MACAN Manufacturing

Faster than laser. Smoother than a scalpel.

FAQ

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50 Years Strong...
Macan is committed to quality and supporting the American economy.

The Radiosurge (MC-6A) is a high precision dental electrosurgery unit especially for the aesthetically demanding aspects of prosthodontics including safe implant exposure. Comes with autoclavable reusable 6pc. "Ultra-Flex" electrode set, surgery handpiece & cord, unique "flexi-plate" dispersive pad that works through clothing & eliminates positioning for each case, dispersive plate cord, owner's manual, 3 year warranty (unit only). Rated at 3 MHz. Great as a laser adjunct in all dental specialties. Capable of bipolar coagulation & "two point" isolated excision with optional accessories (not included). Isolated Output: Waveforms: Cut, Blend, and Coag.

The MC-4A is a simplified, yet versatile precision unit for most dental indications except implants, biopsies, and crown and bridge. Great as a laser adjunct in periodontics, endodontics and orthodontics. Comes with autoclavable reusable 5pcs. "Ultra-Flex" electrode set, surgery handpiece & cord, unique "flexi-plate" dispersive pad as above, dispersive plate cord, owners manual, 2 year warranty (unit only). Rated at 50watts @ 3MHz. Waveforms: Blend & Coag.
"Spark-Free" Technology*
Modern dental practice involves gingival tissue management as a part of the restorative process to a degree never before seen.

The “spark-free” technology, which incorporates RF band pass filtration, adds significantly to patient comfort by eliminating sensations and helps to reduce the risk of tissue recession necessary for successful immediate impressions in crown preparation, crown lengthening, and other aesthetically critical procedures by dramatically reducing collateral heat production.

*This technology is used in ophthalmic coagulators where very tight control of coagulum is critical.

Floating Return Technology
Floating return technology not brings to the dental suite the electrical safety common to operating room general surgery units, but allows the safe, effective application of bipolar coagulation without taking the extra ordinary precautions required for ground referenced machines.

3 Year Warranty
Who is MACAN Manufacturing?
MACAN is the result of collaboration between two remarkable individuals. One, Ira Lanski, was an expert in dental products and the needs of practicing dentists. The other, Stuart Mc Carrell, was a brilliant engineer. Together these men produced electrosurgical instruments specifically for dental application in order to bring the clinical benefits of electrosurgical technology out of general surgery and into routine dental practice, an area not well served by industry at that time. That was thirty years ago. MACAN has continued to improve and develop its technology and remains an exclusively electrosurgical company. Electrosurgery is not a side line for MACAN, it is our primary focus.

What is electrosurgery?
Electrosurgery is the use of high frequency electrical energy in the radio transmission frequency band applied directly to tissue to induce histological effects.

Like laser treatment, electrosurgery is thermo-dynamic and develops heat directly within tissue cells. Unlike laser however, electrosurgery works over the entire surface of the electrode tip in contact with tissue, which makes it ideal for sculpting living tissue particularly in prosthodontics.

"Radiosurgery" is a type of ionizing radiation oncology treatment. However, the term is sometimes used in a dental context to refer to high frequency electrosurgical units as a way to distinguish them from the lower frequency electrosurgical units commonly used in general surgery.

Cautery is the application of external heat to tissue to induce a controlled third degree burn. Neither lasers nor electrosurgery are cautery devices, and the term "electro-cautery", when applied to electrosurgery, is erroneous.

Where is electrosurgery used?
In two words: soft tissue. In general surgery, electrosurgery is used on nearly every soft tissue in the human body. The energy introduced by electrosurgery reacts with water molecules within the cells of the tissue being treated, therefore, in dentistry it is not effective on hard tissues like enamel or bone.

Why use electrosurgery in dental practice?
Electrosurgery may be thought of as the sculpture of living tissue because it works without pressure, unlike scalpel, which makes it ideal for aesthetically significant interventions. Bleeding is controlled by electrosurgery, and adjustable concurrent hemostasis is inherent during electrosurgical intervention, which makes it very valuable when treating hemolytically compromised patients. Electrosurgery is also effective as an adjunct to other therapies due to its ability to induce heat in fluid. For example: in root canal sterilization, accelerating whitening agents in spot whitening, accelerating desensitizing agents, and in gingival curettage.

Is anesthesia required?
Yes, local anesthesia is required for electrosurgery.

How is electrosurgery applied?
By means of two electrical connections called "electrodes".

In "monopolar" electrosurgery, one is an "active" electrode and is used to introduce therapeutic current into tissue. These are also called "tips" or "electrode tips" and come in a wide variety of sizes and shapes suited to specific clinical indications for incision, excision, curettage, and coagulation. These are held in an insulated hand piece. The other electrode is the "dispersive" electrode and is in the form of a large flexible pad. "Dispersive" connection to the patient is by means of capacitive coupling which works through normal street clothing without direct skin contact so that the patient reclines against the dispersive pad (or "plate") completing the electrical
The "active" electrode is many orders of magnitude smaller in surface area that the "dispersive" electrode so that therapeutic current is highly concentrated in the area being treated. In contrast, therapeutic current is distributed over the very large area of the "dispersive" pad such that current density at any point is too low to induce any measurable histological effect, hence the term "dispersive".

In "bipolar" electrosurgery, both electrodes are the same or similar size and are mounted on a common hand piece. No separate dispersive plate or pad is used and the cable from the bipolar hand piece to the electrosurgery unit has two conductors.

**Can electrosurgery be safely used for implant exposure?**
Yes. See the article in "Dentistry Today" November 2003 Volume 22, No. 11 by Dr. Bernard Guillaume. Do note that a deft technique is essential to prevent harmful heat build up in the osseo-integration since a temperature rise of only 60C will necrotize the integration and cause a failure of the implant.

Electrosurgery has the advantages in that bleeding is controlled during exposure and a degree of cicatrisation may be readily established in the tissue to preclude regrowth.

**How much collateral tissue denaturing can one expect?**
Although this depends on many factors with surgical technique being the most significant, in general, collateral tissue denaturing is on a par with, or better than, laser. The least possible is on the order of 140 microns in CUT mode (minimal to modest concurrent hemostasis) assuming good dose titration and deft technique, with up to 700-750 microns in BLEND mode (strong concurrent hemostasis) assuming average technique. Electrode size has a strong influence also, with thinner electrodes inducing less collateral effect. Note that electrosurgery involves a single pass of the electrode whereas laser requires multiple passes so that collateral tissue denaturing with laser depends strongly on the depth of incision whereas electrosurgery does not (collateral tissue denaturing is constant along the sides of a uniform cross section electrode regardless of depth).

**FAQ Typical monopolar setup**
The illustration shows the flow of electrosurgical energy through the body from the electrode (tip) to the dispersive plate. The advantage to this principle is the restraint of heat to the electrode site since current density over the dispersive pad is too low to generate significant heat. The disadvantage is current concentration within a narrow anatomic structure connecting the treatment site to the body.

**FAQ Typical bipolar coagulation set up**
The above figures show how electrosurgical coagulating current introduced by a bipolar forceps is constrained to the immediate volume of tissue being treated. The figure on the left shows a bipolar forceps inducing superficial coagulation on the surface of an anatomic structure, and the one on the right shows vessel or tubal coagulation (also called electro-igation). The advantage to this application is controllability, freedom from charring or burning, and it avoids involving the surrounding tissue, which makes it effective on anatomic structures where monopolar application is problematic. Note also that this application is effective in wet fields whereas monopolar forced coagulation is not.

**How does electrosurgery help in prosthodontics?**
See "Impressions in Fixed Prosthodontics" by Dr. Martin F. Land for a short but informative treatment of electrosurgery in prosthodontics. Note that the MC6A is intended to effectively address the recession issue raised in the article. First, electrosurgery may be used to eliminate cord packing entirely for crown preparation. There is a second minor benefit in that microscopically the tissue has a slightly grainy appearance compared to that of cord packing which is quite smooth and shiny which can fool digital optical data collection for CNC crown manufacture. Electrosurgery avoids this.
Second, edentulous tissue may be sculpted very readily in a manner far superior to laser, for example, the direct creation of sulcus for a bridge in a single pass with a suitable sized loop.

Third, electrosurgery provides the ability to expose implants with bleeding control as you go.

Fourth, electrosurgery is unsurpassed for aesthetic crown lengthening.

**How does electrosurgery help in general restorative dentistry?**
Primarily through its ability to control bleeding, for example, in operculectomy, in exposing a sub-gingival carie, or reducing interproximal granulation tissue. The ability to pressurelessly lance abscesses or fistulous tracts, the ability to plane or reshape edentulous tissue for prosthetic patients, and the ability to accelerate spot bleeding and desensitizing treatments are advantages as well. Of course, the ability to sculpt tissue for aesthetic crown lengthening alone or in conjunction with veneer placement are valuable enhancements for today’s general restorative practice.

**How does electrosurgery help in orthodontics?**
First, with its bleeding control which allows accurate gingivectomy for band placement, and second, for sculpting the gingiva which extrude after successful orthodontic treatment. See the illustrations attached for an example. Dealing with an occasional stain from an orthodontic band by using the electrosurgery unit to accelerate spot bleeding is also a useful adjunct to orthodontia, as well as addressing periodontal issues prior to orthodontic therapy.

**How does electrosurgery help with endodontics?**
Bleeding control during flap reflection as well as bipolar coagulation which is safe and effective for controlling bleeding on or near exposed bone is a primary adjunct. Electrosurgery has also been used effectively for accelerating root canal sterilization for a long time and is highly effective for pulpotomy.

**How does electrosurgery help in periodontics?**
Electrosurgery has been used for gingival curettage, both deep and shallow, very effectively for many years. It does not damage enamel which can happen with laser treatment nor does it require white hot incandescent fiber-optics to effect deep curettage. Electrosurgery has even been used effectively for donor graft harvesting. Reducing edentulous ridges is another common adjunct in periodontics, as is managing flap reflections and reshaping.

**FAQ Gingivectomy illustrations**
Probing to determine biological width prior to gingivectomy for clinical crown lengthening. Note sub-optimal gingival tissue health. Mild hemorrhagic response is evident immediately post-op. Slight weepage is still evident after lavage. This example represents sound clinical judgment since concurrent hemostasis was compromised out of respect for the sub-optimal state of tissue health. The final healing is expected to be sans circatrix due to good thermal control. Optimal thermal artifact control is evidenced by the patency of the excised tissue suggesting good energy dose titration and adequate technique. The negligible hemorrhagic response is typical of normal healthy gingival tissue. Note orthodontic tension wire removal.

**FAQ Illustration inter-proximal tissue reduction**
Inter-proximal granulation tissue developed because patient delayed seeking treatment for fractured cusp and sub-gingival carie. Initial approach to this tissue was conservative. Tissue detritus adhering to the loop electrode suggests inadequate dose titration for this circumstance. Sound clinical judgment was exercised by selecting the conical electrode in lieu of the loop electrode rather than retitrate energy dose out of respect for the limited inter-proximal tissue capacity to withstand therapeutic current. Completed preparation for matrix restoration: note freedom from thermal artifact and good hemostasis affording negligible risk of interference with matrix placement.
How do the MACAN Radiosurge and the MC-4A units differ? Which one is right for me?
Both units are modern high precision, isolated output, monopolar electrosurgical generators. Despite their different appearances, the MC-4A is literally two-thirds of the Radiosurge MC6A from an electronic perspective. The MC-4A lacks the pure CUT function of the Radiosurge MC6A. Prosthodontics with its high precision sculptural aspects is the forte of the Radiosurge MC6A. Implant exposure and biopsy are not recommended for the MC-4A, however, for all other indications, both units are identical and share the same accessories. In other words, the Radiosurge MC6A can address all dental electrosurgical indications whereas the MC-4A cannot. For general restorative dentistry there may be a bit of a dilemma which hinges on how much crown and bridge work is part of the practice: crown and bridge is better served by the Radiosurge MC6A as is all anterior aesthetically significant intervention.

What is "isolated output"?
It refers to the path therapeutic current takes from the active electrode back to the unit. In an isolated output unit the path is from the active electrode, through the body, through the dispersive electrode and back to the unit. A very small clinically negligible amount of therapeutic current can stray off to electrical earth ground. The limitation of stray, or "RF leakage" current, prevents alternate site burns and makes isolated output units safe for concurrent use with physio-monitoring equipment and significantly reduces radio interference with other equipment in the room. This has been the standard in general surgery operating rooms for 25 years. Isolated output units absolutely will not work without a dispersive plate in monopolar application. Therapeutic current in "ground referenced" units returns to the unit primarily through the dispersive electrode, which is connected to electrical earth ground through a capacitor inside the unit. However, therapeutic current will flow through any electrical path to earth ground wherever it is available: capacitively through the chair, through physio-monitoring leads such as EKG leads, or wherever else the patient contacts earth ground. These units can work without a dispersive plate when sufficient capacitive coupling between the patient and the chair exists. These units do interfere with other equipment readily and are not recommended for use in conjunction with physio-monitors or with bipolar accessories. It is also not advisable to touch the metal casing of these units during operation either, since there is a risk of an unpleasant tingling or "shocking" sensation, even a small risk of coagulation burn.

What is "bipolar"?
"Bipolar" refers to two things, a situation which engenders some confusion. First, it refers to a technique where therapeutic current is restrained to the immediate volume of tissue being treated and does not diffuse through the body. Bipolar electrodes are exemplified by bipolar forceps, where the two tips of the forceps are insulated from each other, and two wires connect the forceps to the unit. Bipolar also refers to the electrosurgical unit itself in terms of RF isolation. "Bipolar" is defined as a greater degree of isolation than "isolated". MACAN isolated units are rated safe for bipolar coagulation but not for incision or excision. Bipolar accessories are certainly not safe with ground referenced generators.

What about smoke and odor?
This phenomenon is shared by laser and thermal cauterity, arising from the volatization of cellular fluid contents, primarily during incision and excision. The smoke is considered a mild carcinogen and is therefore more of an issue for staff due to continued exposure. The use of high speed suction held near the surgical site is recommended or else a dedicated smoke evacuator, both of which are effective. Judicious use of irrigation can help reduce smoke production, also, the closer to ideal the energy dose titration the better. Odor is controlled by placing gauze moistened with a suitable pleasant smelling astringent, mouthwash, or deodorant on the patient's bib or directly under the nostrils.

Is electrosurgery safe around pregnant patients or dentists?
Yes. Safety is enhanced with isolated output units since therapeutic current does not diffuse through the body into the chair, rather remains high up well above the abdomen when the dispersive pad is at the recommended shoulder height. Do avoid draping the cables over the patient, especially the abdomen, for the greatest safety.
Is electrosurgery hard to learn?
No. However, like all medical surgical intervention some practice or training is required. Although hands-on seminars provide the best learning opportunity, self-education is practical using a practice medium such as beef steak. There are excellent texts available from leading dental distributors with illustrated self-education chapters that go beyond the manual information. Monopolar electrosurgery incision and excision technique is much easier to master than bipolar incision or excision.

What are the pitfalls of electrosurgery?
All surgical or pharmacological interventions which can induce profound histological changes have safety considerations associated with them, and electrosurgery is no exception. The means of avoiding pitfalls along with alternate approaches are given in the unit Owner’s Manual. These strongly reflect those given in IEC 60601-2-2 which are the result of decades of cumulative clinical experience and known to be effective. Tissue injury in incision or excision is most likely from too low a dose setting or poor technique than any other factor, reinforcing the need for training and practice. Injuries to pulp, bone, or tissue arising from excessively high dose settings or accidental contact are rare but not unknown with ground referenced units.

Is electrosurgery "self sterilizing"?
No. Bacterium and fungi are volatized along with target tissue, which is helpful in any case but particularly in pulpotomy, and fulguration can be used to address remnant bacteria in enucleated cysts. However, viruses can survive electrosurgery as well as in laser orthomeric cautery interventions. Autoclaving the electrodes before use is required.

What is "fulguration"?
A term taken from the Latin for "lightning", it is the application of electrosurgical therapeutic current by means of an arc, or spark. Commonly used in dermatology and general surgery for bleeding control over large areas, the effect of the technique is somewhat superficial and does not go deep into tissue. The treatment area is desiccated to about 1mm depth with an underlying coagulum. There may appear some eschar on the surface. This arcing represents a column of ionized atmospheric gasses and limits the flow of therapeutic current while spreading it out over an area under the electrode. High voltage is required for effective fulguration. Fulguration has limited application in dentistry and is used primarily in conjunction with a pointed conical electrode to perform "soft" coagulation of tiny hemorrhagic areas in conjunction with crown preparation, for the treatment of enucleated cysts using a ball electrode, sometimes for pulpotomy in small teeth using an interproximal electrode, and for treatment of tumor beds to address remnant cells with a ball electrode. Since the Radiosurge MC6A and the MACAN MC-4A are low voltage units, an adaptor is required to step up voltage for fulguration. In the past, due to the relatively limited current penetration, fulguration was used to control bleeding directly on bone, where direct forced coagulation is contra-indicated. However, this application has been largely supplanted by bipolar forceps coagulation, which is easier, safer, and more effective.

What effect does operating frequency have on electrosurgery?
Assuming operating frequency is high enough (over 100kHz), neuro-muscular stimulation is avoided. A higher frequency of 3.0MHz or more provides better efficiency for the capacitive dispersive pad in comparison to general surgery units which run around 1.0MHz or less and which rely on direct contact dispersive pads. However, figures given for low frequency general surgery units and for high frequency dental units show the same collateral tissue denaturing widths and the same healing times.

What is "molecular resonance"?
It is a kinetic, frictional heat producing effect which occurs in cells when the water molecules are "agitated" by a strong rapidly reversing electromagnetic field, in other words, a micro-wave oven. The frequencies employed by electrosurgery are too low to achieve this effect to a significant degree, rather, work primarily by ohmic heating.

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