

ellman
Surgitron
FFPF
OPERATING MANUAL

Introduction

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Surgery that is performed with modern radiosurgical equipment should not be confused with the results obtained with electrocautery, medical diathermy, spark gap generators, or partially rectified devices that do not provide surgical cutting waveforms. Thus, before reviewing the instructions and clinical use, a brief definition of radiosurgery and of the radio frequency waves that produce this phenomenon may prove helpful.

Radiosurgery is an atraumatic method of cutting and coagulating soft tissue, without the post-op pain and tissue destruction of electrocautery. The cutting effect, known as **electrosection**, is performed without manual pressure or crushing tissue cells. It results from heat generated by the resistance the tissues offer to the passage of a radiofrequency wave, which is applied with a fine wire called a surgical electrode. The heat disintegrates and volatilizes the cells in the path of the waves. This causes the tissue to split apart as though it had been cut with a razor-sharp knife. **Electrocoagulation** is a nonvolatilizing destruction of tissue cells by a radio-frequency wave.

The atraumatic nature of electrosection provides a noteworthy advantage. The lack of trauma results in tissue healing without fibrous contractile scar tissue, which characterizes healing of wounds created by manual cutting. An equally significant advantage is provided by the sterilizing effect of radiosurgery.

Radiosurgery, as a result of these advantages, facilitates, accelerates, and improves surgical procedures tremendously. It also helps to eliminate the unfavorable post-operative sequelae such as **pain, swelling, infection, trismus, and post-surgical shock** from excessive blood loss, that are so often experienced after "traditional" instrumentation for comparable surgery.

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Operational Functions For Surgitron F.F.P.F.

1. **On-off Control/Waveform Dial** - Red light indicates unit power is on.
2. **Active (Black)** - Surgitron handpiece with chuck plugs into this color-coded jack.
3. **R.F.White Indicator Light**- Signals when electrode is being activated. Foot pedal must be depressed.
4. **Indifferent Plate - (Green)** Recommended for all surgical and coagulation procedures. The Antenna (Indifferent) plate is inserted into this jack.
5. **Variable Power Control Dial:** Sets desired power output by fine tuning. Always tissue-tune to office environment.
6. **Cut (Filter)**-Setting for cutting waveform with minimal coagulation.
7. **Cut & Coagulation (Fully Rectified)** setting for cutting and coagulation simultaneously.
8. **Coagulation (Partially Rectified).** Setting for extra bleeding hemostasis waveform.
9. **Fulguration** - insert "black" Surgitron F.F.P.F. handpiece from "black" active terminal to "white" fulgurating terminal. Turn the upper waveform dial to "Partially Rectified." Turn the round power dial to 6 or 7. If a more controlled spark is desired, power dial may be lowered based on desired result.

SPECIFICATIONS

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Models:

Surgitron F.F.P.F. (110 volt)

Available in 220 volts.

Output Voltage - Variable from 110 to 260 +/- 5%

Output Power - 140 +/- 5%

Output Frequency - 3.8 MHZ.

Output Waveform - Cut - (Fully Filtered)

Cut & Coag.- (Fully Rectified)

Hemo - (Partially Rectified)

Fulguration - Spark Gap

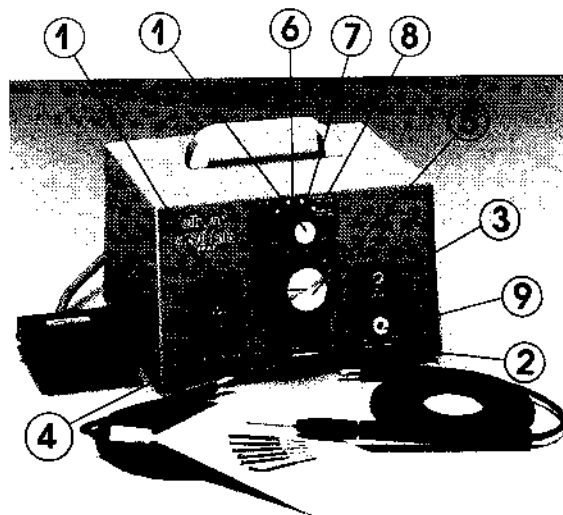
Size:

Width 7-3/4 inches

Height- 4-3/4 inches

Depth- 6-3/4 inches

Net Weight 6-3/4 lbs




REPLACEMENT TUBE
"G.E." Cat. No.: 6146B
REPLACEMENT FUSE
Rated 3A, 250V

CONTENTS F.F.P.F.

- 1 - Surgitron Radiosurgical Instrument
- 1 - Surgitron Sterilizable Handpiece
- 1 - Foot Switch Assembly
- 1 - Antenna Plate Assembly
- 1 - Instruction Manual
- 1 - Set of Sterilizable Electrodes

Preparation for Use

Preparation

On the Surgitron F.F.P.F., check to make sure that the wave selection switch is in the OFF position . Connect the  Hospital Grade plug to a 3 - wire grounded AC power receptacle. Insert the Handpiece male plug into the **black** female jack on the front panel of the Surgitron F.F.P.F. marked "Handpiece". Insert the Antenna Plate male plug (green) into the **green** female jack on the front panel marked "Indifferent Plate". The Antenna Plate should be placed on the operating table positioned near the operative site. The Antenna Plate does not have to make skin contact, but should be under the patient. Select the correct electrode for the particular procedure to be performed. Insert the selected electrode into the Handpiece. Make sure that the electrode is seated fully so that no brass is exposed, and then turn chuck of Handpiece clockwise until tight.

OPERATIONAL PREPARATION OF THE SURGITRON F.F.P.F.

1. Switch the waveform selection dial to Filtered Cut for pure micro-smooth cutting. Allow 15 seconds before activating unit.
2. For cutting with coagulation, switch the Waveform selection dial to Cut & Coag Fully Rectified.
3. For pure Hemostasis-Coagulation to control all forms of hemorrhage, switch waveform selection to Hemo Partially Rectified.
4. Fulguration- remove handpiece jack from black terminal marked "Handpiece" and place into white terminal marked "Handpiece Fulgurate." Fulgurate Spark-Gap for dessication will be produced.

Clinical Information and Practicing Procedures

LEARNING TO USE RADIOSURGERY

Before making contact with the tissue, the power intensity must be selected and the foot switch must be activated. During the actual cutting, it is important to use a smooth uninterrupted motion with even and light pressure. The movement should not be too slow. If it is, the build-up of lateral heat in the tissue may cause charring, followed by necrosis and sloughing. (see Preoperative Cutting Practice). When performing a second or third cut in the same surgical site, allow approximately ten seconds for the tissue to cool between applications of the electrode to the site. Radiosurgery should not be regarded as a totally new art that will require learning of old skills. All rules of good surgical technique and clinical judgment still apply. The biggest difference, and **the most important thing to be learned**, is that radiosurgery cuts **without pressure**, unlike the steel scalpel, and so a light, smooth, continuous brush like stroke should be developed. Only then will the surgeon really appreciate the tremendous advantages inherent in radiosurgery.

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 accumulation of lateral heat in tissue depends upon various factors as indicated in the following formula:

$$\text{Lateral Heat} = \frac{\text{Time Which Electrode Contacts Tissue}}{\text{Intensity of Power}} \times \text{Electrode Size} \times \frac{\text{Nature of Wave}}{\text{Frequency}}$$

This formula may be broken down in the following manner:

Electrode Contact Time

- The slower the passage of the electrode, the greater the lateral heat.
- The more rapid the passage of the electrode, the less the lateral heat.

Intensity of Power

- Intensity too high- high accumulation of lateral heat, due to sparking.
- Intensity correct- lateral heat reduced to the minimum necessary to volatilize tissue cells. Smooth flow through tissue with no sparking and no resistance through tissue.

Clinical Information and Practicing Procedures

- c. Intensity insufficient -- high accumulation of lateral heat due to drag. Also excess bleeding due to drag or tissue being pulled and torn from its base.

Electrode Size

- a. The larger the electrode, the more lateral heat produced and the higher the power setting necessary to operate.
- b. The smaller the electrode, the less lateral heat produced and the lower the power setting necessary to operate.

Nature of the Wave Form

- a. Fully Rectified Filtered - Least lateral heat.
- b. Fully Rectified - Less lateral heat.
- c. Partially Rectified - High lateral heat.

Frequency - The higher the frequency, the less lateral heat produced.

THE RADIOSURGICAL CUTTING WAVE

Electrocoagulation has many practical uses in surgery. The Surgitron instrument has the ability to control bleeding by coagulation, which can be limited to just the surface area where it is needed, without heavy and deep tissue destruction. This conserves tissue and reduces trauma, and makes the use of escharotics like silver nitrate, potassium permanganate, and iodine crystals seem barbaric. Approximately 75% of all clinical radiosurgery procedures are performed with the cutting waveforms:

1. Continuous Wave - Fully Filtered
2. Modulated Wave - Fully Rectified

***FULLY FILTERED WAVE**

The fully filtered waveform is a pure continuous flow of high frequency waves. This filtration results in a continuous non-pulsating flow of waves which provides a micro-smooth cutting flow. Under many clinical conditions this feature is most advantageous. This wave produces the least amount of lateral heat and tissue destruction.

FULLY RECTIFIED WAVE

The Fully Rectified Waveform produces a minute but perceptible pulsating effect which can, under certain conditions, slightly reduce the efficiency of the cutting effect.

In addition to a smooth cut, the Fully Rectified Wave is accompanied by a very slight superficial coagulation on the raw cut tissue surfaces. This coagulation is imperceptible clinically and microscopically, yet it provides effective hemostasis.

When the tissue is areolar, a perceptible film of coagulum forms along the surface of the coated margins as the tissue heals. The coagulum does not interfere with normal healing by primary intention, and peels off spontaneously when the healing is complete.

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PARTIALLY RECTIFIED WAVE

The Partially Rectified Waveform is an intermittent flow of the high frequency waves in producing hemostasis and is highly effective in sealing off bleeders up to a 1/16 inch in diameter, eliminating the need to tie them off. The Partially Rectified Wave is also recommended for the indirect technique where one can coagulate blood vessels by grasping a hemostat and lifting free of surrounding tissues. An Electrode Ball is then brought into contact with the hemostat, 1 or 2 inches from its tips. When the Partially Rectified Waveform is turned on, the walls of the vessel will be sealed making ligation unnecessary.

FULGURATION

The fulguration or Spark-Gap Wave is a mutated electronic current that has been weakened to simulate the effects of the Oudin current. The Fulguration current produce a potent dehydrating effect on tissues. Its destructiveness is self-limiting because of the air space the sparks must jump and because of the insulating effect of the carbon or eschar and the movement to prevent cumulative heat destruction.

GENERAL DESCRIPTION

The ~~ellman~~ Surgitron F.F.P.F. is used to cut, cut & coagulate, coagulate extra-heavy bleeding, and to fulgurate. Special modes are provided for each of these functions.

PRECAUTIONS

1. Radiosurgery should not be used by anyone who wears a pacemaker without first consulting the physician to insure that the pacemaker is protected and not affected by high frequency interference.
2. The Radiosurgical instrument should not be used in the presence of flammable or explosive liquids or gases.
3. Remember, to deactivate the Handpiece, by removing foot from Foot Pedal, each time an electrode is changed.
4. If the radiosurgery unit is not used for a period of time or if proper settings are not known, the operator should start off with low power setting and cautiously increase power until ideal cut is accomplished with no tissue drag and minimum sparking.
5. Due to radio frequency from radiosurgery, place the ECG monitoring electrode as far away as possible from the radiosurgery Antenna Plate.

ANESTHESIA

Anesthesia, either local or general, must be used with radiosurgical procedures.

IF NITROUS OXIDE analgesia is used, a local anesthetic should also be used.

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CUTTING

Since radiosurgery requires virtually no pressure to effect a cutting action, the hand should rest on some support in order to retain good control over the instrument. The ingredients for efficient radiosurgery are a gentle touch, digital dexterity, a fluid wrist action, and a feather-light touch. **The tissue to be cut should be moist. If it is too dry, surface charring will occur. Excessively dry tissue can most easily be moistened with a wet gauze.** Prior to performing an operative procedure, the area should be studied in order to select the correct electrode, waveform and power. Several practice strokes, with power off, are recommended to determine the correct length, depth, and direction of cut.

PRE-OPERATIVE CUTTING PRACTICE

Prepare the Surgitron F.F.P.F. for operations as described in PREPARATION FOR USE, then follow the steps below.

1. Select a piece of fresh, lean beef containing very little fat. Do **not** use veal because it does not change color when cut with an electrode. Allow meat to reach room temperature.
2. Place the meat on the Antenna Plate.
3. Insert the electrode of choice (Straight Loop, Diamond or Vari-Tip) into the handpiece.
4. Rotate the Power Output knob to the #8 position.
5. Turn the waveform dial to the Filtered Cut position.
6. Depress the foot switch.
7. Using a smooth, brush-like motion, make several incisions of various lengths and depths. Then de-energize the electrode and observe the results. You will note that the power setting has been too high, causing sparking and noticeable discoloration along the cutting track.
8. Reduce the Output Power intensity to the #1 position. You will notice the electrode either will not cut at all, or it will cut only with some pulling and dragging. Note if cutting does occur, tissue shreds adhere to the electrode.
9. Repeat the above procedure for Output Power Intensity settings of #6, #5, etc., until such point when no discoloration occurs and there is no visible sparking. The radiosurgical tip should not encounter resistance. The cut should be micro-smooth without sparking and without drag. These results normally occur at an output power of #2 to #4. When the correct power setting is located, a magic marker can be used to indicate proper setting. Continue to practice using slow, medium, and fast cutting strokes at each of the settings to acquire dexterity and confidence required for an actual operation on a patient.

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COAGULATION

The Surgitron can be used to seal off small blood vessels. Turn to the Partially Rectified Wave. The Ball electrode is normally used since it provides extended coverage of the tissue surfaces. Prior to performing coagulation, the tissue should be wiped clean of blood so that the area needing treatment can be viewed. Direct pressure will help to locate bleeders. Intermittent gentle contact with the tissue is performed until bleeding stops.

BIPOLAR

The Surgitron can be used for Bipolar procedures by placing the Bipolar cord plugs into Antenna and Active. The Waveform Dial should be placed in the HEMO position. The Power Dial should be lowered to #1 or #2 depending on the procedure.

PRE-OPERATIVE COAGULATION PRACTICE

Prepare the Surgitron. The same meat specimen used for cutting may be used for coagulating practice. Effective coagulation is achieved when the treated area appears on the meat as blanched spot of approximately 2mm diameter with a minimum penetration into the tissue. Feather light touching of the ball electrode is all that is necessary to coagulate bleeders efficiently.

1. Place the beef on the Antenna Plate.
2. Insert the ball electrode into the Handpiece
3. Rotate the Output Power Intensity to #1 position
4. On the Surgitron F.F.P.F. switch the dial to Coag.
5. Position the ball electrode in light contact with the beef.
6. Depress the Foot Switch.
7. Repeat the above procedure with power settings of #2, #3, & #4. Contact should be 2 to 3 seconds.
8. Switch the dial to OFF to disconnect power.

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CONTROL OF BLEEDING

Abnormal bleeding is not a problem in radiosurgery. A wide range of coagulation or hemorrhage control can be obtained by utilizing the Partially Rectified wave with different techniques. Coagulation can prevent bleeding or hemorrhage at the initial entry into soft bleeding once blood is present. All forms of hemorrhage must be stopped first by some form of direct pressure - air, compression, or hemostat. When bleeding has momentarily stopped, final sealing of the capillaries or large vessels can be accomplished by short application of the Partially Rectified Coag Wave. There are two types of coagulation electrodes: ball electrodes, and blade electrodes.

POST-OPERATIVE TISSUE PROTECTION

Post-operative protection can be provided by applying three or four air-dried layers of Tincture of Benzoin and Myrrh.

ELECTRODE STERILIZATION

The active part of the electrode is always sterile when the Surgitron is in operative use. The tissue will also be sterilized when it comes in contact with the active electrode. This is an extreme advantage over the scalpel, which is contaminated by the nonsterile tissue surrounding the surgical incision. The shank of the electrode, however, is not sterilized when the Surgitron is activated. It is therefore suggested to either autoclave the electrodes or cold sterilize them with the Electrode-Kleen sterilizing and anti-rust solution. Of course the electrodes will have longer shelf life if they are cold sterilized. Do not attempt to operate with electrodes if the protective rubber housing is cracked or worn. In the event that the brass is exposed, a shock or burn may be felt by the operator or patient.