CRANIOPHARYNGIOMAS
TREATMENT BY COMBINED SURGERY AND RADIATION THERAPY

SIMON KRAMER, M.D.*, WYLIE MCKISSOCK, F.R.C.S., AND
JOSEPH P. CONCANNON, M.D.†
Royal Marsden Hospital, the National Hospital for Nervous Diseases, and
St. George's Hospital, London, England

(Received for publication May 23, 1960)

The treatment of craniopharyngiomas presents a difficult problem. These tumors are, almost without exception, benign histologically and therefore should be curable by removal. However, their situation within the skull is such that Cushing considered them to "... offer the most baffling problem which confronts the neurosurgeon." Before the advent of corticosteroids, attempts at total extirpation of craniopharyngiomas carried a surgical mortality of about 41 per cent, and even after what appears to be successful total removal recurrence occurred in an appreciable number of patients. With the use of the corticosteroids, attempts at total extirpation of craniopharyngiomas carried a surgical mortality of about 41 per cent, and even after what appears to be successful total removal recurrence occurred in an appreciable number of patients. With the use of the corticosteroids, the operative mortality has been reduced, but even so few patients have useful survival periods after surgical treatment. Horrax, in his series of 1,814 brain tumors, mentioned 48 craniopharyngiomas. He labelled 20 patients as having favorable tumors, "but only 6 patients could be considered to be leading useful lives." Occasionally long survivals have occurred after aspiration of a craniopharyngiomatous cyst and partial removal of the capsule, but usually, if limited surgery only is employed, recurrence of symptoms takes place quite soon.

Radiation therapy rarely has been employed systematically in the treatment of these tumors; indeed most authors have considered them radioresistant. We thought, however, that craniopharyngiomas might well respond to high doses of irradiation since most of them arise from squamous epithelium. We therefore embarked upon a combined surgical-radiotherapeutic attack upon the craniopharyngiomas. The surgery was to be limited to the minimum necessary to prove the diagnosis and to evacuate a cyst, if present, to relieve the acute symptoms; radiation therapy was to be employed in an attempt to deal with the residual solid tumor and prevent refilling of the cyst.

Aspiration and/or biopsy of the craniopharyngioma was performed through a burr-hole in most patients; in others a frontal craniotomy was performed. Two children in this series in whom the tumor blocked the foramen of Monro had a Torkildsen's operation to by-pass the obstruction. Tumor was not always available for histological examination because surgery was limited deliberately. The diagnosis in the absence of such tissue was based upon the clinical and neurological findings and on the presence of cholesterol crystals in the cystic fluid. The investigations and neurosurgery were carried out under the directions of one of us (W. McK.) at the National Hospital, Queen Square, London or the Neurosurgical Service of St. George's Hospital, London. As soon as possible after surgery the patients were transferred to the Royal Marsden Hospital for radiotherapy.

We had considered injecting radioactive liquids into the cyst at the time of aspiration. We discarded this idea because we wished to avoid distention of the cyst with possible increase in symptoms and because
we felt that the solid portion of the tumor would not receive adequate irradiation. Because of the advantages of mega-voltage therapy in treating intracranial neoplasms we decided to use two-million-volt roentgen rays and rotation techniques. The patients were treated with a small circular portal varying from 4.5 to 6 cm. in diameter according to the size of the tumor to be irradiated. Originally we used two paths of rotation of 180° each, at an angle of 90° to each other, one situated in the frontal and the other in the posterior parietal region (Fig. 1), but later we used a single path of rotation of 360° in the fronto-occipital plane centered on the tumor (Fig. 2).

Because of the small volume to be irradiated accurate localization of the tumor in the beam was most important. Air-contrast roentgenograms were available in each case to determine size and site. A plaster cap covering the patient’s head was employed to mark the axis and the path of rotation. Skin marks were applied through holes in the cast at these points. The cast was not used during irradiation so as not to build up the dose on the scalp. Set-ups were checked with roentgen-ray films taken on the therapy machine (Fig. 3). The tumor dose aimed at was 5,500 r in 6 weeks in children and 7,000 r in 7 weeks in adults. When the over-all treatment was either shorter or longer the dose was adjusted accordingly. Fig. 4 shows the distribution of dosage obtained with 360 degrees of rotation and a field 6 cm. in diameter.

Our patients tolerated the treatment well. Several of them remained outpatients throughout their course of treatment. Only 1 of the patients exhibited signs of increased intracranial pressure during the first week of treatment and these signs subsided rapidly without interruption of the treatment. Skin reaction consisted of mild erythema only. Epilation occurred, but was not severe and full regrowth of hair took place within a few months. Fig. 5 shows minimal epilation in a patient after receiving a tumor dose of 5,700 r in 46 days.

**CLINICAL DATA**

Between March 1952 and March 1954 we treated 10 consecutive patients with cranio-pharyngiomas according to our plan. The clinical, neurological and pathological findings are summarized in Table 1. Six of our patients were children; 4 were adults. There were only 2 females. The presenting symptoms in the children were caused most commonly by intracranial hypertension; all 4 adults complained of failing vision as the first symptom. Two of the children had re-