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Intracranial Meningiomas in Elderly Patients

Postoperative Morbidity and Mortality. Factors Predictive of Outcome

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Summary

We studied retrospectively a series of 96 patients (36 men, 60 women), older than 65 years of age (mean age: 70 ± 4 years, range 65–82), operated upon for an intracranial meningioma from October 1978 to December 1988. Fifty-two patients (54%) were under 70, 32 between 71 and 75 and 12 over 75 (46%). The tumours were diagnosed for all the patients by CT scan. Thirty-four (35%) were located over the convexity, 24 (25%) in the falx/parasagittal region, 38 (40%) in the base, tentorium and posterior fossa. Neurological and physical conditions were assessed preoperatively and at the closing date in June 1989. Operative mortality was 16% (15/96). Patients were divided into two groups: poor outcome, defined by the death or a post-operative Karnofsky index $\leqslant 70$ ($n = 36$), and good outcome defined by a Karnofsky index of 80 or more ($n = 60$). The two groups did not differ regarding age, sex ratio, tumour size and peritumoural oedema. The only predictors of poor outcome were poor preoperative general health condition (stage III of the American Society of Anesthesiology classification), ($p < 0.01$), poor preoperative neurological condition (Karnofsky's index) ($p < 0.001$), and location of the tumour on the base or in posterior fossa ($p = 0.02$).

Keywords: Intracranial meningioma; elderly; age; prognosis.

Introduction

Intracranial meningiomas account for 15 to 20% of all intracranial tumours[2, 11]. After surgical removal, patients can have a good quality of life, provided they are in good general health before the operation and the tumour has been completely excised[2]. With the progressive increase in life expectancy and the general availability of computerized tomography neurosurgeons are now often facing intracranial meningiomas occurring among the elderly. However, although many studies have already been published on intracranial meningiomas, very few have pointed out the problem of elderly patients[1, 4, 9]. The aim of the present work was to evaluate the mortality, morbidity and prognostic factors of poor outcome after surgery in a series of 96 consecutive patients aged 65 or more.

Material and Methods

This is a retrospective study of 96 consecutive patients who underwent 111 craniotomies for the removal of an intracranial meningioma from October 1, 1978 to December 31, 1988. For 12 patients, this was a second or a third craniotomy due to tumour recurrence. The patients ranged in age from 65 years to 82 years with a mean age of 70 ± 4 years. Figure 1 shows the distribution of the patients according to their age and sex. Follow-up assessment was obtained from the department charts and, when necessary, patients were contacted by letter or by phone at the closing date in June 1989.

The most usual symptoms and signs in the 96 patients are summarized in Table 1. The preoperative neurological deficit was graded retrospectively with the Karnofsky Rating Scale[6]. Fifty patients rated over 70 and were considered to be in good neurological condition, 40 rated 60 or 70 and were considered to be in fair condition and 6 patients rated less than 60 and were considered to be in poor condition. Since we were dealing with an aged population, general health

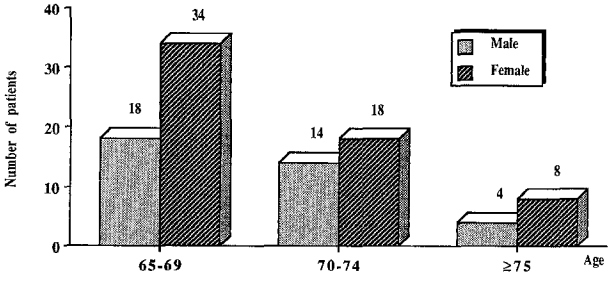

Fig. 1. Distribution of the 96 patients according to age and sex. Figures are number of patients

Table 1. *Symptoms and Signs in 96 Patients*

	Number	Percentage*
Seizure partial	21	22
generalized	29	30
Cranial hypertension	18	19
Hemiparesis	34	35
Tetraparesis	1	1
Sensory disturbance	15	16
Aphasia	15	16
Extrapyramidal disturbance	2	2
Behavioural disturbance	23	24
Memory impairment	18	19
Anosmia	7	7
Bladder disfunction	8	8
Visual impairment	10	10
Visual field defect	9	9
Exophthalmos	3	3
Cerebellar signs	3	3
Trigeminal neuralgia	1	1
Dysphagia	1	1
Stupor	2	2
Tumefaction	2	2

* Since a patient may have more than one symptom or sign, the total percentage exceeds 100%.

Table 2. *ASA Physical Status*

Category	Description
I	Healthy patient
II	Mild systemic disease. No functional limitation.
III	Severe systemic disease. Definite functional limitation
IV	Severe systemic disease that is a constant threat to life.
V	Moribund patient

Table 3. *Relative Frequency of Meningiomas at Various Tumour Sites*

Tumour localization	Cases	%
Group 1: convexity	34	35
Group 2: parasagittal/falx	24	25
Group 3:	38	40
olfactory groove	4	4
tuberculum sellae	9	9
sphenoidal ridge	8	8
orbito-cranial	3	3
basal	5	5
tentorial	3	3
posterior fossa	5	5
foramen magnum	1	1
Total	96	100

condition of the patients was graded according to the criteria of the American Society of Anesthesiology (ASA classification, Table 2)[12]. Twenty-one patients were graded in ASA class I, 48 in ASA class II and 27 in ASA class III.

The site and the size of the tumour and perifocal oedema were determined for all the patients by reviewing retrospectively the CT scans. The location of the tumours is summarized in Table 3.

Fifty meningiomas had a diameter greater than 4 cm, and 46 a diameter lower than or equal to 4 cm. According to the Kazner classification[7], 39 tumours were associated with a severe oedema, 45 with mild oedema and 12 with no oedema.

Other procedures were used for the preoperative work-up, including skull X-rays and electroencephalography. Cerebral angiography was performed only to define the relationship of the tumour to venous sinuses and arteries, mainly when the meningiomas involved the parasagittal and basal regions. The extension of tumour removal was graded according to the Simpson classification[13]. Grade 1 and 2 excisions constituted 84.4% of the patients.

Results are shown as means ± one standard deviation. Several percentages were compared with the Pearson's chi-square. Two means were compared with the unpaired Student's test. A p value less than 0.05 was considered as significant. A stepwise logistic regression was used to assess the effect of prognostic variables on the patient's outcome. All calculations were performed with the BMDP Statistical Software (BMDP Statistical Software, Inc., 1440 Sepulveda Bvld, Los Angeles, CA 90025 USA).

Results

Mortality

There were 15 deaths within 30 days of surgery (16%). Causes of deaths were haematoma (n = 6), cerebral infarction (n = 4), empyema (n = 1), status epilepticus (n = 1), pulmonary embolism (n = 2) and gastrointestinal haemorrhage (n = 1).

Morbidity

Medical and surgical complications are shown in Table 4. 57% ($^{55}/_{96}$) of the patients had no medical or surgical complication. Post-operative haematoma was the most frequent and the most severe complication observed. This complication was directly responsible for death in 6 patients within the first month, and indirectly in 4 additional patients. The presence of at least one medical complication was significantly associated with the presence of a surgical complication (CHI square = 21, dF = 1, $p < 0.001$).

Postoperative Outcome

Four months after surgery 60 patients (63%) rated 80 or more on the Karnofsky rating scale (normal activity, without or with minor or some symptoms), 14 (15%) rated 70 or less and 7 additional patients died from complications related to the surgery. During the entire period of follow-up, 5 other patients died for

Table 4. *Medical and Surgical Post-operative Complications Among the 96 Patients*

Surgical complications		Medical complications	
Haematoma	15 (16%)	pneumopathy	19 (20%)
Cerebral infarction	12 (13%)	meningitis	3 (3%)
Empyema	2 (2%)	septicaemia	2 (2%)
Cerebral oedema, stupor ± transient deficit		cardio-respiratory failure	5 (5%)
	16 (17%)	pulmonary embolism	6 (6%)
Wound infection	1 (1%)	cardiac insufficiency	4 (4%)
Hydrocephaly	2 (2%)	epilepsy (seizure)	4 (4%)
		epilepsy (status epilepticus)	3 (3%)
		gastrointestinal haemorrhage	1 (1%)

The same patient may have more than one complication.

Table 5. *Prognostic Factors of Poor or Good Outcome**

Outcome	Good (n = 60)	Poor (n = 36)	p
Age (years)	70 ± 4	71 ± 4	NS
% of males	37	39	NS
ASA-1 (%)	27	14	
ASA-2 (%)	53	44	
ASA-3 (%)	20	42	$p = 0.05$
Preoperative Karnofsky ⩽ 70 (%)	33	72	$p < 0.001$
Base or posterior fossa meningioma (%)	32	53	$p < 0.05$
Size > 4 cm (%)	48	58	NS
Severe oedema (%)	35	50	NS

* A good outcome was defined by a Karnofsky's index > 70.
A poor outcome was defined by a Karnofsky's index ⩽ 70 or death.
NS = difference not significant.

reasons not related to their meningioma and 13 patients were lost to follow-up. Among the 56 remaining patients, contacted by phone or letter at the closing date, 48 rated over 70 on the Karnofsky rating scale and 8 rated 70 or less, but all were at home. Thus, after a mean follow-up time of 48 ± 40 months (median: 48), 48 of the 74 patients (65%) who survived 4 months after the operation had a good quality of life after their operation.

Prognostic Factors

In order to assess the risk factors for a poor outcome, patients were postoperatively classified into two groups: poor outcome, defined by death or a Karnofsky index ⩽ 70 (n = 36), and good outcome defined by a Karnofsky index of 80 or more (n = 60). The two groups did not differ as regards age, sex ratio, tumour size and peritumoural oedema (Table 5). A poor outcome was related to poor preoperative general health (stage III of the ASA classification), poor preoperative neurological condition (Karnofsky's index), and location of the tumour on the base or in the posterior fossa (Table 5).

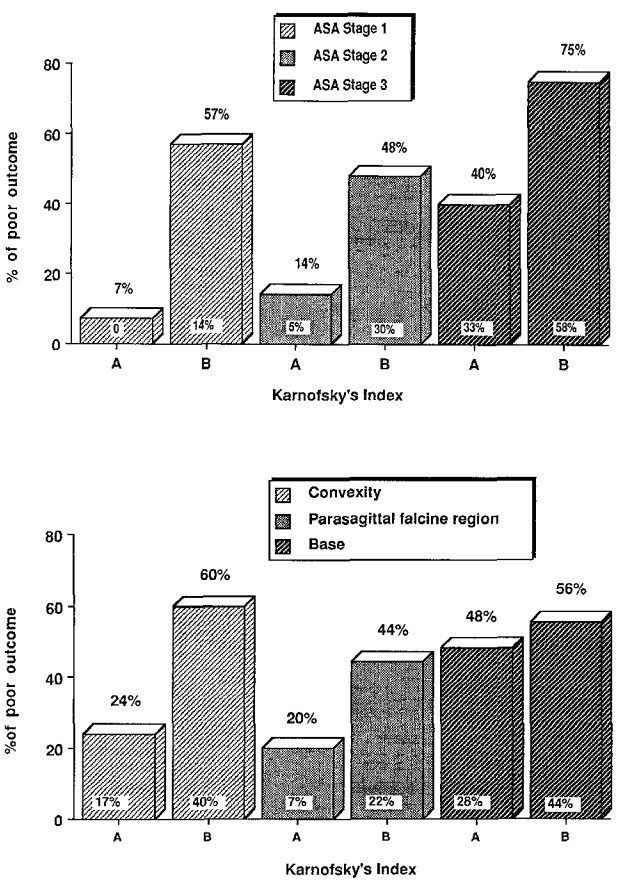

Fig. 2. Prognostic value of ASA classification (upper part) or location of the tumour (lower part) compared to the Karnofsky's index (*A* Preoperative Karnofsky's index > 70; *B* Preoperative Karnofsky's index ⩽ 70). Figures in columns are percentages of death

Because the preceding variables may not have been independent, a logistic regression was performed with outcome as the dependent variable and age, sex, ASA classification (stage 3 versus other stages), peritumoural oedema, site of the tumour (base versus other locations), size of the tumour (> 4 cm, $\leqslant 4$ cm) preoperative Karnofsky index (> 70, $\leqslant 70$) as the independent variables. Only ASA classification ($p < 0.01$), Karnofsky's index ($p < 0.001$), and tumour site ($p = 0.02$) were found to be significant independent predictors of outcome. The adjusted odds-ratio gave an approximation of the relative risk associated with each of these three variables. Patients with a Karnofsky's index $\leqslant 70$ had a relative risk of poor outcome of 7.02 (95% confidence interval: 2.51 to 19.63) by comparison to the patients with a Karnofsky's index > 70. Patients at stage 3 of the ASA classification had a relative risk of poor outcome of 4.86 (95% confidence interval: 1.58 to 14.89) by comparison to the other patients. Patients with a tumour located on the base had a relative risk of poor outcome of 3.27 (95% confidence interval: 1.20 to 8.92) by comparison to the patients with other locations. The effect of these three variables are graphically displayed in Fig. 2.

Discussion

The present study shows that, among 96 patients aged 65 or more operated on consecutively for an evolutive intracranial meningioma, 22 (23%) died during the perioperative period. However, a good outcome was observed in 60 of the 74 survivors (81%). Few publications deal with the surgical results in elderly patients operated upon for an intracranial meningioma. Nowadays, since CT scans are easily available, the detection of such a tumour after the age of 65 years is more and more frequent. Thus, in our series, 11 patients were operated upon between 1978 and 1980, 30 between 1981 and 1984 and 55 between 1985 and 1988. In the series of 133 meningiomas reported by Jan *et al.*[5], 58 (44%) occurred in subjects older than 60 years. The proportion of subjects older than 65 years was 21% in Papo's series[9]. Thus, depending upon the limit choosen for age, from 20 to 40% of the patients may be considered as elderly, and this proportion will probably increase in the future with the progressive aging of the population in Western countries.

Most authors[1,4,8,9] emphasize the high risk of morbidity and of mortality associated with meningioma surgery in older patients. Among patients older than seventy years, the mortality rate was close to 50% in Papo's series[9], 37% three months after surgery in Djindjian's series[4], 13% in Jan's series[5] and, only 8% in the recent report by Awad *et al.*[1]. These differences are probably the consequence of differences in recruitment since most patients were symptomatic or had symptoms in progress in the present work as well as in Papo's and Djindjian's series, whereas 21% of Awad's patients were asymptomatic and none had severe deficit.

The difference in prognosis between middle-aged and elderly patients probably lies in the latter's poor general health. The independent effects of the ASA grading and of the preoperative Karnofsky's index are shown in Fig. 2. Considering patients with a good Karnofsky's index, we observed no death in the 14 patients at stage I of the ASA classification and only 1 death in the 21 patients at stage II, which compare favourably with the 4% perioperative mortality death rate reported by Chan in younger patients[2].

The occurrence of a poor outcome rises as the ASA grading increases and, for example, ASA III patients have a 5-fold risk increase of a poor outcome whatever their neurological status. In the present work, the location of the tumour on the base or in the posterior fossa was also associated more frequently with a poor outcome. This fact had already been emphasized by Chan[2] and Awad[1], and can be explained by technical problems and/or incomplete excision. We did not find significant differences in outcome related to tumour size which is explained partially by the location of the tumour since a large convexity meningioma can be easier to remove than a smaller tumour of the inner part of the sphenoidal ridge. Evidence concerning the importance of severe oedema as a predictor of poor outcome is conflicting. Thus, while Djindjian[4] found that severe oedema was predictive of poor outcome, we found only a non-significant tendency whereas Papo[9] found no relationship between oedema and outcome. These discrepancies may be related with the strong association between oedema and neurological status: in our series, severe oedema was observed in 57% of the patients with a Karnofsky's index $\leqslant 70$ and only 26% of those rating over 70.

We did not divide the histological diagnosis of meningiomas into subcategories. This decision was taken for two reasons. First, if the diagnosis of meningioma is often suspected preoperatively the subgroup is unknown and consequently cannot influence the decision for or against operation. Secondly, none of the many histological classifications of meningiomas which have been proposed could be shown to have an influence

on the postoperative course[10], with the exception of so-called angioblastic meningiomas[3] which were excluded from our series since they are diagnosed as haemangiopericytomas[14] in our laboratory.

We conclude that age *per se* is not a contraindication to the surgery of meningioma. Careful examination of risk factors for poor outcome, mainly neurological and general health conditions and tumour location, is needed prior to making a decision. Thus, we do not advocate surgery in asymptomatic elderly patients because of the high mortality and morbidity associated with this type of surgery. On the other hand, surgery must be considered when either neurological signs occur or worsen, or growth rate of the tumour on CT scan increases, with due consideration given to tumour location.

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