Cerebral Space-Occupying Cysts Following Radiation and Chemotherapy of Malignant Gliomas

By


With 7 Figures

Summary

Eight cases of cerebral cyst formation among 50 patients (=16%) with malignant supratentorial gliomas treated by surgery, megavoltage radiation, and multiple-agent chemotherapy are reported. Five of them developed signs of intracranial hypertension or progressive neurological deficit, while in three patients cerebral cysts were detected by CT without clinical deterioration. At operation or autopsy, or both, the large fluid-filled, smooth-walled cysts were lined by glio-mesenchymal scar tissue with no or little tumour recurrence in five, while three patients showed large recurrent tumour masses associated with necrosis and cyst formation. Clinical signs or CT evidence, or both, of cerebral cysts developed 4 to 12 months (average 10 months) after the first craniotomy, and 3 to 9 months after termination of radiotherapy, usually after the second to fourth course of polychemotherapy. The cystic cavities which are attributed to increased necrosis and other effects of radiation and cytostatic treatment, may mimic tumour progression or recurrence, and cerebral abscess, but are usually recognized by CT. Surgical treatment produced transient clinical improvement in 5 patients, but usually did not prevent the fatal outcome of the disease, which in these patients occurred 3 weeks to 6 months after surgical treatment of cyst formation, their life span ranging from 9 to 22 months. The pathogenesis and clinical problems related to cerebral cysts arising following multimodality treatment of malignant brain tumours are discussed.

Keywords: Cerebral cysts; malignant gliomas; multimodality treatment; radiation necrosis.
Introduction

During recent years encouraging reports have documented the efficacy of both radiation and chemotherapy in patients with intracranial malignant gliomas. Although the effects of irradiation on the CNS and the morphologic changes in tumour tissues induced by radiation and chemotherapy have been well recognized, the number of recent accounts of intracranial radionecrosis and of adverse reactions from chemotherapy suggests that the prolongation of life achieved by combined modality treatment in these patients is also attended by a certain risk of therapy-induced CNS tissue alterations and neurological complications. In malignant gliomas treated by radiation or chemotherapy, or both, diffuse cerebral oedema, extensive tumoural and peritumoural necrosis, intracranial haemorrhage, and intracranial hypertension due to other causes have been reported. Intracranial hypertension, which is generally indicative of tumour recurrence, may be caused by either delayed radionecrosis of the brain presenting as a mass lesion, fluid accumulation under tension in the operation cavity, or by formation of cerebral necrotic cysts, some of which may be relieved by surgical decompression.

Eight such cases have been observed in a series of 50 patients with malignant supratentorial gliomas treated with postoperative megavoltage irradiation and polychemotherapy according to the COMP-protocol.

Material and Methods

Between January 1977 and December 1980 fifty patients with supratentorial grade III and IV gliomas after maximum feasible tumour resection received combined radiation and multiple-agent chemotherapy. Irradiation was given by 60Co or 25 and 45 MeV photon beam (betatron) with doses of 40 to 66 Gy in 5 day/week daily fractions of 1.5 to 2.0 Gy over 8 weeks using two large opposing fields. No radiosensitizer was given. The patients received simultaneous chemotherapy according to the COMP schedule with CCNU (100 mg/m²), procarbazine (100 mg/m²), vincristin (1.4 mg/m²), amethopterin (10 mg/m²) and 20 mg methylprednisolone/day in 15-day courses at regular intervals of 6 and 18 weeks respectively. Most patients received simultaneous irradiation and chemotherapy, beginning 10 to 14 days after surgery; only some patients had postoperative radiotherapy, while polychemotherapy was added with or without irradiation after second craniotomy for tumour recurrence. By March 1981 28 patients had died (average survival 13.7 months), and all except for one brain were available for neuropathological examination.