Bipolar coagulator with automatic thermocontrol

Technical note

KENICHIRO SUGITA, M.D., AND RYUICHI TSUGANE, M.D.
Department of Neurosurgery, School of Medicine, Nagoya University, Nagoya, Japan

An all-transistorized bipolar coagulator has been designed featuring a thermocontrolling mechanism which consists of a thermocouple concealed in the tip of the forceps. This avoids the complication of the adherence of tissue to the coagulating instrument.

KEY WORDS  •  bipolar coagulator  •  thermocontrol mechanism

ALTHOUGH the usefulness of the bipolar coagulator is well known, there are still many practical problems. These include the adherence of tissue to the tips of the coagulating forceps, the creation of an electric spark between the forceps tips, and the difficulties of removing the carbonized clots and tissue from the tips. Most of these complications are due to overheating of the forceps tips. Irrigation with a saline solution and coating of the forceps tips with a special metal have been tried.

This paper describes a newly designed all-transistorized bipolar coagulator with automatic thermocontrol.

Method

A diagram of the thermocontrol bipolar coagulator* is shown in Fig. 1. An iron-constantan thermocouple of 0.3 mm in diameter is concealed in the tip of the forceps. The forceps tips can be varied to be as sharp as one wants by moving the thermocouple a little back from the tip. The current from the generator is regulated by the feedback mechanism from the thermoreceptor in the forceps tip, so that the temperature of the forceps tip is kept under the preset level. A pair of dials on the control panel is used for presetting the desired temperature of the forceps tip (40° to 100° C) and for controlling the output intensity. The actual temperature of the tip of the forceps is indicated on the thermometer. This all-transistorized generator has a pure 300 ±5 K Hz sinusoidal radiofrequency wave, in contrast to the mixed frequencies used with more than 2 to 3 mega Hz in the ordinary generator.

One of the other improvements is the remote controller of current intensity or preset temperature. After gas sterilization the controller can be used by the operator or his assistants.
Discussion

Recently bipolar coagulators are being widely used in neurosurgical operations under the operative microscope; many authors\textsuperscript{1,3-5} have reported improvement or modification of the coagulator. Electrocoagulation with a thermocontrolling system was first applied to the electrode in stereotaxic surgery,\textsuperscript{6} where it has proved indispensable.\textsuperscript{7}

The feedback mechanism of thermocontrol in the bipolar coagulator has the following advantages. Adherence of tissue to the forceps occurs much less often than with the usual apparatus because the temperature of the tips is kept under the presetting temperature. Even with this apparatus, irrigation with saline is still necessary in a dry operative field. Even if a baked layer of blood or tissue does adhere to the forceps tips, it can be wiped off more easily than in the usual technique. For this reason it is occasionally useful to wipe the forceps tip with sterilized paraffin oil. The automatic thermocontrol mechanism creates much less damage to the critical area than does the ordinary apparatus. Finally, no electric spark occurs between forceps tips even under the maximal intensity because of the all-transistorized generator. This prevents injury not only to the tissue, but also to the forceps tips.

It has been a general concept\textsuperscript{5,6} that insulation of the forceps for a bipolar coagulator is not necessary. However, in actual use the forceps blades touch the brain retractor or brain tissue, especially when working in a narrow field under the operative microscope, and an electric current occasionally spreads over the critical tissue. For these reasons, insulation of the forceps blade except for the tips is necessary for practical use.

References

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Address reprint requests to: Kenichiro Sugita, M.D., Department of Neurosurgery, Nagoya University School of Medicine, Tsurumai, Showa, Nagoya, Japan.