Advances in Soft Tissue Surgery: Vessel Sealing

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By
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What is Vessel Sealing Technology?

Technology using a proprietary combination of pressure and energy that permanently fuses vessels and tissue bundles up to and including 7mm.

What is Vessel Sealing Technology?

The vessel sealing device delivers pulsed/continuous energy:
- Pulsed energy = 1st generation generators
- Continuous energy = 2nd generation generators
- Delivered energy melts collagen and elastin in the vessel wall, allowing it to reform into a permanent plastic-like seal.
Instrumentation

- Electrothermal Bipolar Vessel Sealer (EBVS)
  - Bipolar device
  - Does not require a patient return plate
  - Electrical circuit completed between instrument jaws
  - Reduced risk for iatrogenic/inadvertent thermal injury to patient
  - Produces a hemostatic seal by applying high current (4 A) and low voltage (<200 V) to the vessel (or tissue bundle)
  - Energy denatures the collagen & elastin in the vessel wall
  - Instrument jaws apply pressure to appose vessel walls and allow proteins to form as a seal

Histologically

- Collagen bundles form across the vessel lumen
- Internal elastic lamina preserved
- Permanent seal formed (think “seal-a-meal”)
Guidelines

- FDA approved for sealing vessels ≤ 7mm in diameter
- Discrete vessel sealing = 1st generation generator
- Vessel sealing within tissue bundles = 2nd gen generator
- Developed for both laparoscopic and open procedures

System Operation

- Energy delivery cycle:
  - Measures initial impedance of tissue and delivers optimized energy to create vessel/tissue seal
  - Energy delivery:
    - Pulsed = 1st generation generators
    - Continuous = 2nd generation generators
    - Energy delivery adapts to changes in the tissue
    - Temp of tissue kept relatively low
      - Thermal spread minimized (mean = 2.57 mm)
      - Sticking and charring - reduced
    - Senses that tissue response is complete and stops the cycle
    - Audible tones lets the surgeon know when the cycle is complete
Disposables

- Human medicine
  - Hand piece instruments designed for “one-time” use
- Veterinary medicine
  - “Unlimited” reuse potential
  - Gas (ETO) sterilization
  - Plasma sterilization

Vessel Sealing Technology in Elective Surgery

- Elective surgery uses
  - Ovariohysterectomy (OVH) – open or laparoscopic
  - Ovariectomy (OVE) – open or laparoscopic
  - Castration – open or closed
- Functional in both dog and cat procedures
- Daily use in most practices
OVH vs. OVE

- Ovariohysterectomy (OVH)
  - Removal of both ovaries and uterus
- Ovariectomy (OVE)
  - Removal of ovaries only

OVE Benefits\(^1,2\)
- Faster
- Smaller incision – facilitated by vessel sealing
- Less morbidity

OVH/OVE Open Technique

- Standard Technique
  - Ligation is the difference
- Ventral midline celiotomy
  - Smaller incision
  - 2-4cm caudal to the umbilicus

- Isolation of the Ovaries
  - Not fully exteriorized
  - Suspensory ligament may remain intact
  - +/- Forceps to control suspensory ligament
OVH/OVE Open Technique

**OVH/OVE Procedure**

- Suspensory Ligament & Ovarian Vessels
  - Vessel sealing device used in place of suture ligatures or clips
  - Simplifies the most difficult portion of procedure
  - Fast – seals and cut in less than 5 seconds

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OVH/OVE Open Technique

**OVH/OVE Procedure**

- Ovariectomy
  - Clamp and seal proper ligament as well
  - Remove ovary
  - Identical on the opposite side
OVH/OVE Open Technique

**OVH Procedure (cont.)**

- **Broad Ligament**
  - Seal and cut - eliminates small bleeders

- **Uterine Body**
  - Cranial to cervix
  - Small uterus – single clamp, seal, cut

**Uterine Body**

- Larger uterus
  - Clamp and seal each uterine vessel (no cutting)
  - Clamp, seal and cut uterine body
  - May require multiple bites
  - Very large bodies best to place suture

**Routine celiotomy closure**
**OVE Laparoscopic Technique**

**History**
- 1985 – 1st reported laparoscopic canine sterilization

**OVH vs. OVE**
- European experience
- No difference in postop complications
- No difference in incontinence
- No difference in endometritis, pyometra, neoplasia
- No difference in postop wt gain

**OVE Laparoscopic Technique**

**Advantages**
- Less postoperative pain
- Lower postoperative morbidity
- Improved visualization
- Faster return to normal activity

**Disadvantages**
- Need for specialized training
- Need for specialized equipment
- Need for a surgical assistant
OVE Laparoscopic Technique

- 2-Portal or 3-Portal Technique
- “Tippy” table
- Laparoscopic equipment/set up
- Vessel sealing device critical

Canine Castration Technique

- Routine pre-scrotal approach
- Closed Technique
  - Tissue bundle 7mm or less
  - Suspend with forceps
- Open Technique
- Routine closure
Uses in General Surgery

- Splenectomy
- Nephrectomy
- Adrenalectomy
- Tonsillectomy
- Soft palate resection
- Limb amputation
- Tumor resection
- Intestinal anastomosis (mesentery)
- Any procedure where vessel ligation is required
- Both “open” and “laparoscopic” procedures

Splenectomy

- Vessel ligation
  - ≤7mm
  - ~300mmHG
Splenectomy – “A Keeper”

Tonsillectomy
Typhlectomy

Soft Palate Resection

A Histopathological Comparison of Two Techniques for Soft Palate Resection in Normal Dogs

Eighteen dogs were used to compare histopathological findings following excision of the soft palate using either a bipolar sealing device or a carbon dioxide laser. Histopathological comparisons were done at 48 and 96 hours after soft palate resection. Mean depths of tissue injury at 96 hours were 3.5 and 3.33 mm for bipolar sealing device and carbon dioxide laser, respectively. Control of hemorrhage was excellent in all dogs, and none of the dogs developed signs of respiratory compromise after soft palate resection. Using the bipolar sealing device for soft palate resection was significantly faster than using the carbon dioxide laser, although both techniques were fast. J Am Anim Hosp Assoc 2007;43:39-44.

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Introduction

Elongated soft palate is the most common upper airway anomaly diagnosed and surgically treated in brachycephalic dogs.1,2 Brachycephalic dogs are defined as those that possess short, wide muzzles and short, broad heads.3,4 Elongated soft palate may also be accompanied by other primary anatomical abnormalities, including maxillary overbite, choanal stenosis, and infection related to the secondary respiratory disorders.5,6 Elongated soft palate may also be accompanied by pharyngeal stenosis, choanal atresia, laryngomalacia, and tracheal stenosis.7,8 Other abnormalities related to elongated soft palate include nasopharyngeal obstruction, and death.9,10 Some of these abnormalities require surgical procedures to relieve the obstructive signs.11 Elongated soft palate is a frequent procedure to treat elongated soft palate is in brachycephalic dogs.12 Traditional treatment is performed by excision of the soft palate in an attempt to relieve the obstruction.13,14 Monopolar electrocautery has been used to perform the excision.15 Laser-assisted transoral carbon dioxide (CO2) laser is an acceptable tool that may be utilized for soft palate excision.16 A second expert documented similar clinical outcomes between the CO2 laser and the traditional method, and significantly short-
Prostatic Cyst
**Prostatic Cyst**

![Image of a prostatic cyst being held by a hand, possibly during a surgical procedure.]

**Vessel Sealing Technology Benefits**

**Patient Benefits**
- Seal strengths comparable to mechanical ligation
- More secure ligation than clips
- No foreign material left behind
- Less morbidity, less dissection
- Less blood loss
- Reduced anesthesia and overall surgical time
Vessel Sealing Technology Benefits

🎉 Surgeon Benefits

🎉 Easier
🎉 Safer
🎉 Improved outcomes
🎉 Use in simple to complex procedures
🎉 Exciting cutting edge technology
🎉 Improved “bottom line”
  🎉 Faster
  🎉 Less anesthesia

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Vessel Sealing Technology Benefits

Average OVH Surgical Time
(skin to skin)

- Surgeon A: 26.9 minutes (Normal OVH), 18.7 minutes (OVH w/VSD)
- Surgeon B: 46.6 minutes (Normal OVH), 18.7 minutes (OVH w/VSD)

23% Decrease

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Average Castration Surgical Time
(skin to skin)

- Surgeon A: 25.9 minutes (Normal Castration), 10.5 minutes (Castration w/VSD)
- Surgeon B: 25.5 minutes (Normal Castration), 10.5 minutes (Castration w/VSD)

28% Decrease
30% Decrease
13% Decrease
**Vessel Sealing Technology Economics**

**Costs**

- **Energy delivery unit (Generator)**
  - $12K - $25K
  - Suitable to lease options
  - Additional modalities are available
- **Hand pieces**
  - $250 - $1200 each
  - Reusable

**Costs (cont.)**

- **Sterilization expense**
  - Ethylene oxide (ETO)
  - Plasma sterilizer
Vessel Sealing Technology Economics

Revenue stream

- Time
  - Shorter procedures
  - More procedures
- Usage fee
  - Elective surgeries
  - General/Emergency surgeries
- Cost Analysis easy to perform

Conclusion

Vessel Sealing Technology

- Cutting edge
- Multiple uses in every day practice
- Benefits the patient
- Benefits the surgeon
- Benefits the practice
References


Instructions for CE Certificate

1. To complete the evaluation, please go to the following website:
   http://www.keysurvey.com/survey/293526/1dab/

2. After completing the evaluation, you will automatically be linked to the Continuing Education Certificate. The CE certificate can only be accessed after the evaluation is completed.

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If you have any questions about completing the evaluation or accessing your CE certificate, please email us at webconference@aahanet.org or call 800/252-2242.
Questions to the Speakers

Please email your questions to webconference@aahanet.org by Monday, March 22, 2010.

Drs. Ostwald & Petersen will provide written responses to all of the questions and they will be posted on AAHA's website by Saturday, April 3, 2010.

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