Anesthesiology
51:167–169, 1979

Long-term Follow-up Study of Chemical Hypophysectomy and Additional Cases

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Chemical hypophysectomy was introduced by Moricca as an added means of managing patients with pain secondary to metastatic cancer.[1] In 1977, we modified the technique to include a stereotactic approach and reported results in 13 cancer patients whose follow-up periods of evaluation ranged from four to 30 weeks.[2] The purpose of this report is to present additional follow-up data obtained from the original group of patients and to describe results in a second group of cancer victims.

METHODS

The technique used for the additional cases was the same as that previously reported.[2] In essence, after endotracheal intubation and induction of general anesthesia, the patient's head was placed in a stereotactic head-holder with the targets directed at the sella turcica. Using biplanar x-ray, a 20-gauge spinal needle was introduced via the nostril, and through the sphenoid sinus, into the sella turcica. After x-ray confirmation of needle position, small volumes of absolute alcohol were injected into various quadrants of the sella. A total of 5–6 ml of 100 per cent ethyl alcohol was usually injected.

RESULTS

All of the original 13 patients have died from their disease. Evaluation of pain was continued until death. Table 1 shows that there was no deterioration in pain relief states with time. In fact, none of the original patients who had successful blocks needed parenteral administration of narcotics after treatment.

The patients in the second group were also followed until death. All patients in this group had pain that was unmanageable by any available treatment modality, including radio-therapy, chemotherapy, and narcotics. Eight patients had metastases secondary to cancer of the prostrate. Three had cancer of the kidney; two, cancer of the lung; one, mammary carcinoma. After chemical hypophysectomy, 13 of the 14 patients had good to excellent long-term relief of pain. (table 2).

There were two complications in the additional cases—both ocular-nerve palsies. Neither caused significant patient disability.

DISCUSSION

The procedure of chemical hypophysectomy is being more widely used. Since our initial report, several other investigators have had similarly good results. Corrsen *et al.*,[3] in a series of 24 patients who had various types of cancers, obtained complete relief of pain in 13 and alleviation of pain in ten. Lipton *et al.*,[4] in a series of 110 patients, had partial to complete relief of pain in 72 per cent. Both groups of investigators used free-hand advancement of a trocar into the sella turcica under x-ray control, as described by Moricca.[1,5] In addition, both groups used small quantities of alcohol to produce hypophysectomy, approximately 1 ml per injection. Takeda *et al.*[6] reported excellent relief of pain in 22 patients who had disseminating cancer pain of various origins. Again the Moricca technique was used, with an average of 1.8 to 2.2 ml 100 per cent ethyl alcohol injected.

Moricca's personal series now includes more than 4,000 cases, and he reports results similar to those he reported previously. He has modified his technique to use the larger volumes of alcohol, which we found to be efficacious.‡

Little has been done to elucidate why this method works. It was found that when contrast medium was used before the injection of alcohol, the spread of contrast material above the sella was easily seen.[4] If the alcohol follows the radiopaque contrast material, it would then ascend the pituitary stalk and along the wall of the third ventricle, eventually breaking through into the ventricle itself. One possible way in which pain relief could occur is destruction of thalamic and hypothalamic nerve pathways. This has yet to be proven by pathologic studies.

The possibility that the endorphin system was involved was raised by us in the original communication.[2] However, in those cases in which endorphin in

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Accepted for publication December 19, 1978.

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0003-3022/79/0800/0167 $00.65

TABLE 1. Original Cases with Follow-up Data*

	Site of Primary Tumor	Preoperative	Postoperative									
			24 Hours	2 Weeks	4 Weeks	8 Weeks	12 Weeks	16 Weeks	20 Weeks	26 Weeks	30 Weeks	Death
Patient 1	Prostate	4	3	2	1	1	1	1	1|			20 weeks
Patient 2	Cervix	4	3†	0	0	0	0	0	0	0|		28 weeks
Patient 3	Prostate	4	1	0	1	1|						9 weeks
Patient 4	Kidney	4	0	0	0	0	1	1	1|			20 weeks
Patient 5	Prostate	4	1	1	2	1	2	2	2	2|	2§	8 months
Patient 6	Prostate	4	2	0	1	2|						10 weeks
Patient 7	Prostate	3	0	0	2‡	0|						12 weeks
Patient 8	Prostate	3	1	1	1|							6 weeks
Patient 9	Kidney	4	2‡	1	1	2|						8 weeks
Patient 10	Bladder	4	0	2	2							4 weeks
Patient 11	Cervix	4	0	2	3	3†	1|	0	0			20 weeks
Patient 12	Prostate	4	0	0	0	0|	0					12 weeks
Patient 13	Breast	4	0	0|								3 weeks

* *Legend*: 4 = poorly controlled with large doses of narcotics
3 = reasonable control requiring large parenteral doses of narcotics
2 = controlled with oral narcotics (*i.e.*, codeine)
1 = controlled with oral analgesics (*i.e.*, aspirin)
0 = controlled, no medication needed
| = end or original observations.
† Cordotomy.
‡ Second injection.
§ Status unchanged until death.

TABLE 2. Additional Cases

	Site of Primary Tumor	Preoperative	Postoperative									
			24 Hours	2 Weeks	4 Weeks	8 Weeks	12 Weeks	16 Weeks	20 Weeks	26 Weeks	30 Weeks	Death
Patient 1	Prostate	3	0	0	0	0	0	0				17 weeks
Patient 2	Prostate	4	0	0	0	0	0	0	2	0	0‡	8 months
Patient 3	Prostate	4	3†	1	1	1						10 weeks
Patient 4	Prostate	4	2	1	1	1						10 weeks
Patient 5	Prostate	3	1	2	2	1	2					13 weeks
Patient 6	Prostate	3	0	1	0	0						11 weeks
Patient 7	Prostate	4	2	1	1	2	2	2				16 weeks
Patient 8	Prostate	4	0	0	1	1	1	2				18 weeks
Patient 9	Kidney	4	0	2	2	2						10 weeks
Patient 10	Kidney	4	2	1	1	2						10 weeks
Patient 11	Lung	4	2	1	1							7 weeks
Patient 12	Breast	4	1	1	1	1	1	1				18 weeks
Patient 13	Lung	4	2	1	1							5 weeks
Patient 14	Kidney	4	1	0	1	2	2					15 weeks

* *Legend*: 4 = poorly controlled with large doses of narcotics
3 = reasonable control requiring large parenteral doses of narcotics
2 = controlled with oral narcotics (*i.e.*, codeine)
1 = controlled with oral analgesics (*i.e.*, aspirin)
0 = controlled, no medication needed
† Cordotomy.
‡ Status unchanged until death.

cerebrospinal fluid (CSF) was measured, except for a very transitory increase in the first few hours, no prolonged increase in CSF endorphins could be shown. In addition, the analgesia produced by chemical hypophysectomy was not reversed when naloxone was given. This was shown to be true in our series, as well as in those of others.[4,6,‡] Thus, we still have no satisfactory explanation for a technique that has obvious clinical benefits.

Long-term follow-up data and new cases substantiate the value of transsphenoidal chemical hypophysectomy using stereotatic techniques. The relief of pain is retained for the duration of the patient's life. We believe that this form of pain therapy is the treatment of choice for diffuse metastatic cancer pain when it cannot be controlled by other modalities. The good results and minimal complication rates of stereotactic chemical hypophysectomy compare favorably with those of other forms of pituitary ablation.[7–11]

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Anesthesiology
51:169–170, 1979

A Magnetic-drive Circulator Designed for Completely Closed Carbon Dioxide Absorption Systems

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Patient benefits such as retention of body heat and moisture, rather than economic considerations, were primary objectives when the completely closed carbon dioxide absorption method was introduced by Ralph Waters. His continued preference for the "to-and-fro" soda lime absorber was due to his desire to avoid the increased work of respiration imposed by the breathing tubes and directional valves of a circle absorber. Nevertheless, he did admit that the introduction of a pump into a circle system "just might overcome this objection."

In 1959, Revell introduced a compressed air-driven pump for use in an anesthetic circle system.[1] Wajskol, Parsloe and Morris, in an address before the World Congress of Anaesthesiology in Mexico City (1976), demonstrated a significant decrease in the work of breathing performed by the patient when a circulator is used.§

The most serious problem encountered in perfecting the Revell circulator into a production unit had to do with securing and ensuring the permanence of a gas-tight drive shaft between turbine and the squirrel cage that circulated the anesthetic atmosphere. A

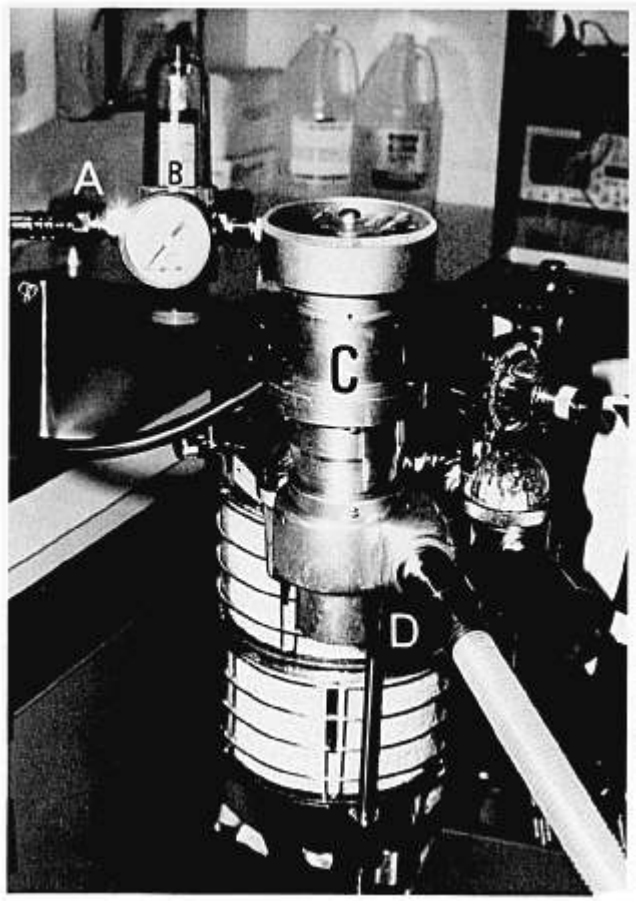

FIG. 1. Compressed air from theater source (*A*) enters miniature regulator (*B*); reduced pressure enters and exits from magnetic-drive circulator (*C*); anesthetic atmosphere delivered to inspiratory breathing tube (*D*).

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Accepted for publication December 16, 1978.

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