Treatment of Malignant Gliomata

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Malignant intrinsic brain tumours are relatively common intracranial neoplasms and they form the major preoccupation of most neurosurgeons in the United Kingdom. They have captured the attention and engaged the energy of many neurosurgeons. Despite the improvements in operative technique and more powerful sources of radiation, they remain as major problems, little changed in the last 30 or 40 years.

The distressing and almost invariably rapidly progressive character of these neoplasms has led some neurosurgeons to abandon all attempts at treatment once the diagnosis has been made. Others have investigated new techniques in attempts to improve the apparently dismal results of conventional treatment. Thus intracavitary radiation, radioactive isotopes and numerous chemotherapeutic agents have been tried. Attempts have also been made to increase the radiosensitivity of these tumors by producing hyper- or hypo-oxygenation and by other, possibly more complex, methods such as the administration of thyroid hormone, at present on trial in this Unit.

Many of these methods are reported as achieving "encouraging results." In our opinion, these often are attributable to the selection of patients. It is not reasonable to assess the results of a particular treatment in a series comprising both relatively benign astrocytomas and highly malignant gliomas. The variable course of gliomata, even without treatment, is well known, and clearly it is important to assess the results of treatment for each group of neoplasms. All cerebral gliomas are malignant in that they are intrinsic tumours of the brain, and it is rarely possible to excise them completely. Speaking of "benign gliomas" we refer to cases with material obtained by burr-hole biopsy or at operation, although other areas of the same tumour may have malignant features. Similarly, material from an area with malignant features results in the histological diagnosis of "malignant glioma." Although the over-all behaviour of a particular tumour is determined by the most malignant part, the presenting symptoms and signs may be caused by the larger mass of the "benign glioma." In such cases survival may exceed that for other cases of malignant glioma.17 One of the difficulties is the so-called "malignant change" presumed to have occurred in growths previously regarded as "benign." Not all this clinical malignancy has histological confirmation. Even in a slowly growing tumour such as a meningioma, a stage is reached when the vital centres are invaded and no further increase in size can be tolerated.

But there is a group of cases satisfying the histological criteria of malignancy, and the biological criteria as well. The effects of treatment in such cases may be assessed more reliably and the influence of different treatments compared. The present investigation was made in order to produce a basis for the comparison of conventional methods of treatment with new methods.

There have been a number of studies of the course of gliomas, many of which have included glioblastoma multiforme.1,3,10,17,19 Surveys restricted to glioblastoma multiforme have also been made.5–7,9,13,15,18,21

Selection of Cases

The notes of all cases indexed as cerebral glioma were examined for the period 1950–1960. Approximately 500 of these were diagnosed as malignant gliomas. Cases for the 11 years up to 1950 have already been reported by Pennybacker et al.17 The criteria for ac-

Received for publication September 24, 1963.
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ceptance in this series was a progressive history of less than 1 year and histological confirmation, either at operation or at autopsy, if the latter was performed within 1 month of admission. All other cases, including those with probable but doubtful histology, were excluded, as were patients when the date of death or ultimate fate was unknown. Only 225 of over 500 patients examined satisfied these criteria.

**Age Incidence**

Fig. 1 presents the ages of patients on admission. The ages ranged from 9 months to 80 years but the peak for both sexes is in the 6th decade. Eight-six per cent were over 40 years old. These findings are in agreement with those of most authors.

**Sex Incidence**

Of 225 cases 137 were male (61 per cent), a relationship of 1.5 to 1. Roth and Elvidge\(^\text{18}\) found 78 per cent were in men, although Frankel and German\(^\text{9}\) and Netsky et al.\(^\text{15}\) had figures approximating ours.

**Duration of History**

Sixty per cent (133 cases) had a history of less than 3 months, 24 per cent (55) less than 6 months, and 16 per cent (37) less than 1 year. The preponderance of patients with a very short history agrees with most authors and accords well with clinical experience.

Site and Extent of Tumour

It is not always possible to determine the site of origin of these tumours, but in considering the parts of the brain involved most commonly, the parietal lobe was involved in 49 per cent (111 patients), the frontal lobes in 45 per cent (102 patients), temporal lobe in 40 per cent (91 patients), and the occipital lobes in only 12 per cent (27 patients).

Basal ganglia, thalamus or corpus callosum was involved in 38 per cent (85 patients), and 11 per cent (24 patients) had bilateral involvement.

Of 201 (89 per cent) of patients with unilateral involvement, 140 (70 per cent) had tumours of the cortex or subcortical white matter without encroachment on deep structures. Both deep and superficial structures were involved in 55 patients (27 per cent) and 6 patients (3 per cent) had tumours in deep structures only. In 73 (52 per cent) of 140 patients with unilateral superficial tumours, only one lobe was involved, in 62 (44 per cent) two lobes, and in 5 (4 per cent) three lobes. These findings agree with those of Davis et al.\(^\text{7}\) although Maxwell,\(^\text{14}\) using necropsy material, had 75 per cent of patients with bilateral involvement as compared to our 11 per cent. Matsukado et al.\(^\text{13}\) also found 47 per cent were bilateral. This difference between the clinical and autopsy findings illustrates the great difficulty in determining the potential resectability of lesions on a purely clinical basis as well as on the findings at operation.

We found no relation between age and extent of a tumour, although Roth and Elvidge\(^\text{18}\) found that involvement of multiple lobes was most frequent in the elderly and involvement of basal ganglia in the younger age group.

Cystic and Solid Tumours

We assessed the incidence of cystic tumours in this series on the basis of operative and autopsy findings. Obviously some tumours with cystic changes escaped inclusion in the cystic group because a cyst was not found at operation and no autopsy was done.