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THE ELECTROSURGERY HANDBOOK

A COMPREHENSIVE OUTLINE ON THE USE OF ELECTROSURGERY IN VETERINARY PRACTICE

Featuring the VETROSON® V-10 BI-POLAR Electrosurgical Unit

3/07

TABLE OF CONTENTS

GROWTH OF ELECTROSURGERY

Today, it is very common for veterinarians to have a working understanding of electrosurgery. In fact a large percentage of veterinarians use electrosurgery in their practices on a routine basis. This was not the case 20 years ago when the field was in its infancy and spark currents were used to cauterize bleeders. Surgery with R.F.current was seldom employed, and when it was, bulky expensive "Human" machines were used.

WHAT IS ELECTROSURGERY?

Electrosurgery is often confused with cautery. Cauterization by definition is burning. The application of externally generated heat of whatever source causes third degree burns with resultant scar tissue, necrosis, and sloughing.

Electrosurgery, by contrast, is a **cold** modality. The electrode itself never gets hot, but merely directs high frequency energy to the desired operative site. The high frequency or radio frequency current does the cutting, not the electrode. Pressure is not required to effect cutting.

HOW IT WORKS

In 1893, a French physicist named d'Arsonval discovered that a high frequency current will pass through tissue without pain or shock, the only known effect being the production of heat internally, proportional to the amount of current used.

This discovery led to the development of diathermy and, in a sense, modern radar cooking. In both, as in electrosurgery, the high frequency current passing through the tissue creates molecular heat. In diathermy by using two electrodes or plates of equal size, the energy is distributed evenly and at low density over the entire surface being treated, creating moderate heat in the tissue. In electrosurgery by using electrodes of vastly different sizes, the energy is concentrated at very high density at the tip of the smaller or active electrode. This highly concentrated, high density energy when applied to the tissue generates intense molecular heat **within** each cell instantaneously. This molecular heat can be controlled to cut, coagulate, desiccate, or fulgurate the tissue as required.

ELECTROSURGICAL CURRENTS USED

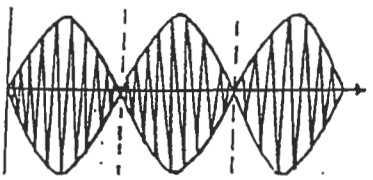
Today the veterinarian may employ the various currents using a wide variety of electrodes to accomplish this.

CUTTING CURRENT

When the highly concentrated, high density energy which is focused at the tip of an electrode is applied to the tissue, it creates such intense molecular heat in the cell that the cell explodes. As the electrode moves through the tissue destroying the cells selectively and consecutively, the cutting effect is achieved without any resistance by the tissue. Continuous movement of the electrode prevents heat from spreading beyond a single line of cells.

Two types of current commonly used for cutting:

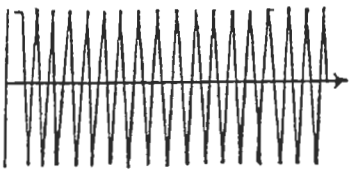
(1) The normal or fully rectified, modulated, undamped current is used for cutting with coagulation when control of bleeding is desired. This is the most widely employed current in veterinary medicine. With this current the capillaries and lymphatics are sealed at the same time the incision is made, providing a clean, dry field.



Normal or Fully Rectified (Full Wave) Output. Hemostasis - Good; Cutting - Good

This normal current is used for incising and excising tissue. A straight wire electrode incises like a blade, but without bleeding and pulling entailed in blade cutting. A loop electrode can be used to remove a mass of tissue in one deep scoop cut, or can plane off tissue in very thin layers, reducing or thinning out heavy tissue masses. The fully rectified cutting current is very helpful in taking biopsy specimens. The sealing effect of current seems to inhibit metastasis.

(2) The second cutting current available is a fine or filtered, unmodulated current for cutting with the least amount of resistance and coagulation. The fine output waveform is preferred in certain types of surgery.



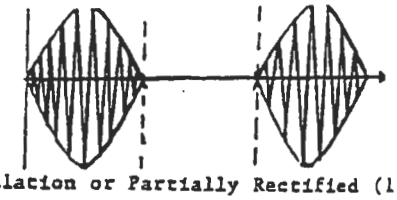
Fine or Filtered Fully Rectified (Full Wave) Output. Hemostasis - Almost None; Cutting - Very Good

COAGULATION CURRENT

When the current density is reduced and a broad-surfaced electrode is used to dissipate the energy over a larger area, the effect is hemostasis by coagulating the surface cells without deep penetration. These coagulated cells then serve as a layer of insulation, preventing heat from successive applications of current from penetrating too deeply to be controlled.

To a surgeon accustomed to the violent effects of escharotic agents like silver nitrate, potassium permanaganete, or iodide crystals, the results obtained by using the coagulation current seem almost magical. Good control of bleeding and seepage is achieved without deep tissue penetration, without massive tissue destruction, and with minimal trauma.

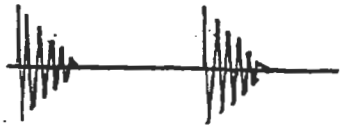
The coagulation current is a partially rectified current for coagulation without cutting. This waveform has been found most effective for precise, pin-point surface coagulation with minimal tissue destruction.



Coagulation or Partially Rectified (1/2 Wave Output.
Hemostasis - Very Good; Cutting - Good

SPARK OR FULGURATION CURRENT

Fulguration is the destruction of tissue by sparks. The fulgurating or spark current is primarily used in dermatology for carbonizing unwanted surface growths and sometimes to control heavy bleeding.



Spark or Fulguration (Damped Wave) Current.
Hemostasis - Severe Trauma;
Cutting - None

BENEFITS OF ELECTRO/RADIOSURGERY

The major benefits of electro/radiosurgery are:

(1) Reduced bleeding, even in edematous or vascular tissue
(2) A clean, dry operating field with little or no bleeding
(3) Accurate control of every procedure
(4) Fast, uneventful healing by first intention
(5) An automatically sterile instrument every time
(6) No soft tissue loss by sloughing or shrinkage

TECHNIQUE

The cardinal rule of good electrosurgical technique is to keep the electrode moving to prevent the buildup of heat at any one point in the tissue. Lateral heat may be controlled by the following:

(1) THE TIME THE ELECTRODE REMAINS IN CONTACT WITH TISSUE – It's important to develop a smooth, continuous stroke without pressure.

(2) DOSAGE CURRENT – The power selected must be in balance so that there is no drag or sparking – too low a setting will produce drag – too high a setting will result in sparking.

(3) ELECTRODE SIZE – The electrode type must be tailored to the surgery to be done. In general, cutting will be more efficient using thinner electrodes.

(4) CURRENT SELECTION – Cutting is generally done with the fully rectified current; coagulation mode has a partially rectified current.

NOTE: The importance of developing a smooth, continuous stroke without pressure cannot be overemphasized. Remember, it is the current that does the work; the electrode is merely the guide.

HEALING

The healing after electrosurgery is at least as good as the healing after cold steel surgery. Healing is by first intention, without heavy cicatrical formation. The scar after electrosurgery is extremely soft and supple and usually nearly invisible by the time healing is complete.

PRECAUTIONS AND SAFETY INSTRUCTIONS

This manual, in whole or part, should not be considered a substitute for formal training. Appropriate education in the use of electrosurgical procedures is strongly recommended prior to undertaking any procedure on patients.

Electrosurgery units **SHOULD NOT BE USED** near cardiac pacemakers

1) Good anesthesia is required before electrosurgery is attempted

2) Regarding anesthesia gases:
   - Inhalation anesthesia gases such as halothane, isoflurane and nitrous oxide may be used safely with electrosurgery. They are not combustible.
   - Ether and ethyl alcohol are combustible and should not be used while performing electrosurgical procedures
   - Oxygen and nitrous oxide are acceptable as they are not combustible agents, but would support a situation if combustion occurs.

3) Be sure handpiece and attachments are dry before using.

4) Select proper operating mode and power for the procedure at hand DEPRESSING FOOT SWITCH to activate handpiece.

5) Avoid prolonged tissue contact. Stop cutting at the first sign of tissue blanching. Permit tissue to cool at least 10 seconds between cuts.

6) Remove tissue that may accumulate on electrodes with alcohol-saturated gauze pads.

7) If RF Pilot Lamp remains on when foot switch is not depressed, this indicates a malfunction. **DO NO OPERATE UNIT.**

8) **DO NOT CONTACT METAL, TEETH OR BONE WITH ACTIVE ELECTRODE.**

9) Handpiece cords should not be coiled or twisted around metal objects.

10) The unit must be properly grounded at the outlet. **DO NOT** use with underground plugs or outlets.

11) **TURN THE POWER UNIT OFF BEFORE TOUCHING OR CHANGING ELECTRODES.**

INTRODUCTION TO THE VETROSON V-10 BI-POLAR ELECTROSURGICAL UNIT

BENEFITS

The VETROSON V-10 Electrosurgery Unit, a third generation unit from Summit Hill Laboratories, is the latest most efficient and most economical unit offered to the veterinary profession since introduction of the MV 9 by Summit Hill Laboratories in 1989.

It employs the latest low-impedance, high frequency technology in its transistorized, solid-state printed-circuitry not commonly found in electrosurgery units with "tube" circuitry. It is designed for use in general surgery as well as dental procedures.

This means that the power output of the V-10 once set for the case at hand self-adjusts automatically during the procedure to compensate for different resistance loads encountered at the operative site.

THE SOLID-STATE VETROSON V-10 IS READY THE SECOND IT IS TURNED ON

The V-10 is 100% solid state. There are no vacuum tubes to break...or burn out...or keep the veterinarian waiting while they warm up. Simply turn the machine on, select the current mode and proper power for the case at hand, and it is now ready to operate.

THE V-10 CONSTANTLY ADJUSTS THE POWER TO COMPENSATE FOR CHANGES IN RESISTANCE

Soft tissue varies in electrical resistance. The deeper the tissue, the greater the electrical load it puts on the electrosurgical unit.

Veterinarians experienced in electrosurgery have probably noticed that tube-based instruments will occasionally drag during surgical procedures. That's because the electrical resistance in the deeper tissue at the middle of the cut is different than the resistance at the beginning of the cut. This increase in load causes the output to drop. Dragging an underpowered electrode through tissue damages cells, retards healing and causes sloughing.

The V-10 features special low-impedance circuitry, which acts like a car's automatic transmission. Generally, the power only has to be set once for the case at hand. Then the instrument's circuitry takes over, automatically adjusting the power to compensate for tissue variations at the operative site. Cutting efficiency remains constant throughout the procedure...even when the electrode penetrates highly vascularized tissue at the middle of the incision.

A UNIQUE "SENTRY CIRCUIT" GUARDS PATIENTS AGAINST MALFUNCTIONS

The VETROSON® V-10 features a separate electronic "sentry circuit" whose sole purpose is to protect the patient from malfunction. Every time the foot control is depressed the circuit compares the electrode output with the control settings. If there is any discrepancy, the circuit immediately deactivates the unit and triggers a warning signal.

THE V-10 IS DESIGNED FOR TODAY'S ASEPSIS CONCERNS

Both the Surgery and Coagulation Handpieces are activated by depressing the foot pedal, assuring sterility throughout the operation.

The handpieces are made of an inert, high-temperature Delrin resin that stands up to steam autoclaving for 20 minutes at 250 degrees F.

VETROSON® V-10 Electrodes also may be sterilized. Testing at one independent research laboratory suggested that the tip insulation could withstand as many as 200 sterilization cycles before failing. (In real life, normal wear and tear will make the electrode unusable long before the insulation degrades from sterilization.)

COMPONENTS OF THE VETROSON® V-10

The V-10 consists of basic components: the generator or unit, the handpieces, the electrodes, and the patient ground plate.

THE GENERATOR

The electrosurgery generator is basically a high frequency oscillator, converting the 60 Hz AC coming out of the wall into high frequency current between 1.4 – 1.7 MHz. The V-10 generator is completely transistorized. Most competitive units are vacuum tubes. Tubes are becoming scarce and such technology is being replaced with solid-state circuitry in TV's and stereos and most electronics.

THE HANDPIECE

The handpieces are simply insulated devices for holding the active electrode of choice, making it possible for the operator to place and move the electrode in the required location. Sterilization of the handpiece has been discussed previously.

THE ELECTRODES

The active electrodes are the assorted instruments which actually direct the high frequency energy into the tissue. By their shape and the manner of application to the tissue, they largely determine the effect the energy will have.

Thin wire electrodes, straight or looped, are usually used for cutting. The straight wires will make incisions and remove small tissue tabs. The loops excise tissue, either in gross sections or by planing.

Ball shapes and heavier wires are used for coagulation. Actual size photos of available electrodes are shown on Page

> NOTE: When inserting electrodes into the handpiece be sure that the electrode is securely fastened by tightly twisting the top of the handpiece. No bare metal of the shank should be exposed.

The cutting tip of the electrode is sterile as soon as the unit is activated. The energy which destroys tissue cells to create the incision also destroys any organism which may be within its range. However, the electrodes must be sterilized.

THE GROUND (INDIFFERENT) PLATE

It is necessary to use the Ground Plate on all surgical procedures (The one exception is when Bi-Polar Forceps are being used.) This plate is known by several names and takes several forms. Variously known as the ground plate, indifferent plate, patient and passive electrode, it consists of a conductive plate for making contact with the patient via a cable that is connected to the unit.

Its use is essential for accurate completion of the circuit (i.e. R.F. current from the unit to the handpiece/electrode through the patient to the ground and back to the unit).

All safety codes pertaining to the use of electrosurgery specify the use of some kind of direct return path for the current to the unit itself. Grounding the patient to some common ground, such as the examining table or the wiring or plumbing of the building, is not considered safe.

The plate should be placed so that it is making firm contact with some part of the animal's body as close to the surgical site as possible. It is not necessary for the contact to be on a bare spot on the animal's body. For instance, the ground plate may be placed under a dog without shaving the dog. However, the ground plate should be placed as close to the area of operation as possible. In large animals the ground plate may be made more secure by taping it near the site of the operation.

> NOTE: It is not recommended that a metal clip be used as ground since firm contact is often difficult to make in animals.

BI-POLAR FORCEPS

The VETROSON® V-10 is designed for Bi-Polar use. The plugs on one end of the Bi-Polar Cord (red) and the other (black) fit into the Patient Ground and Surgery handpiece respectively. The Bi-Polar forceps plug into the other end of the Bi-Polar Cord.

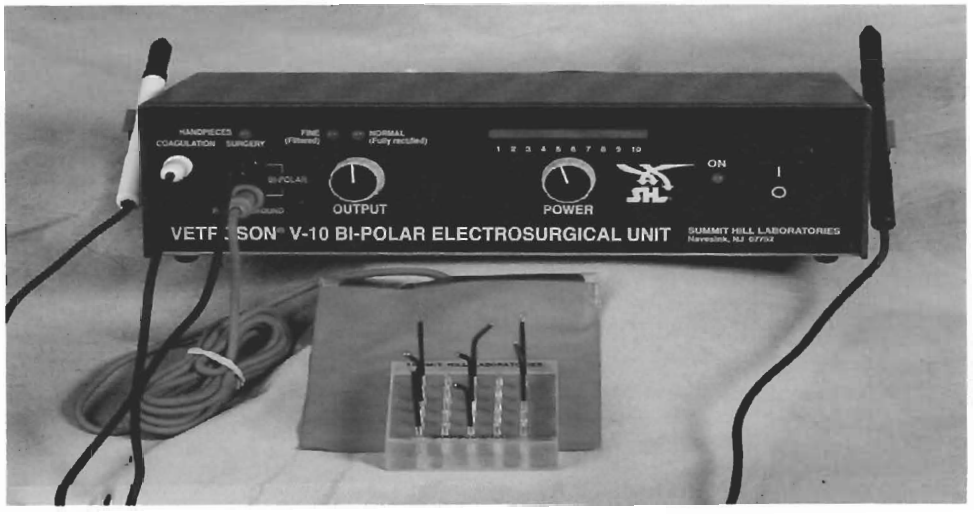
INSTALLATION AND OPERATION

The VETROSON® V-10 Electrosurgical Unit is designed to operate on 117-109 volts, 50/60 Hz alternating current, 1.2 Amps maximum. The operating frequency power is 140 watts; a 2.5 Amp fuse is used.

If the standard unit is to be used on other than the specified power supply, proper conversion devices should be used.

THE VETROSON® V-10 ELECTROSURGICAL UNIT CONSISTS OF:

- The Power Unit with Foot Switch
- Surgery and Coagulation Handpieces
- A Set of 8 Electrodes
- Patient Ground Plate and Cord
- Handpiece holder
- The Electrosurgical Handbook
- Warranty Card



BACK PANEL

The cords for the footswitch and AC line voltage are permanently connected to the back of the machine so they cannot accidentally become loose or disconnected.

The line voltage (AC) cord is the UL specified, 3-wire ground type. An adapter should be used where polarized circuits are not available. To ground your machine when using an adapter, be sure to connect the green pigtail wire on the adapter to the screw which holds the face plate on the outlet box.

SETTING UP THE VETROSON V-10

(1) Plug the line cord of unit into any convenient electrical outlet. NEVER OPERATE EQUIPMENT WITHOUT COMPLETE AND PROPER GROUNDING.

(2) Plug the Coagulation Handpiece Cord (white) into the Coagulation outlet, the Surgery Handpiece Cord (black) into the black Surgery outlet, and the Ground Plate cord (red) into the patient ground outlet.

Note: Two jacks, marked "Coagulation" and "Surgery" accept the respective two handpieces. These handpieces have larger plugs which will not fit into the red Ground Jack.

(3) Select and insert an electrode into Surgery Handpiece. Make sure it is fully seated with no metal shaft exposed. Turn the end of the handpiece until electrode is locked in place. Do the same with the coagulation handpiece.

(4) Push On/Off rocker switch on the front panel. The AC pilot lamp will light indicating the unit is on.

(5) Use either the Normal (fully rectified) or Fine (filtered) current mode. There is an Indicator Light over each position that clearly shows which current is being used.

(6) Use power output knob to select the correct power for the case at hand. A Red Indicator Light will pinpoint the exact power location selected.

(7) To activate both handpieces, depress foot switch. RF pilot lamp will light. This indicates high frequency power is flowing. An RF lamp staying on when foot switch is not depressed indicates a malfunction.

(8) Please refer to Page 7 on using Bi-Polar Forceps – then follow all points above except 2 and 3.

USING YOUR VETROSON V-10 ELECTROSURGICAL UNIT

Even if you are experienced in the use of other electrosurgical units, we recommend strongly that you get acquainted with your new unit before using it on a patient. All machines differ. In addition to the Normal cutting mode, the V-10 unit has a unique fine (filtered) output and a special Coagulation waveform that can be of inestimable value when used efficiently.

Before activating the surgical current, always check to be sure that the electrode is securely seated in the Surgery Handpiece. Any bare metal showing between the end of the handle and the band of insulation on the shank of the electrode will also become active and can burn the operator or the patient.

All electrodes should be kept clean and free of dry coagulum, tissue, etc. To insure efficient operation, wipe electrodes and handles before use. Make sure all connections are tight.

All electrosurgery units will, to some extent, generate a slight spark just as the electrode contacts the tissue. The V-10 unit has been designed to minimize this effect. However, extreme care must be used in the neighborhood of flammable antiseptic solutions or flammable anesthetics.

TIPS ON CUTTING

The cutting current permits bloodless or nearly bloodless incisions. Depending on the electrode chosen, it may be used to make simple incisions, or to amputate tissue or gross sections. It may be used to scoop out entire tumors or other masses

When cutting always depress the foot switch before the electrode actually comes in contact with the tissue. Adjust the power level to the level that will permit the electrode to float through the tissue without any resistance.

Operate with electrode tip as perpendicular as possible to the plane of intervention. Keep the electrode in constant, controlled, uninterrupted motion. Cut with a light, smooth,

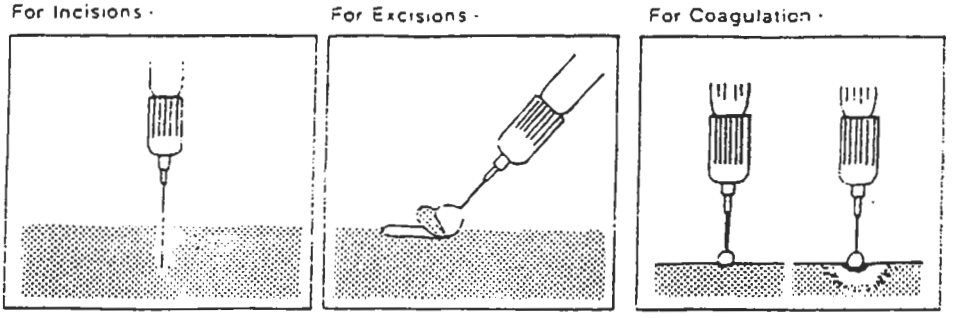
even stroke. For deep penetrations make repeated shallow penetrations, allowing about 10 seconds between interventions for the tissue to cool.

At the proper power level, and with a good smooth stroke, good hemostasis will occur while cutting. If the hemostasis provided by the cutting current seems inadequate for a specific situation, slowing down the stroke slightly will give the current time to create greater coagulation. However, this must be done very carefully to prevent too much heat being generated with subsequent necrosis and trouble.

Where the tissue is exceptionally tough, or where edematous or fatty tissue dissipates the energy too rapidly, the higher power setting on your VETROSON V-10 unit supplies a power reserve that will satisfy every surgical need. Such energy dissipation can be greatly reduced if the operative site is kept dry by suction, and, if necessary, by wiping the area with a sponge or gauze pad as you proceed.

Continually wipe carbonized tissue from the electrode with an alcohol-moistened wipe. Avoid electrode dragging which is usually caused by too little power, excessive moisture or a dirty electrode To familiarize yourself with the tactile skill needed for electrosurgery, practice by cutting a fresh, moist piece of beef at room temperature. Place it directly on a patient ground.

With incisions using new type electrodes, try starting at power setting No. 4. With excisions using small loop-type electrodes, try starting at power setting No. 5. Using larger loop electrodes, try starting at No. 6. If electrode drags, increase power to the next higher setting until smooth, non-dragging cutting is achieved. The closer the ground plate is to the site of surgery, the lower the power setting required.



TIPS ON COAGULATION

This current has two basic uses. The first is for hemostasis by coagulation of the surface cells. The second is destruction of tissue in situ by overcoagulating the cells to the point that they slough off. Examples of the latter are: to "starve" granulation tissue by destroying the blood vessels which feed it; to destroy the lining of the diseased anal sac gland; to cause tissue contraction as in the treatment of entropion; and to destroy surgically inaccessible growths in the nasal cavity, auditory canal, or vaginal vault.

> CAUTION: This "overcoagulation" must be carefully controlled to prevent the destruction extending farther than desired.

The coagulation current supplied by the VETROSON V-10 has a specially modified waveform for more efficient and safe performance. When using the coagulation current, tough the tissue lightly with the tip of the electrode before closing the footswitch. The whitening (blanching) of the surface will usually be noticeable in one or two seconds.

Vessels which have been cut during surgery, but which are too big to be sealed with the coagulating electrodes, can usually be sealed quickly and without tying. Clamp the severed ends of the vessel with a hemostat and touch the electrode to the hemostat as close to the tissue as convenient. Step on the footswitch sending the coagulating current down the beaks of the instrument. This seals the severed vessel. Stop when the tissue at the beaks starts to turn white. When done correctly, the tissue will not adhere to the hemostat when released. This technique can be used successfully on vessels up to 3 mm. in size.

> NOTE: There is no danger to the operator holding the hemostat with one hand while touching the electrode to the hemostat with the other.

For the coagulation mode with ball electrodes, try starting at power setting No. 3. Coagulation is controlled by the length of time the electrode is kept in contact with the tissue, the site of the electrode and the power used. It is evidenced by a yellowish blanching around the point of contact. If necessary, increase power until suitable coagulation is achieved.

TIPS OF FULGURATING

This current is useful for destroying warts and small tumors in situ, especially those which cannot be easily removed because of their location. It can also be used to sterilize the bed from which a malignancy has been taken, to control bone surface bleeding, and to destroy the lining of a fistuleus tract. Hold the electrode a short distance from the surface being treated (about 2 mm) and move the spark over the surface. For fulguration (carbonization of tissue) use coagulation mode to an initial power setting of at least 7.

FOR THOSE NEW TO ELECTRO/RADIO SURGERY

Please study this section if electrosurgery is new to you. Electrosurgery should not be regarded as a totally new art that will require unlearning old skills. All the rules of good surgical technique and clinical judgement still apply.

The biggest difference, and the most important thing to be learned, is that electrosurgery cuts without pressure unlike the steel scalpel. Therefore, light, smooth, continuous strokes should be developed. Only then will the surgeon really appreciate the tremendous advantages inherent in electrosurgery.

DEFINING GOOD TECHNIQUE

Almost the only way that electrosurgery can create tissue damage is if heat is allowed to accumulate in the tissue to the point where excessive dehydration occurs and the tissue is destroyed. Preventing the accumulation of such heat is the basic objective of electrosurgical technique. The two factors that are involved in good technique are the power setting on the unit and the smoothness of the cutting stroke. The two are interdependent.

There are four ways that excessive heat can be generated.

(1) USING TOO MUCH POWER
(2) MOVING TOO SLOWLY THROUGH THE TISSUE
(3) USING TOO LITTLE POWER
(4) REPEATING THE STROKE IN THE SAME AREA TOO SOON

The hazards of too much power and moving too slowly are obvious. The danger from too little power comes from the fact that, if the power is insufficient to permit the electrode to pass smoothly and without resistance through the tissue, that movement is necessarily slowed down by the need to overcome the drag, keeping the electrode in contact with the tissue too long, and so permitting heat to spread laterally in the tissue. Also, the power level is inadequate to completely "explode" the cells so partially cooked tissue shreds are found adhering tenaciously to the electrode.

The danger from repeating a stroke too soon is that, unless several seconds are allowed between successive strokes in the same incision, the heat generated by the first stroke will not have had time to be dissipated before the heat of the second is added. This last is especially important to the veterinarian working in mucous tissue or in the mouth where the tissue is most fragile.

This leads to the following test for determining good technique and correct power settings:

(1) WAS THERE ANY RESISTANCE WHATEVER TO THE SMOOTH, ABSOLUTELY PRESSURELESS PASSAGE OF THE ELECTRODE?

(2) WAS THERE ANY NOTICEABLE CHANGE IN THE COLOR OR CHARACTER OF THE CUT SURFACE, LIKE DEHYDRATION OR CHARRING?

(3) WERE THERE SHREDS OR FIBERS OF TISSUE "COOKED" ONTO THE ELECTRODE?

The optimum power setting is that at which the answers to all three questions are "NO". However, remember that the first objective is to get the cutting done, so it is most important to answer question #1 with "NO", even at the cost of some compromise on #2.

NOTE: In some procedures where the normal amount of hemostatis produced while cutting is inadequate, more coagulation can be obtained by slowing down the speed of stroke. However, this must be done very carefully to prevent overheating and excessive destruction.

Other factors which affect the power requirements, and so the power setting of the machine, include:

- THE SIZE AND SHAPE OF THE ELECTRODE
- THE AMOUNT OF ELECTRODE SURFACE IN ACTUAL CONTACT WITH TISSUE
- THE DEPTH OF THE INCISION
- THE TYPE OF PROCEDURE (CUT, COAGULATION, ETC.)
- THE NATURE OF THE TISSUE (FIBROTIC, EDEMATOUS, ETC.)

PRACTICE ELECTRO/RADIOSURGERY PRIOR TO THE REAL THING.

The following exercise will help you learn to recognize the proper power setting for any procedure, as well as the smooth stroke referred to previously. A little time spent on this practice will help you greatly in getting the most out of electrosurgery.

Start with a straight wire electrode in the handpiece. With a piece of lean meat on the ground plate, and the power set on NORMAL cutting, at its highest setting (10), make an incision about 1 inch long and 2 mm. deep. Note that at this setting there will be very strong sparking and considerable discoloration, if not real charring, on the incised tissue

Now turn the power down to about (7) and make another incision like the first, noting the decreased sparking and discoloration. Turn the power down again and repeat, noting again the changes in the feel of the stroke and the response of the tissue.

Turn the power down to the first or second position and repeat. Note the drag on the electrode and the tissue shreds cooked on the electrode. Also note the torn nature of the incision as opposed to the smooth cutting of the previous incisions.

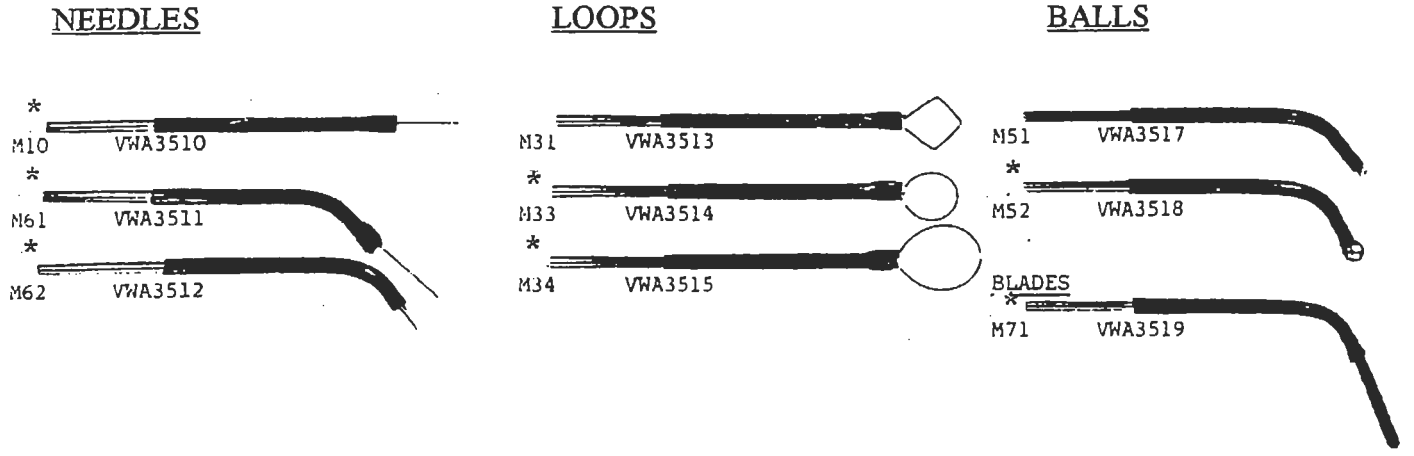
Turn the power up enough to permit the electrode to move easily and smoothly through the tissue, and repeat the incisions at different power settings until you find a point where the electrode floats through the tissue with absolutely no resistance. At this optimum setting practice making simple incisions until you have developed a smooth, flowing, brushlike stroke.

When you are comfortable with the basic stroke described above, change the electrode to a large loop and start again removing sections of tissue 2 to 3 mm. deep. Note the need to use more power when a larger electrode is used and when more tissue is involved. Practice again until you can remove these gross sections with the same ease and fluidity as the simple incisions. Make power adjustments as needed to obtain that result.

Now try the other procedures described in this manual such as cutting, coagulation, and fulguration (pages 10, 11 and 12). Repeat each of these until you are confident that you understand the effects of the various currents, and the feel of the various procedures.

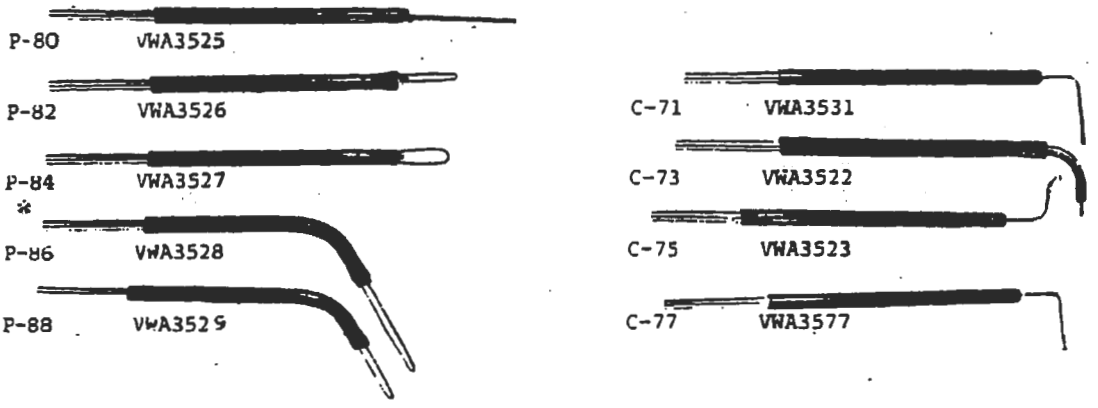
AVAILABLE BASIC ELECTRODES – ACTUAL SIZE
(Shaft Size 1/16")

A wide variety of standard electrodes are available, as well as special electrodes, such as the spark needle (M62) for Fulguration, etc. The M71 blade, the "P" series for Periodontal Work and the "C" Series for Crown Preparation. These are pictured below.



NEW DENTAL ELECTRODES

FOR PERIODONTAL WORK "P" Series Delicate Loops, plus a thin coagulation needle which are especially suited for gingival surgery.	FOR CROWN PREPARATIONS "C" Series electrodes designed for creating a sucular trough that exposes all margins of a crown preparation for easy impression taking.



The following list of procedures is grouped for convenience according to the electrode most likely to be used and approximate power settings (in parentheses). However, these are only suggestions. Again, your own experience and dexterity will quickly indicate personal preferences and techniques.

NEEDLES

Incisions (2-3)	Ear Cropping (4-5)	Mammary Tumors (8-10)
Castration (3)	Entropion (3)	Tail amputation (8-10)
Spaying (4)	Ectropion (3)	Epilation (2)
Declawing (8)	Nictitaing Membrane (2-3)	Biopsy (3-6)
Deodorizing Skunks (4)	Basal Cell Carcinoma (3)	

LOOPS

Tonsillectomy (4-5)	Soft Palate Resection (4-5)
Biopsy (3-6)	Pedunculated Growth (4)
Debarking (3)	Sessile Growths (4)
Nasal Polyps (3)	Oral Papillomas (3)
Eyelid Tumors (3)	Gingival Hyperplasia (3)

* Supplied with the V-10

BALLS

Hemostasis (2-4)*	Vaginitis (3)*
Cervicitis (3)*	Anal Sac Glands (3)*
Granulation Tissue (2)*	Anal Fistulae (4)*

*Coagulation Current

SPECIAL ELECTRODES

Blade (M71) This flat blade is most useful when cutting into tissue where heavy bleeding is anticipated and stronger than usual coagulation seems desirable.

Spark Needle (M62) As its name implies, this electrode is used almost exclusively with SPARK (fulgurating) current. It serves as a pinpoint "nozzle" for spraying the spark over the desired area. Its bulk provides resistance to the high heat of the sparks which would quickly carbonize and destroy the conventional thin wire electrodes.

Periodontal Work "P" Series delicate loops, plus a thin coagulation needle which are especially suited for: Gingivectomy, Biopsy, to reduce and remove swollen and hypertrophied gum tissue around the necks of teeth, to gain better access and visibility, to incise, excise, drain or coagulate minor periodontal conditions.

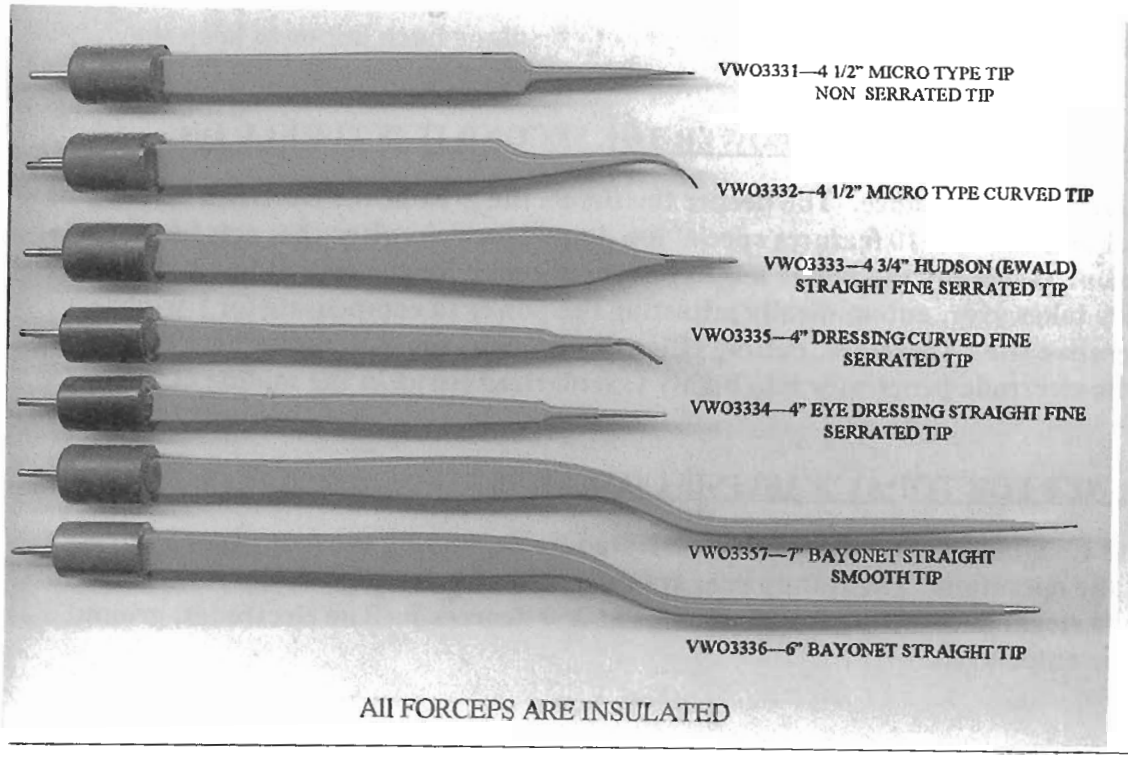
Crown Preparation "C" Series Electrodes designed for creating a sulcular trough that exposes all margins of a crown preparation for easy impression taking.

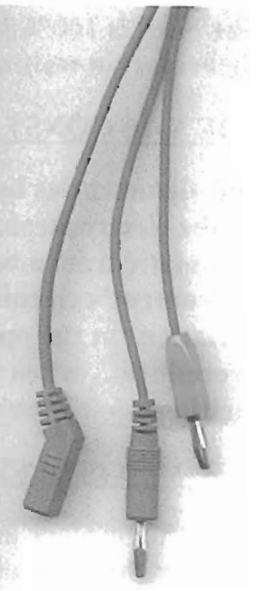
Vetroson Tonsil Snare Kit – To be introduced soon.

BIO-POLAR FORCEPS

The following Bi-Polar Forceps are available as well as a 12' Bi-Polar Cord. The Bi-Polar forceps plug into the special cord which in turn plugs into the Surgery and Patient ground jacks. The Bi-Polar cord plugs are color-coded.

Electrodes for the **VETROSON®** V-10 Bi-Polar Electrosurgical Unit will fit the older **VETROSON®** units as well as the *Macan & Ellman* machines.





VWO3361
BI-POLAR CORD
12' LENGTH

MAINTENANCE

The VETROSON® V-10 Unit- Requires little or no maintenance for years of dependable trouble-free service. Caution auxiliary personnel not to wet or attempt to sterilize the power unit itself.

Cords, Coagulation Handpiece and the Indifferent Plate should be cleaned by washing with soap and water or wiped with alcohol prior to sterilization. Knots, kinks, curly or sharp bends in the cables are to be avoided. Make sure these parts are completely dry before use. Occasional attention should be given to contact points to see they are clean and free of film

WHAT TO DO IF UNIT STOPS WORKING

If the unit does not function properly, first check the fuse. If the fuse is burned out, replace with a 2.5 AMP fuse. If the fuse is functional, please call Summit Hill Laboratories on our WATS line.

WATS "HELP" LINE

Please call our office anytime you have a problem with our VETROSON® equipment. Also, we have technical advisers available to help you set up the unit in preparation for use. Please avail yourself of this service. Call 1-800-922-0722. We will require your serial number. Please have it available when you call.

WARRANTY

The VETROSON® V-10 BI-POLAR ELECTROSURGERY UNIT- control unit is warranted for five years against defects by reason of improper workmanship and/or material.

Other listed components and accessories are warranted against defects by reason of improper workmanship and/or material for a period of thirty days from date of purchase.

SERVICE POLICY

If repairs are necessary, SUMMIT HILL LABORATORIES will deal directly with the veterinarian. When repair is necessary, carefully packaged machines should be sent to our repair address, VMS, One Sheila Drive, Tinton Falls, NJ 07724. Our repair department can assess and repair equipment in 24 hours.

REV. 5/2007