Radiofrequency Thermal Hypophysectomy*

Technical Note

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In a recent report, a technique for trans-sphenoidal stereotaxic destruction of the hypophysis was described. The ablatory agent was radiofrequency (rf) current applied via a stainless steel radial electrode. Temperature monitoring of the heat lesions was provided by a thermistor bead inserted at the base of the spring. This procedure brought about panhypopituitarism in 39 of 40 cases. The temperature monitoring system proved unsatisfactory, however, since the thermistor bead used to monitor temperature at the electrode tip was easily damaged and required frequent replacement at considerable expense. The procedure described below permits rf coagulation of the pituitary with or without monitoring of temperature.

To attempt rf destruction of the pituitary without monitoring temperature, it is only necessary to prove that boiling has begun at the electrode tip, thus indicating that temperature has in fact risen to destructive levels. This is easily ascertained since a rise in the tissue resistance occurs as steam formation begins. Thus, at any adequate rf generator output, voltage and current remain steady until the boiling point is reached; then, a slow rise in voltage and fall in current occur. When temperature is monitored while such lesions are in progress, a sharp rise in temperature to $70^\circ$-$90^\circ$C occurs within 30 seconds, followed by a slow rise to $95^\circ$C or higher. These observations confirm the reliability and practicality of producing lesions without temperature recording.

Material and Method

The pre- and postoperative management of patients including hormonal and antibiotic schedules have been described previously.$^1,2$

Received for publication July 2, 1968.
Revision received October 7, 1968.
* Supported in part by U.S. Public Health Grant AM 12740-01.

General endotracheal anesthesia was used in all cases. Under stereotaxic anesthesia, the sella turcica was penetrated in the midline using a 2.3 mm twist drill hole low in the anterior wall. The 2.1 mm rf electrode† was advanced to within 4 mm of the dorsum sellae, and a radial spring (Fig. 1) was projected down at 6 o'clock (Fig. 2). The electrode has radial springs to provide lesions at any position within the sella. X-ray confirmation was obtained. The rf output lead was connected to the electrode, and the grounding lead affixed to an 18-gauge spinal needle inserted into an arm muscle. The rf current was applied using an initial output between 250 and 350 milliamperes (mA) depending on the length of the side electrode extrusion. The voltage and current remained steady as the tissue temperature rose. After about 3 minutes, the rf voltage began to rise imperceptibly, but the rf current declined indicating increasing tissue resistance as boiling began. After a voltage climb of about 4 V, the lesion was terminated. The spring tip was wiped clean before proceeding to the next lesion. If boiling occurred before 3 minutes, coagulation was repeated at a slightly lower power output to prolong the lesion.

To insure total destruction of the adenohypophysis, a number of radial lesions

† Radial Hypophysectomy Electrode, Radionics, Inc., Burlington, Massachusetts.
were made using various styles depending on the shape of the sella. To help determine the limits of the hypophysis, palpation of the lateral dura and of the diaphragma sellae was carried out with the soft blunt tips of the spring electrodes. Resistance was easily perceived whenever these structures or the floor of the sella were touched. Laterally, for example, it was possible to palpate the dura at the edge of the pituitary thus ensuring adequate destruction of the lateral pole of the gland. Lesions were avoided superiorly within 2 mm of the dorsum in the midline to protect the pituitary stalk and thus prevent diabetes insipidus (Fig. 3 left). A total of 5 to 8 lesions usually sufficed to cover all portions of the gland. Pupillary reactions and position of the eyes were monitored during periods of coagulation. Ordinarily, the pupils enlarged symmetrically during coagulation. The procedure should be terminated if pupillary inequality or asymmetrical posture of the eyes develops, since this may be the only clue of impending visual damage when general anesthesia is used. It should be pointed out, however, that in none of these cases did anisocoria occur. At the completion of the procedure, a 2.3 mm dumbbell silicone rubber plug impregnated with silver* was used to occlude the defect in the anterior wall of the sella (Fig. 3 right).

**Results**

The radial technique has been used in 83 patients, but the modification described above was used in the last 43 consecutive patients. Of these, seven had metastatic mammary cancer, and the remainder diabetic retinopathy. There were no operative deaths, rhinorrhea, or meningitis. In one patient, in whom a plug was improperly positioned, CSF rhinorrhea was suspected, but actual discharge of fluid was not observed. The plug was replaced a few days later without incident. No case of sinus sepsis occurred. All patients were judged hypopituitary on the basis of the following criteria:

* Radionics, Inc., Burlington, Massachusetts.