sub>2</sub> laser ablation permits removal of the damaged epithelium with as little as 0.1 to 0.2 mm of reversible thermal injury to the submucosa. CO<sub>2</sub> lasers are used for oral, soft tissue procedures, such as gingivectomy, gingivoplasty, frenectomy, and biopsy. Tissue vaporization is more efficient with the CO<sub>2</sub> laser than with other lasers discussed because of the direct absorption of this wavelength by water.."

Jan Bellow s, DVM

"Laser Use in Veterinary Dentistry"

Vet Clin Small Anim 32 (2002) 673-692. Elsevier Science, (USA)

## Dermatology surgery procedures:

Acral lick granuloma ablation, Cutaneous masses: skin tags, Follicular cysts and tumors, Gingival hyperplasia and epulis, Hyperkeratosis of digital pads /nasal planum, Hemostasis, Malignant melanoma, Localized demodex, inclusion cysts, papillomas, Epibulbar melanoma, Pigmented viral plaques, Actinic keratosis, Pinnal tumors, Feline ceruminous cystomatosis, Calcinosis circumscripta, Squamous cell carcinoma removal, Viral papillomas, Wound management (acute and chronic), Nodular sebaceous hyperplasia, Plasma cell pododermatitis.

"The CO<sub>2</sub> laser proved to be an excellent choice for laser surgery because of the ability to limit the zones of damage to microsurgery with little to no collateral damage. This laser is the primary laser in use today in veterinary dermatology. The operator can easily control the device for use in three ways: skin incision, lesion excision, and ablation. It can be readily controlled for precise microsurgery or can be used for ablating larger lesions. Because of its high absorption by water, there is little to no collateral tissue damage with this laser when used properly. ...the ability for the operator to control the effect of the laser beam essentially to the area that you can see with no collateral damage, has led to wide use of this laser in many areas of medicine, including veterinary dermatology ..."

David Duclos, DVM

"Lasers in Veterinary Dermatology"

Vet Clin Small Anim 36 (2006) 15-37, Elsevier Science (USA)

## Avian and exotic surgery procedures:

Traumatic wound debridement, Eyelid polyp removal, Stripping of tendons, Avian pox lesion removal, Diptheroid membrane obstructing, Anal sac removal, Choanal opening, Fibrosarcoma removal, Vocal fold excision, Granulation tissue ablation, Histiocytoma of forepaw, Lipoma removal, Xanthoma removal, Liver mass removal, Gonadectomy, Adrenal gland removal, Constricted toe syndrome, Lymph node biopsy, Ovary ablation, Papilloma removal, Caesarian section, Renal adenocarcinoma, Sebaceous adenomas, Skin incisions, Canthoplasty for lid deformities, Synovial cell sarcoma removal, Bumblefoot, Nasal polyp removal, Uterine adenocarcinoma, Hysterectomy.

"There are many benefits of the CO<sub>2</sub> laser in exotic animal practice. Their use is limited only by the imagination... The benefits of carbon dioxide (CO<sub>2</sub>) laser use in exotics include decreased blood loss, pain, surgery time, and healing time. Because the CO<sub>2</sub> laser seals small vessels as it cuts, there is a decreased blood loss, which is of great benefit because many of the exotic species are quite small and therefore have a small blood volume. The use of CO<sub>2</sub> lasers for surgery also decreases pain because they seal nerve endings as they cut, which may also decrease selfinduced trauma after surgery. Decreased pain may also lessen postsurgical fear and anxiety. Lasers make surgery safer and provide a quicker recovery period. Ablation of cutaneous masses is simplified, with minimal loss of blood. Many exotics develop a capsule surrounding an abscess. If this capsule is not removed or is only partially removed, there is a high recurrence rate. The CO<sub>2</sub> laser allows for the ablation of the capsule."

Agnes E. Rupley, DVM and Terri Parrott-Nenezian, DVM

"The Use of Surgical Lasers in Exotic and Avian Practice"

Vet Clin Small Anim 32 (2002) 703-721. Elsevier Science (USA)

## Equine surgery procedures:

Sarcoid removal, Acute Scrotal Hernia Repair, Fibroma/Neurofibroma, Umbilical hernia repair, Basal Cell Mastocytoma, Entrapped epiglottis procedure, Granulation tissue removal, Lymphoid polyps, Cryptorchidectomy, Melanoma, Palmer digital neurectomy, Castration, Removal of Hydroceles, Scirrhus cord resection, Neoplasia, Squamous Cell Carcinoma, Guttural pouch membrane ablation, Ethmoid hematoma, Ablation of penile and cervical lesions, Proud Flesh.

"... surgical lasers have extended the operative precision, range, and morbidity reduction .... Equine upper airway surgery has also been revolutionized, and there are certainly many applications yet to be developed."

Stephen W. Crane, DVM

"Lasers in Medicine and Surgery"

Vet Clin Small Anim 32 (2002) xi-xii. Elsevier Science (USA)

