

Introducing Veterinary CO₂ Laser Surgery in Japan

I am an owner of a busy small animal veterinary hospital in Nagoya, Japan. One day I encountered a book on CO₂ laser surgery and became fascinated with the technology that brings less bleeding, less swelling, less pain and less risk of infection. It goes without saying that less stress during and after surgical treatment is the best for humans and for animals.

I decided to learn more about small animal soft tissue laser surgery in the USA, and did so for two years at various private practices and at Louisiana State University. At the same time I studied to become a diplomate of the American Board of Laser Surgery (ABLS). Learning the art of laser surgery from the best veterinary laser surgeons in the U.S. and through ABLS allowed me to select the best surgical laser for my hospital back home.

Types of Medical Lasers

It is important to select the type of surgical laser by its wavelength and how it interacts with the tissue. Medical lasers can be assigned to one of three categories:

WYSIWYG stands for "What you see is what you get." This type is suitable for precise surgery with minimum thermal damage to adjacent tissue, because for those wavelengths the absorption coefficient is dominant over scattering coefficient in soft tissue. Examples are CO₂ at 10,600 nm and Er:YAG at 2,940 nm, but the CO₂ laser offers also a superior hemostasis over the Er:YAG laser.

By Masahiro Seki, DVM, Dipl. of American Board of Laser Surgery For The Education Series

WYDSCHY stands for "What you don't see can hurt you." For this type, the scattering of laser light inside the soft tissue is dominant over the absorption. As a result, the laser light spreads deep and wide inside

the soft tissue, which can cause extensive and far-spread thermal necrosis at high power densities relevant to surgical applications.

WYDSCHY examples include Nd:YAG laser at 1,064 nm and laser diodes in the wavelength range of 800-1,000 nm intended for surgical use (i.e. not therapy). The safest way to use WYDSCHY laser surgically is not to use the laser light directly on the tissue, but only as a heat source to heat up the surgical tip (of glass fiber, either bare glass or sometimes with metal tip over the glass) in a "contact" mode where the heat (and not the laser light) interacts with the soft tissue.

SYCUTE stands for "Sometimes You Can Use Them Effectively." This type is useful for color-selective thermolytic destruction of pigmented tissue. Examples include Alexandrite laser at 755 nm and laser diodes in the wavelength range of 800-1,000 nm in highly successful human cosmetic applications where the laser light is used for hair removal (diodes) and skin pigmentation removal (Alexandrite).

Another SYCUTE example is laser therapy using 800-1,000 nm laser diodes at low power densities (i.e. not for surgery). These wavelengths exhibit low water absorption and have significant scattering in soft tissue

A review of available surgical laser technologies reveals that the CO₂ Laser at 10,600 nm wavelength is the most suitable for the soft tissue surgery.



Figure 3A



Figure 3B



Figure 3C

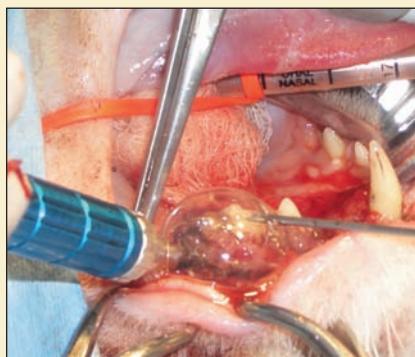


Figure 3D



Figure 3E



Figure 3F

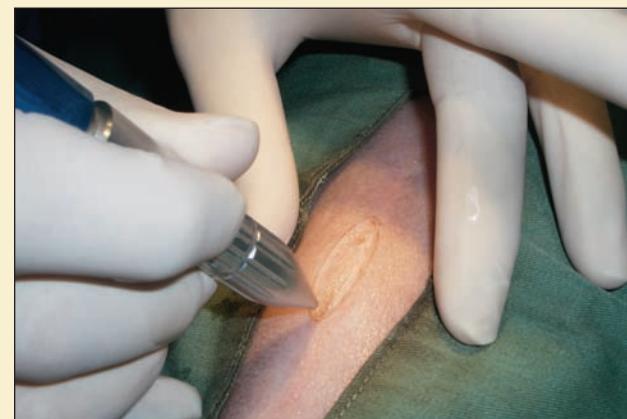


Figure 1

PHOTOS COURTESY OF DR. MASAHIRO SEKI

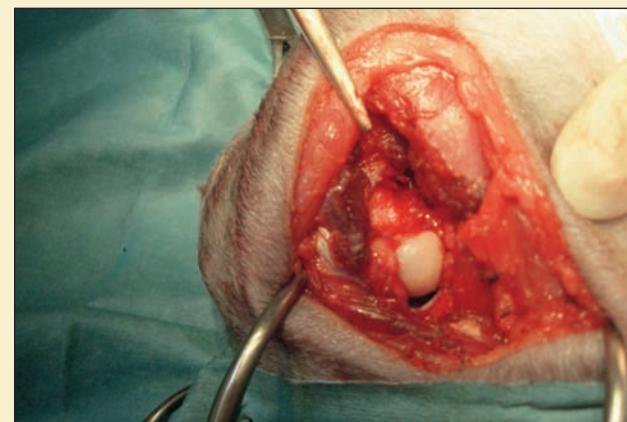


Figure 2

allowing for deep and wide penetration of laser light. Another great application for laser diode is ICG-augmented diode laser treatment of leg veins—it only works with ICG pigment and is a perfect illustration of the SYCUTE concept.

Why CO₂ Laser?

A review of available surgical laser technologies reveals that the CO₂ laser at 10,600 nm wavelength is the most suitable for the soft tissue surgery. It is one of the simplest WYSIWYG lasers and it is not surprising that it is the most common surgical laser in human and veterinary medicine.

Ever since the invention of the CO₂ wavelength compatible flexible fiber (to be exact, this is a hollow reflective light guides made of metal with the interior surface highly polished and anti-reflective coated), the American made flexible fiber surgical CO₂ lasers became the lasers of choice for small office surgery around the globe. They bring simplicity and convenience to laser surgery unobtainable with older articulated arm lasers.

My choice was for flexible fiber CO₂ laser from Aesculight with its pioneering tipless laser handpiece that is used like a drawing pen during surgery. It features an on-board library of laser surgery cases, and is pre-programmed with useful pulsed and Super-Pulsed modes for ease of operation. It is rugged, durable and versatile, and has proven so far to be the right choice for our hospital.

CO₂ Laser Surgery Case Studies

I use my CO₂ laser for all surgeries at the hospital. There are some surgery cases that are hard to do without the CO₂ laser. Skin incisions illustrated in **Figure 1** are easy to perform with the tipless laser handpiece under the correct power and proper focal spot size settings of 0.25 mm, resulting in clean bloodless margins that heal easy and without complications.

The diode laser is not appropriate in this case as the skin gets damaged excessively due to slow thermal conduction of heat from the tip (glass or metal) to and through the soft tissue.

Another great illustration of surgical CO₂ laser in action is femoral head osteotomy with much reduced intra-operative bleeding (Figure 2) that greatly simplifies the surgery.

For oral tumor (Figures 3A and 3B) palliative resection, I use the CO₂ laser to remove the tumor and to assist the maxillectomy while maintaining excellent hemostasis (Figures 3C through 3E). For the CO₂ laser assisted maxillectomy, I use the cold saline flush to protect and facilitate cooling of the surrounding bone tissue. Figure 3D shows a bubble formed by laser beam striking a saline solution. Figure 3E illustrates dry, bloodless surgical site immediately after maxillectomy. A much improved patient is presented in immediate post-op image in Figure 3F.

Enucleation is much simplified if performed with a CO₂ laser. All stages of the procedure are literally blood-free: conjunctiva incision (Figure 4A), eye muscle resection (Figure 4B), removal of the eyeball (Figures 4C and 4D) and eyelid resection (Figure 4E). A great outcome is presented in the immediate post-op image in Figure 4F.

Summary

My experience with CO₂ laser for surgery at our hospital is in sync with how laser surgery is practiced in North America. It is a new and pioneering concept, however, in Japan, where until now laser diodes were promoted for soft tissue surgery. Hopefully more laser veterinarians from Japan can get trained at the American Board of Laser Surgery in the advantages of CO₂ laser wavelength for soft tissue surgery—and for the benefit of our patients. ●

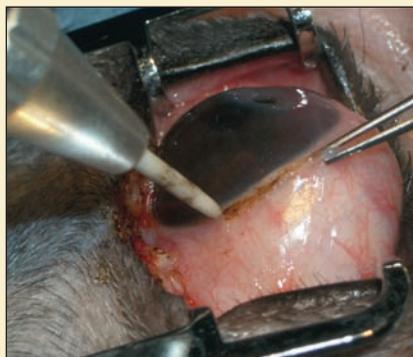


Figure 4A



Figure 4B



Figure 4C

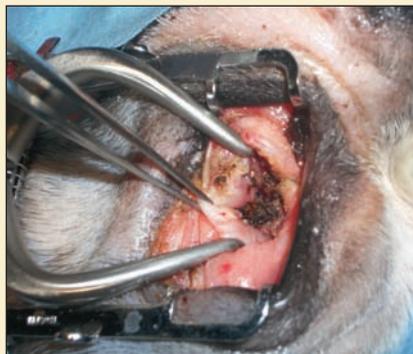


Figure 4D



Figure 4E



Figure 4F

Dr. Masahiro Seki is the owner of a small animal clinic Animal Laser Center in Nagoya, Japan. He is the first board certified veterinary laser surgeon in Japan. He uses both the CO₂ and diode laser wavelengths in his practice. Dr. Seki is a diplomate of American Board of Laser Surgery, and a director at the Japanese Laser Veterinary Science Society.

This Education Series article was underwritten by Aesculight LLC of Woodinville, Wash., manufacturer of the only American-made CO₂ laser.

0.8 mm focal spot size
setting*: Anal Sac Excision-Open, Perianal Adenoma, Vaginal Tumor, Aural Hematoma, Ear Canal Polyp, Abscess Incision and Drainage, Acral Lick Granuloma, Toenail Lasing, Entropion Correction, Indolent Ulcer, Gingivectomy, Buccal Mucosal Hyperplasia, Granulation Tissue Under Tongue, Tissue Sculpting, Oral Fibrosarcoma, Mucosal Hyperplasia, Hemilaminectomy, Tongue Growth, Lingual Stifle Imbrication and many more...

0.4 mm focal spot size
setting*: Perianal Adenoma, Perianal Urethrostomy (feline), Vaginal Fold Excision, Ventriculochoerectomy – Ventral Approach, Declaw Amputation, Vaginal Tumor, Stenotic Nares (feline), Dock Tail Removal, Neuter (canine), Neuter (feline), Vaginal Tumor, Stenotic Nares (feline), Ovariohysterectomy, Abscess Incision and Drainage, Digital Fibroma Excision, Incisional Biopsy (Achilles Tendon Mass), Interdigital Cornified Growth, Stifle Imbrication, Persistent Right Aortic Arch, Thyroidectomy, Hemangioma, Mammary Lumpectomy, Mastectomy, Tail Amputation Sebaceous Hyperplasia, Distichia, Indolent Ulcer, Granulation Tissue Under Tongue, Lingual Plasmacytoma, Sublingual Sialocele, Tissue Sculpting, Tongue Growth, Anterior Cruciate Ligament, Anterior Cruciate Ligament-Sever DJD, Hemilaminectomy and many more...

0.25 mm focal spot size
setting*: Anal Sac Excision-closed, Meibomium Gland Tumor, Lateral Ear Resection, Laryngotomy and Laryngeal Chordectomy, Nasal Hyperkeratosis, Stenotic Nares (canine), Stenotic Nares (feline), Declaw Feline, Thyroidectomy, Eyelid Melanoma, Preputial Stricture, Perineal Urethrostomy (feline), Enterotomy, Feline Squamous Cell Carcinoma, Histiocytoma (lip), Squamous Cell Carcinoma (Third Eyelid), Entropion, Conjunctival Tuck, Gingivectomy, and many more...

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Aesculight

CO₂ Laser Surgery

A 21st century scalpel

**Better Surgery
Healthier Patients
Happier Clients
Better Business**

**Non Contact
No Disposables
Autoclaveable
4 focal spot sizes**

**Seals blood vessels
Seals lymphatics
Seals nerve endings**

**Less bleeding
Less pain
Less swelling
Less infection**

**Greater access
Greater precision
Greater control
Greater flexibility**

**More power
More control
More choices**

**Profitable
Affordable
Competitive**

1.4 mm focal spot size
setting*: Buccal Mucosal Hyperplasia, Acanthomastous Epulis, Acral Lick Granuloma, Squamous Cell Carcinoma, External Ear Canal Growth, Histiocytoma - Canine, Toenail Lasing, Melanocytic Nevus (Benign Melanoma), Nasal Hyperkeratosis, Lingual Mucosal Hyperplasia, Perianal Adenoma, Keratectomy, Oral Fibrosarcoma, Entropion Correction, Indolent Ulcer, and many more...

* Source: "A Compendium: CO₂ Surgical Laser Case Studies" © Copyright 2006-2012 Aesculight LLC.

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