Bipolar diathermy forceps with automatic irrigation

Technical note

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A method for providing a saline drip during bipolar diathermy is described. Stainless steel tubing is incorporated in both blades of standard bipolar forceps and connected to the irrigating line. Irrigation is started when the forceps are closed and is stopped when they are open.

KEY WORDS • bipolar diathermy • automatic irrigation • instrumentation

Bipolar diathermy forceps are an indispensable instrument in microneurosurgery; however, burning of the tips and adhesion of tissue have caused problems. In order to overcome these difficulties, we have modified the instrument by incorporating into each blade a fine stainless steel tube, which is connected to the irrigating line. These new forceps provide automatic irrigation, in that the irrigation line is open only when the forceps are being used.

Description of Instrument

The bipolar forceps with automatic irrigation are shown in Fig. 1. The distal end of the tube is connected by Portex Multipore tubing to a 500-ml bottle of physiological saline. An on/off mechanism inserted between the blades works automatically with the closing and opening of the forceps.

In order to test its effectiveness, we coagulated the temporal muscle of a dog using three different types of forceps: standard bipolar forceps, newly designed unilaterally irrigated bipolar forceps, and newly designed bipolar forceps with automatic bilateral irrigation. These three types of forceps were compared with regard to the number of times current was passed until the tips became scorched, and the number of uses until the forceps had to be discarded.

In the case of the standard bipolar forceps,* the number of times current was passed before the tips showed burning was one to five, depending on the output of the bipolar coagulator. The number of times current was passed before adhesion of burned tissue to the tips rendered the forceps unusable was from four to 15 times. In the case of unilaterally irrigated bipolar forceps, the number of times current was passed before burning of the tips or until the forceps were unusable was four to 25, and 10 to over 30, respectively, depending on the rate of flow from the irrigation system. These values were even higher for the bipolar forceps with automatic bilateral irrigation, being four to over 40, and 28 to 40, respectively. Figure 2 shows the results obtained with the bilaterally and unilaterally irrigated bipolar forceps, with saline flow at different rates.

* Bipolar coagulator. Radionics Type 440, manufactured by Radionics, Inc., 76 Cambridge Street, Burlington, Massachusetts.
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FIG. 2. Numbers of times current can be passed before the forceps are unusable due to adhesion of burned tissue to the tips. Left: Bilateral dripping bipolar forceps, showing the maximal number of times the 5-sec passage of electric current could be repeated. If physiological saline was supplied at a rate of 40 ml/hr, for example, the device was still usable after the current was applied over 40 times at any output scale (intensity of current). Right: Results with the unilateral dripping bipolar forceps. Since charred tissue tends to adhere to the forceps, the duration of the current was set at 3 sec. Control values were those obtained with the standard bipolar forceps.

results with standard bipolar forceps are given as control values.

Discussion

Bipolar forceps are among the most useful instruments in microsurgery. However, the commercially available bipolar forceps are less than ideal. It is difficult to avoid burning of the tips during tissue coagulation and to prevent an electric spark from arcing between the tips of the forceps.

Many attempts have been made to overcome these difficulties. King and Worpole developed an instrument irrigated with a continuous saline drip through a fine metal tube mounted along one blade of the bipolar forceps. However, with this apparatus the saline continues to flow even when the forceps are not in use. Dujovny, et al.,1 combined a pressure pump and an electromagnetic valve; with this instrument, the saline flows only when the bipolar forceps are in use. Sugita and Tsugane3 developed a totally transistorized bipolar coagulation system consisting of a thermocouple placed in the tip of the forceps. This apparatus prevents adherence of tissue to the forceps tip using a thermocontrol mechanism instead of saline irrigation.

This report describes bipolar forceps with automatic irrigation. Fine stainless steel tubing is incorporated in both blades of the forceps. Also, an on/off valve quite different from that used by Dujovny, et al.,1 is inserted between the blades. The irrigation line is on when the forceps are closed, and turns off automatically, stopping the flow of saline when they are opened. Therefore, our irrigation system needs no additional foot switch.

At first, the tube was incorporated in only one blade of the forceps, but burning of the tip of the other blade occurred as much as with conventional forceps. With a tube in each blade of the forceps the number of times that current could be passed before burning increased to the extent that it was rarely necessary to clean the forceps tips during a standard craniotomy procedure, thus demonstrating their superior efficiency in the operating room.

References


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