Malignant cerebral glioma—I: Survival, disability, and morbidity after radiotherapy

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See editorial by Gregor and Gill and p 1512

Abstract

***Objective*—To describe survival, disability, and morbidity after radiotherapy for malignant glioma.**

***Design*—Two year prospective study with home interviews with patients and relatives.**

***Setting*—Seven neurosurgical and radiotherapy centres in London.**

***Subjects*—105 patients aged 21 to 75: 59 had biopsy; 46 had partial macroscopic resection; 92 received radiotherapy; and 13 received steroids alone.**

***Main outcome measures*—Survival, time free from disability, and changes in disability after treatment.**

***Results*—Six and 12 month survival for radiotherapy patients was 70% and 39%, respectively. Age, World Health Organisation clinical performance status, extent of surgery, and history of seizures before diagnosis each influenced survival. The Medical Research Council prognostic index was also significantly related to survival. Multivariate analysis showed that initial clinical performance status was the most important component of the index. Most (80%; 49/61) patients with a clinical performance status of 0, 1, or 2 lived at least six months before becoming permanently disabled. Most patients who had initially had a good clinical performance status (0-2) and who were alive six months after radiotherapy (68%; 36/52), however, had experienced either clinical deterioration or severe tiredness after treatment. In 17% (9/52) of these some permanent loss of function remained. These adverse effects were associated with increasing radiotherapy dose. Severely disabled patients (clinical performance status 3 or 4) gained little benefit.**

***Conclusion*—Severely disabled patients gain little physical benefit from radiotherapy, whereas those not so disabled may experience considerable adverse effects.**

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Introduction

Malignant glioma is the most common primary brain tumour in adults. It generally presents with epilepsy, cognitive change, headache, dysphasia, or progressive hemiparesis.[1] Diagnosis is usually achieved by appropriate imaging studies (figs 1 and 2) followed by biopsy or surgery.[2,3] A randomised trial shows that the median survival after surgery for patients on steroids alone is only 14 weeks compared with 38 weeks after radiotherapy.[4] The two year survival after treatment is only 5-10%.[5,6] Although radiotherapy to the brain prolongs life, neurologists and others remain uneasy about the trade off between survival and quality of life.[7-9] For most patients, even after treatment, increasing disability and death occur by one year. Furthermore an economic appraisal has shown that the cost of achieving one quality adjusted life year (QALY) is over £100 000.[10,11]

These concerns have led us to explore in detail the course of this illness, with particular emphasis on predictors of survival, time free from disability, and possible morbidity because of radiotherapy. Our study was of patients largely treated outside a trial setting, and we aimed to show how useful prognostic measures may be among this population. In the next paper in this issue we explore the experience of patients and their relatives after the diagnosis and their views about treatment.[12] This first paper describes the population studied, the radiotherapy prescribed, and the survival, disability, and morbidity which followed.

Patients and methods

RECRUITMENT OF PATIENTS AND RELATIVES TO THE STUDY

Criteria for entrance in to the study were a first histologically confirmed diagnosis of supratentorial glioma grade 3 or 4, age 18 to 75 years, and radiotherapy treatment. During the recruitment period 1990-2 seven neurosurgical and radiotherapy centres in London were brought in a stepwise fashion into the study. They provided a consecutive series of 105 patients. We approached these patients, explaining that a series of voluntary interviews over one year would cover the impact of their illness on everyday life as well as satisfaction with treatment. Ninety two (88%) agreed to participate. All but three had a close relative, and of these, 96% (85/89) agreed to be interviewed. The 13 patients who declined to be interviewed did not differ from those agreeing in terms of age, sex, or, as far as could be determined on these small numbers, tumour site. In addition to the 92 patients receiving radiotherapy, we attempted to study 13 patients for whom the decision had been made to treat with steroids alone. These patients deteriorated rapidly, and only six could be briefly seen. A relative of each of these six was also interviewed.

DATA COLLECTION AND FOLLOW UP

The diagnosis was dated from biopsy or surgery. Initial interviews took place three to eight weeks later, usually during the first weeks of radiotherapy. The interview technique is described in the companion paper.[12] Whenever possible visits were made to the home at 3, 6, 9, and 12 months and patients and relatives interviewed separately. We also saw relatives four to six months after any death occurring within a follow up period of 24-48 months. At this time we asked about the final course of the illness.

We made 270 visits while patients were alive and conducted 64 further interviews with relatives. Interviews with patients at diagnosis or three months were possible for 92% (90/98). Of surviving patients, 86% (56/65) were seen at six or nine months and 72% (26/36) at 12 months. Exceptions were largely because of deterioration. Of the relatives we approached, 85% (64/75) also agreed to interviews after bereavement. They represent 70% (64/91) of all the relatives initially interviewed who were bereaved by mid-1994. In the remaining cases

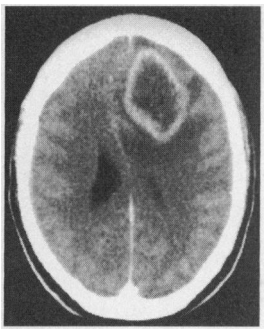

Fig 1—*Computed tomography with enhancement easily revealed this left frontal glioma presenting with short history of dysphasia and hemiparesis in 49 year old man; he died one month after radiotherapy*

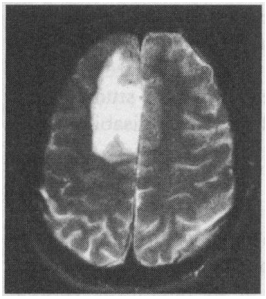

Fig 2—*Magnetic resonance imaging was required to disclose this right frontal glioma that presented with epilepsy in 40 year old man; he remained free from disability for two years after radiotherapy*

general practitioners or hospice staff provided information about the terminal illness. Data for one year and two year survival is therefore complete.

TUMOUR GRADE

Each centre graded tumours with different schemes. To achieve some comparability we chose to reclassify histological reports using the Daumas-Duport definition.[13] This scheme considers four histological features: pleomorphism, mitoses, endothelial proliferation, and necrosis. Any two features classify a tumour as grade 3, but three or four features constitute a grade 4 tumour. This exercise was possible in all but nine cases, in which the diagnosis of "high grade glioma" had been made without details being given of the histological features seen. When we compared the outcome for a grade 3 and grade 4 tumour we excluded these nine cases, although we included them in all other analyses.

MEASUREMENT OF DISABILITY

Our emphasis was on recording the disability that resulted from neurological impairment rather than on the details that clinical examination might reveal. In case patients gave optimistic accounts, we gave greater weight to relatives' observations of actual capability. Self care and basic mobility were rated by using the Barthel scale.[14] The Nottingham extended activities of daily living was used to assess other domestic and social tasks.[15,16] This information determined the World Health Organisation clinical performance status,[17] a broad measure of disability included in the recently developed Medical Research Council prognostic index.[18] The prognostic index was developed with data on 417 patients, all of whom received radiotherapy within a randomised trial.[18] It has since been tested on an independent dataset comprising 443 patients entered into a subsequent MRC trial.[19] The index is based on four factors (age at diagnosis, WHO performance status before radiotherapy, history of seizures before diagnosis, and extent of neurosurgery), each with three categories. A score is attached to each category (fig 3), and a patient's index score is obtained by summing the scores for each of the four factors. A low score indicates a better prognosis. These assessments were made for the point at which the patient began radiotherapy. Increase in disability or other evidence of clinical deterioration occurring between interviews was dated at any subsequent interview.

MORBIDITY DUE TO RADIOTHERAPY

To avoid labelling deterioration as an adverse effect of radiotherapy when tumour growth was responsible, adverse effects were conservatively defined. Deteriorations in clinical performance status during this period were considered to be "acute" or "early delayed" reactions to radiotherapy[20-22] rather than tumour progression if the following criteria were met: firstly, an initial clinical performance status of 0-2; secondly, onset over one or two days; thirdly, no evidence for a neurological cause such as hydrocephalus or another intercurrent illness; fourthly, at least partial reversibility after high dose steroids or a gradual improvement over the 12 months after radiotherapy without further antitumour treatment; fifthly, survival for more than six months from the end of radiotherapy; and, sixthly, if the patient's radiotherapist when presented with all clinical follow up data and computed tomography studies agreed that radiotherapy was the more likely cause. At the time of the study magnetic resonance imaging was not routinely performed to confirm radionecrosis, and by the time of case review by radiotherapists most of the patients had died. Our criteria were therefore derived in a pragmatic fashion after discussion and were not validated against neuroradiological evidence of brain damage. Rather, by a process of elimination, deteriorations which seemed likely to be related to radiotherapy were isolated.

Tiredness or somnolence[23,24] was assessed on the basis of objective evidence of the patients' level of activity and their own reports of tiredness. Tiredness was rated as either "absent during radiotherapy or the subsequent eight weeks," "present but not interfering," or "severe and preventing activity." Hair loss, severe skin burns, and subjective disturbance in hearing were noted. Radiotherapy field sizes and final tumour dose were also recorded.

STATISTICAL METHODS

Event free curves were produced with the Kaplan-Meier method and were compared by using the log rank (Mantel-Cox) test. When we considered ordered categorical data we incorporated log rank tests for trend. To identify independently significant variables we carried out multivariate analyses of factors associated with survival time with Cox's proportional hazards regression model and a forward stepwise variable selection procedure. We fitted ordered categorical variables assuming a linear trend across the categories, as in the original analysis carried out to assess the importance of radiotherapy parameters on the end point of morbidity after radiotherapy.

Results

Characteristics of patients and treatment—Most patients were men (69%; 72/105). The median (range) age was 52 (21-75) years (table 1). Each hemisphere was equally affected. Frontal and temporoparietal tumours were most common; 86% (83/96) were grade 4.[13] Fifty nine patients received biopsy and 46 surgery. Thirty six tumours were partially removed. Ten were classed as "complete" resections. Most radiotherapy patients (76%; 70/92) received 50-60 Gy, the remainder 45 Gy or less (24%; 22/92). Fractions of 1.8-2.0 Gy were administered each weekday for four to six weeks. Ten (11%) received chemotherapy as part of the MRC BR05 trial of adjuvant procarbazine, vincristine, and 1-(2-chloroethyl)-3-cyclohexyl-1-nitrosourea (lomus-

Table 1—*Characteristics of patients and tumours for those receiving radiotherapy or steroids alone. Figures are numbers (percentages) of patients*

Characteristic	Radiotherapy (n = 92)	Steroids (n = 13)
Sex:		
Men	63 (68)	9 (69)
Women	29 (32)	4 (31)
Age (years):		
21-44	24 (26)	2 (15)
45-59	34 (37)	5 (38)
60-75	34 (37)	6 (46)
Hemisphere affected:		
Right	49 (53)	3 (23)
Left	39 (42)	8 (62)
Bilateral	5 (5)	2 (15)
Tumour site:		
Frontal	21 (23)	1 (8)
Temporoparietal	18 (20)	4 (31)
Parieto-occipital	10 (11)	0
Temporal	9 (10)	2 (15)
Parietal	9 (10)	2 (15)
Corpus callosum	6 (6)	1 (8)
Frontoparietal	6 (6)	0
Thalamic	5 (5)	1 (8)
Frontotemporal	2 (2)	0
Occipital	2 (2)	0
Extensive	5 (5)	2 (15)
Daumas-Duport malignancy:		
Grade 3	21 (23)	0
Grade 4	62 (67)	13 (100)
Unclassifiable "high grade glioma"	9 (10)	0

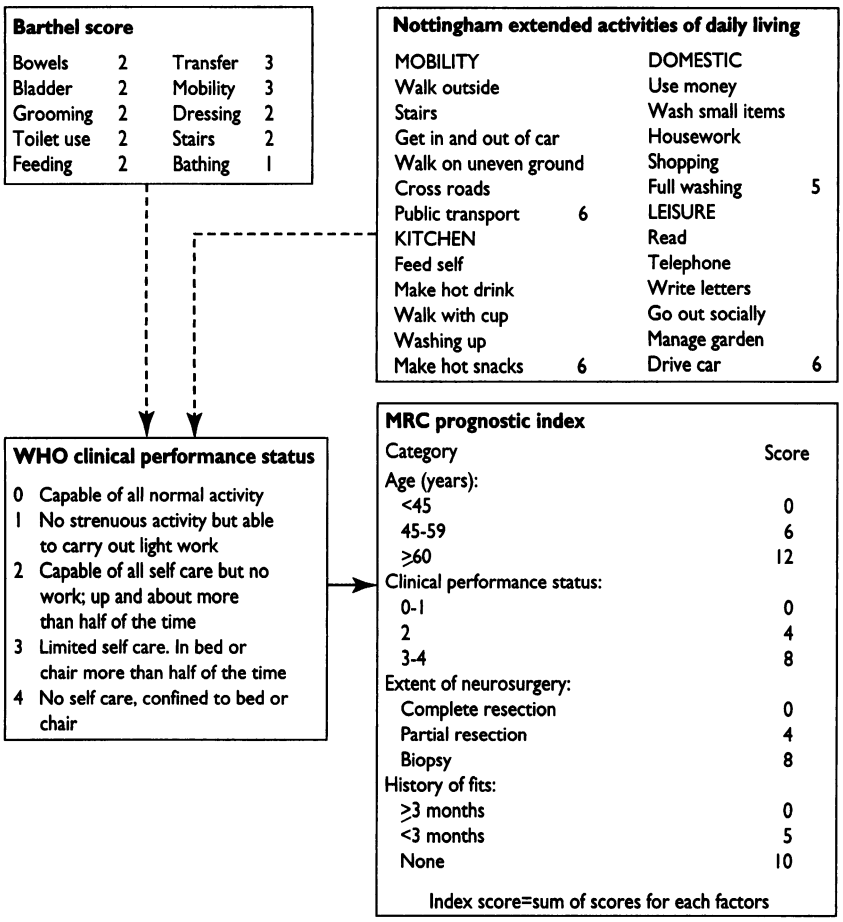

Fig 3—*Assessment of disability, WHO clinical performance status, and score on MRC prognostic index*

tine). Eighteen others (20%) also received chemotherapy within one year for recurrence. Ninety eight patients have died; the seven remaining have a minimum follow up time of two years.

CAN LENGTH OF SURVIVAL BE PREDICTED?

Clinicians clearly excluded rapidly deteriorating patients from radiotherapy treatment. Figure 4 compares the survival of the group receiving steroids alone (median (range) survival 23 days (3 days to 5 months)) with all other patients (10.3 months (19 days to two years in 10%; 9/92)). The first group is not considered further in this paper.

Overall, 27 of the 92 radiotherapy patients died by six months and 56 by 12 months. The survival rate at six months was 70% (95% confidence interval 61% to 79%) and at 12 months was 39% (29% to 48%). Table 2 shows the distribution in this sample of the four components of the MRC prognostic index. There were significant differences in six month survival.

Favourable factors included a good clinical performance status (this having the largest effect), age at diagnosis, history of seizures as a presenting feature, and partial or complete resection compared with biopsy alone. Lower tumour grade (χ^2_1 5.55; P = 0.02) and the absence of necrosis (χ^2_1 11.9; P = 0.0006) were also associated with improved overall survival.

Forty two per cent (39/92) were in the two poorest of the six MRC prognostic groups: a proportion similar to the samples from which the index was originally derived.[18] Because of our smaller numbers the two best, two intermediate, and two poorest groups were collapsed to make three groups. Figure 5 shows survival curves for these three groups. The MRC prognostic index clearly identifies three groups with very different prognoses. To assess the contribution of the individual prognostic factors, however, we performed a multivariate Cox analysis. In addition to the four factors on which the prognostic index is based we included tumour grade and necrosis. By using a forward stepwise variable selection procedure, we first entered WHO performance status in to the model (hazard ratio = 1.75; P<0.0001) followed by the history of fits (hazard ratio = 0.46; P = 0.0001), then extent of neurosurgery (0.49; P = 0.003), the prognostic importance of which increased after adjustment for the other two factors. Interestingly, age did not contribute significant independent prognostic information after inclusion of WHO status and history of fits (1.25; P = 0.13) and nor did tumour grade or necrosis (P = 0.79 and 0.68, respectively). This suggests that in this dataset the information provided by age group is replicating prognostic information provided by other factors in the prognostic index.

We investigated both the MRC prognostic index and, as the most useful single factor, WHO performance status in relation to subsequent disability.

HOW MUCH OF THE PERIOD OF SURVIVAL IS FREE FROM DISABILITY?

We defined the onset of disability as the point at which the patient first experienced problems with mobility or self care and thus scored less than 20 on the Barthel scale. If the patient had presented with such problems and never improved, then they achieved no

Table 2—*Prognostic factors and survival for patients receiving radiotherapy*

Detail	No patients (n = 92)	Median survival (weeks)	Survival rates (%) 6 Months	Survival rates (%) 12 Months	Log rank χ^2_1*	P value
Age (years):						
21-44	24	53	83	54		
45-59	34	42	71	32		
60-75	34	35	59	35	11.6	0.007
Clinical performance status at outset: 0-1	23	65	91	61		
2	38	42	84	59		
3-4	31	21	35	23	15.8	0.0001
Extent of neurosurgery: Partial or complete resection	45	50	79	45		
Biopsy	47	36	60	33	1.78	0.18
History of fits:						
>3 months	15	96	87	60		
<3 months	22	49	86	50		
None	55	36	58	29	20.3	<0.0001
Overall prognostic score:						
0-15	20	61	95	60		
16-25	33	49	79	45		
26-38	39	25	49	23	26.0	<0.0001

*All χ^2 values are from tests for trend and 1 df.

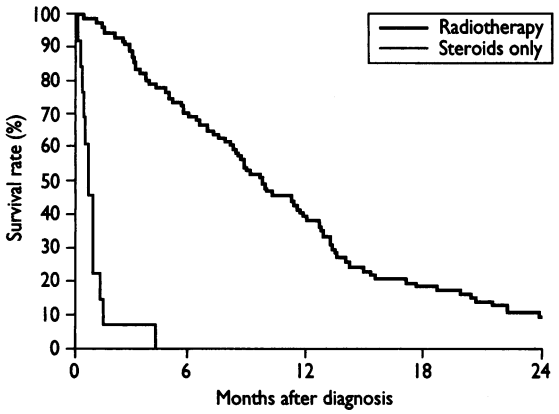

Fig 4—*Survival for patients receiving radiotherapy or steroids alone. Numbers at risk were 92, 64, 36, 17, and 8 at 0, 6, 12, 18, and 24 months, respectively, for radiotherapy; and 13 at 0 months and 0 at 6, 12, 18, and 24 months for steroids alone*

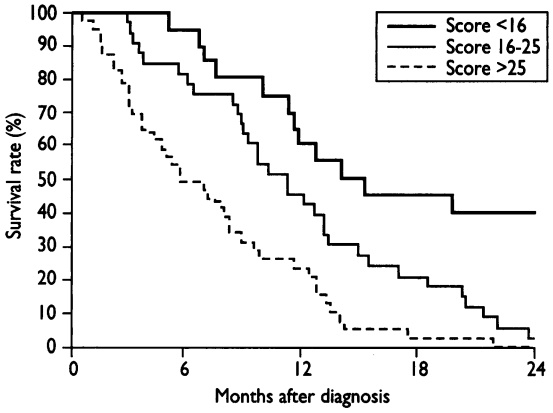

Fig 5—*Survival for patients receiving radiotherapy by initial score on MRC prognostic index. Numbers at risk were 20, 19, 12, 9, and 8 for score <16; 33, 26, 15, 7, and 1 for score 16-25; and 39, 19, 9, 1, and 0 for score >25, at 0, 6, 12, 18, and 24 months, respectively*

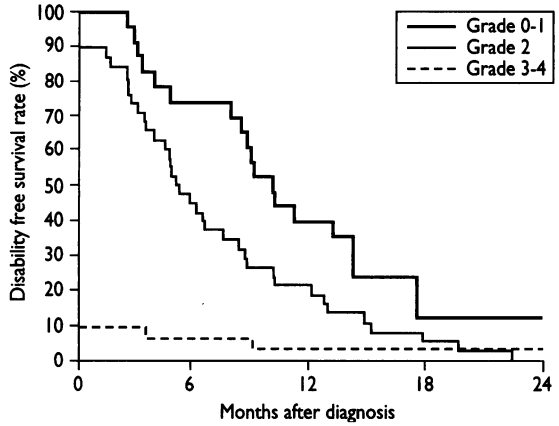

Fig 6—*Survival free from disability (onset of disability being Barthel score <20) by initial WHO performance status. Numbers at risk were 23, 17, 9, 1, and 1 for grade 0-1; 38, 16, 7, 2, and 0 for grade 2; 31, 2, 1, 0, and 0 for grade 3-4, at 0, 6, 12, 18, and 24 months, respectively*

months free from disability. If they had improved for some time we dated the point at which these problems re-emerged. Six patients did not have a deterioration on the Barthel score during the assessment period and were censored at the time they were last known to be free from disability. In each case this was a minimum of one year after diagnosis. The median survival interval free from disability for the group as a whole was only four months. The important prognostic factors for survival were equally good at predicting survival free from disability. Figures 6 and 7 show that survival free from disability varies according to the WHO clinical performance status and the initial score on the MRC prognostic index.

A clinical performance status of 3 or 4 distinguished a group with a particularly poor survival. Of those 23 patients whose clinical performance at onset was 0-1, 74% (17/23) were free from disability for six months and 39% (9/23) maintained this for 12 months. Those scoring 2 also did well, but only 42% (16/38) lived for six months free from disability as defined by the Barthel scale and 18% (7/38) for 12 months. By contrast, only four of the 31 (13%) patients entering treatment with a clinical performance of 3 or 4 improved. This small minority were all self caring and mobile at six months, and one sustained this for more than 12 months. Sixty five per cent (20/31) of this severely disabled group spent at least a month in hospital for treatment compared with 20% (12/61) of all others.

Table 3—*Brain dose, tumour dose, and subsequent deterioration in 52 patients with clinical performance status of 0-2 who were given radiotherapy and survived at least 6 months after treatment. Figures are percentage deterioration (proportions of patients)*

	Dose received by a 10 × 8 cm transverse section of brain		
Tumour dose	**≤40 Gy**	**>40 Gy**	**Total**
40-55 Gy	0 (0/8)	21 (3/14)	14 (3/22)
56-64 Gy	24 (4/16)	50 (7/14)	37 (11/30)

WHAT ARE THE COSTS OF RADIOTHERAPY?

There were 52 patients with an initial clinical performance status of 0-2 and a survival of six months after radiotherapy. Using our conservative criteria (see methods) we initially suspected 17 deteriorations in clinical performance status to be associated with radiotherapy. The contribution of changes in steroid dosage to the situation was sometimes difficult to disentangle, but in all but three cases the patient's radiotherapist agreed. Of these 14 agreed cases (27%; 14/52), nine patients had required admission and the five others required either an emergency visit from their general practitioner or hospital attendance. All partially improved, but nine of the 14 (64%) did not regain their previous clinical performance status.

We investigated whether these deteriorations were associated with radiotherapy dose. Although there was some variation in technique between centres, typically lateral opposed fields were used to treat the whole brain or a "generous volume" around the tumour. After about 40 Gy or four weeks of treatment, field sizes were usually reduced so that the tumour rather than the surrounding brain received the remaining dose. A minority of patients were treated with wedged unilateral fields. None of the group received brachytherapy or stereotactic radiotherapy. We made two estimates about treatment: whether or not the tumour finally received more than 55 Gy and whether or not opposing lateral fields of 10 × 8 cm or larger had been used to administer more than 40 Gy. We classed smaller, unilateral or weighted fields as delivering this amount or less. The use of either approach could result in a final tumour dose of 55 or 60 Gy. Planning data were not always available to consider brain volumes or isocentric radiation curves.

Table 3 shows that reaching each of a higher tumour dose and higher brain dose was associated with deterioration. Half of those with both factors experienced deterioration compared with none with neither. The logistic regression analysis confirmed that both tumour

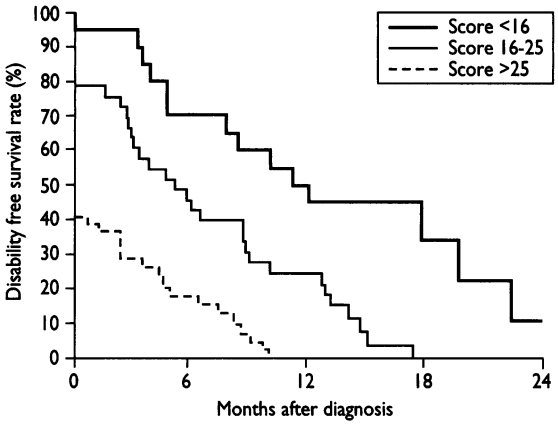

Fig 7—*Survival free from disability by initial score on MRC prognostic index. Numbers at risk were 20, 14, 9, 4, and 1 for score <16; 33, 14, 8, 0, and 0 for score 16-25; 39, 7, 0, 0, and 0 for score >25, at 0, 6, 12, 18, and 24 months, respectively*

Table 4—*Logistic regression analysis of brain dose, tumour dose, and subsequent deterioration in 52 patients with clinical performance status of 0-2 who were given radiotherapy and survived at least 6 months after treatment*

Model including	Coefficient	Standard error	P value	Odds ratio
Constant	−5.85	2.03	0.004	
Brain dose	1.62	0.77	0.04	5.04
Tumour dose	1.37	0.73	0.06	3.94

and brain dose are required to model the outcome (table 4). In terms of odds ratios, brain dose had a slightly larger relative effect.

In addition to the 14 cases of deterioration, a further 42% (23/52) of patients experienced severe tiredness or somnolence sufficient to limit leisure or domestic activities severely during or after treatment. Again there was a significant association between these symptoms and radiation dosage.

In the sample as a whole all patients lost their hair, and 28% (26/92) developed a painful peeling scalp. Forty nine per cent (45/92) lived to see their hair regrow, but for two thirds of these (30/45) loss over the tumour site was permanent. One other possible effect was hearing loss or tinnitus (14%).

Discussion

This prospective study of 92 patients with malignant glioma from London neuro-oncology centres confirms the overall prognosis for this disease and defines again the prognostic importance of age, performance status as assessed by the WHO clinical performance status,[17] and extent of surgery.[5 25 26] In our sample a history of fits as a presenting symptom[27] and the MRC prognostic index[18] were also important, although the clinical performance status was the most important component of the index. We had relatively few patients with grade 3 tumours, and this may account for why tumour grade in our study was unrelated to survival in the multivariate analysis.

We found that neurosurgeons were able to predict those patients with the very worst survival, for whom steroids alone were recommended. It could of course be argued that not providing any other treatment was a self fulfilling prophecy, but the steep decline in the survival curve for those with the worst scores on the MRC prognostic index who did receive radiotherapy suggests that the steroid only group were being separated out on valid clinical grounds. The ease of defining prognostic groups suggests that such measures might be used more often in routine practice. On the basis of our data, the clinician might choose to inform a patient with the most severe disability (clinical performance status of 3 or 4) that even with treatment he or she only stands a 13% chance of substantial improvement in disability. Conversely, 80% who are initially free from disability may remain so for at least six months. In this respect it should be noted that although performance status is an important predictor of outcome, the most frequently cited trial did not report whether this was evenly distributed between the groups randomised to radiotherapy or steroids alone.[4] Another study showed that working capacity was improved in the radiotherapy arm, although this was based on mean performance scores for the groups rather than the proportion of patients improving dependent on their initial score.[28] A retrospective review of outcome after radiotherapy also suggests the need to consider the most appropriate package of treatment and support for elderly or disabled patients.[29] Not only do patients with poor clinical performance status have the worse prognoses, they are less likely to improve, and in our study they also spent much longer in hospital receiving radiotherapy.

The second focus of our study was to ascertain the extent of the trade off between the adverse effects associated with radiotherapy and the improved survival that follows. We limited consideration of adverse effects to severe deteriorations among patients who were initially the least disabled and who were alive six months after treatment. We assumed that if deteriorations during or soon after radiotherapy had been due to recurrence of tumour most would have died in the following six months. Such patients almost certainly have highly aggressive non-responsive tumours. Using these conservative criteria we judged that 27% of this group initially had experienced a substantial deterioration during or after treatment, which the patients' radiotherapists agreed seemed attributable to treatment rather than progression of the tumour. Seventeen per cent of the group were left with permanent problems. In addition to this considerable increase in disability, a further 42% of those initially not severely disabled experienced considerable tiredness. This tiredness could in part have related to the extra travel that outpatient radiotherapy required. Both clinical deterioration and tiredness, however, were associated with increasing dose of radiotherapy. This incidence of adverse effects of treatment (69%) is higher than most previous reports, but these have generally considered delayed brain necrosis or dementia to be the more important and irreversible consequences.[19 22-24 30] Although less severe, the adverse reactions we found do involve larger numbers of patients and detract from the quality of the survival that radiotherapy is intended to achieve. We were not able to validate our pragmatic criteria for adverse effects against neuroradiological evidence of brain damage. Our study, however, raises sufficient doubt about the nature of the deteriorations we have isolated to merit further comparisons of the techniques currently in use.[31]

The assessment of the extent and value of palliation in this setting is complex. In our view one critical factor must be whether the patients and their families judge radiotherapy to have been acceptable or find the gains were worth while. Our companion paper provides some information on patients' experience of this disease and their views about radiotherapy.[12]

Key messages

- Patients with malignant cerebral glioma and poor scores on the MRC prognostic index or the WHO clinical performance status have poor survival and little time free from serious disability
- Activity of daily living checklists are useful in deciding on patients' initial performance status and in monitoring their progress
- As many as one quarter of non-disabled patients may experience clinical deterioration and a further 42% experience considerable tiredness after radiotherapy
- Techniques that spare normal brain from radiation should be considered

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Malignant cerebral glioma—II: Perspectives of patients and relatives on the value of radiotherapy

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See editorial by Gregor and Cull and p 1507

Abstract

***Objective*—To explore the experiences of patients and relatives after the diagnosis and treatment of malignant cerebral glioma.**

***Design*—Two year prospective study with home interviews.**

***Setting*—Six neurosurgery and radiotherapy centres in London.**

***Subjects*—75 patients and 66 close relatives interviewed at diagnosis, 58 patients interviewed after radiotherapy, and 27 interviewed after recurrence.**

***Main outcome measures*—Awareness of likely prognosis, distress, dissatisfaction with radiotherapy, and perception of severe problems in everyday life.**

***Results*—As they began radiotherapy most patients understood that they suffered from a brain tumour (95%; 71/75), but only one quarter (19/75) seemed fully aware of the poor prognosis. Others were unaware (43%; 32/75) or only partly aware (32%; 24/75). The more aware patients were more distressed. Relatives were three times more likely to be aware of the prognosis (67%; 44/66) and were more distressed. Although 39% (29/75) of patients initially made negative comments about radiotherapy, only 17% (13/75) were completely dissatisfied. The decision to accept radiotherapy could be discussed directly with 19 fully aware patients. Twelve found radiotherapy acceptable if it were medically advised or if it improved survival. Assessed by their own reports of problems only 40% of patients achieved a period of stability or remission, yet dissatisfaction with treatment did not increase.**

***Conclusion*—Most patients with malignant glioma initially seemed unaware or only partly aware of the poor prognosis. Relatives were more aware, more distressed, and often concerned to protect patients from full awareness, which made it difficult to explore with patients directly the possible trade off between quality and length of life. Conceptualising the question as a rational choice ignores the social and emotional context of life threatening disease.**

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Introduction

In some medical settings doctors may perceive treatment to be unwarranted as to prolong a considerably diminished quality of life or to reduce this further by adverse effects may not be justified. Considerations concerning quality of life as opposed to length of life underpin much of the current debate over setting priorities for treatment,[1 2] and various formulations of how to resolve such conflicts have been published.[3-6] Whether such formulations would gain much favour in the population at large when faced with the disease in themselves or those close to them is uncertain. Some patients with cancer, for instance, view chemotherapy characterised by side effects and a small chance of success as more worth while than do medical staff or a sample from the general population.[7 8] Moreover, patients with cancer (and those with other serious diseases) may report the quality of their lives in unexpectedly positive terms.[9-13]

We considered the tension between quality and length of life for patients with malignant cerebral glioma, a disease for which the prognosis is almost uniformly poor.[14-16] In the previous paper in this issue (p 1507) we described a cohort of 105 patients, 92 of