

Influence of Tumor Size and Duration of Symptoms on the Postoperative Visual Outcome in Microsurgically Treated Suprasellar Meningiomas

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ABSTRACT

Objective: To determine the influence of the tumor size and the preoperative duration of symptoms on the postoperative visual outcome in patients with suprasellar meningiomas.

Methods: This is a retrospective clinical analysis. Between 2003 and 2005, at the Department of Neurosurgery, Cairo University Hospitals, 13 consecutive patients with histopathologically proved suprasellar meningiomas received surgical treatment. We analyzed the patients retrospectively based on their clinical and radiological data. We compared the preoperative visual condition using visual acuity, field, and fundus examination, with the postoperative visual condition at 1 week, one month, and 6 months intervals postoperatively. We emphasized on the relation between the visual prognosis postoperatively and both the tumor size and duration of symptoms preoperatively. Follow up period ranged from 7 months to 16 months (mean 10.7 months). **Results:** The age of the patients ranged from 39 to 58 years (average 48.8 years). The female to male ratio was (3.3 to 1). Tumor volume ranged from 1.9 to 5.6 cm with a mean of (3.3 cm) in diameter. Seven patients (53.8%) had a tumor size of 3 cm or less and six patients (46.2%) had tumor size larger than 3 cm. The duration of symptoms at the time of diagnosis ranged from 9 months to 5 years with a mean of (2.5 years). Five patients had a preoperative duration of symptoms lasting for one year or less, while eight patients had pre operative symptoms for more than one year. Visual affection was the commonest presenting symptom (84% of the patients). Results showed that visual prognosis was definitely better in patients with tumors 3cm or less in size and in those with duration of symptoms of one year or less. **Conclusion:** Better visual outcome postoperatively was favorably affected by a tumor size of 3 cm or less, and duration of symptoms of one year or less.

Keywords: Suprasellar meningiomas, visual outcome, tumor size, duration of symptoms.

INTRODUCTION

Suprasellar meningiomas originating from the tuberculum sellae, diaphragma sellae and planum sphenoidale are uncommon. They represent 3- 10% of total intracranial meningiomas. Women are affected three times more than men. The disease is usually diagnosed in the fourth or fifth decade [1]. Slowly progressing visual deterioration is the most common initial complaint [2].

Tumors in these regions are very slowly growing and can cause insidious visual loss, and often remain undiagnosed until they have enlarged substantially or the symptoms have become aggravated [3].

If untreated, complete blindness can occur. Treatment involves tumor removal and decompression of the optic chiasm via several operative approaches [4].

Gross total resection (Simpson Grade I or II) is the goal of treatment and can usually be accomplished safely. Special excision-related considerations include appreciation of arachnoid planes separating the tumor from neural tissue, adequate drilling of osseous elements for optimal exposure

and intraoperative preservation of the vascular supply to the optic apparatus[5].

Tumor size and duration of symptoms have been identified as major factors influencing the visual outcome[6].

In this study, we retrospectively analyzed the clinical and radiological data for 13 patients with suprasellar meningiomas, with emphasis on the tumor size and duration of symptoms preoperatively as predictors for visual outcome postoperatively.

MATERIALS & METHODS

Patient population

Thirteen consecutive patients with histopathologically proven suprasellar meningiomas were surgically treated in the Department of Neurosurgery, Cairo University Hospitals, between 2003 and 2005. We analyzed the patients retrospectively based on their clinical and radiological data. (Table 1)

Presenting Symptoms on Admission

Patients typically presented with a history of uni- or bilateral visual decline progressing over months to years. Visual deterioration seems to be

present early and often begins unilaterally. Because growth is slow and insidious in most cases, evaluation and diagnosis were typically delayed, and significant visual loss of one or both eyes occurred.

After admission ophthalmological examinations showed various degrees of visual field defects, decrease of visual acuity and optic atrophy.

Headache (non specific) in site was a common complaint. Other symptoms such as endocrinal dysfunction, mental changes, anosmia, and convulsions were noticed with variable degrees. (Table 2)

Ophthalmological Assessment

Ophthalmological examination carried out for all the patients consisted of testing the patients' visual acuity (Snellen notation), fundus examination, and Goldmann perimetry for visual field defects. The ophthalmological assessment was done preoperatively as well as post operatively at one month, 3 months, and six months interval. A change of 2 lines or more was taken as a measure for improvement or deterioration of vision.

Radiological Investigations

All the thirteen patients had high resolution computed tomography

(CT) and magnetic resonance imaging (MRI) before and after contrast injection. High resolution CT showed variable degrees of hyperostosis of the planum sphenoidale and some patients had radiological evidence of calcification within the tumor. Both T1 and T2 weighted MRI were done in three planes to analyze the relation to the vascular and neighboring structures. Angiography was performed in 3 patients. Embolization of the tumor was not performed in any patient. Through CT and MRI, the size of the tumor was estimated.

Follow up MRI was done at three and six months postoperatively.

Microsurgical Technique

All the operations were done for the patients through a unilateral frontotemporal approach, on the side of visual deterioration. In bilateral involvement the right side was preferred. This pterional approach is well described.

Cerebrospinal fluid drainage (CSF) was done for all patients through opening of the basal cisterns. In 4 patients lumbar drainage was done intraoperatively to reduce the intracranial pressure.

Opening of the sylvian fissure was carried out for all the patients and the M1 segment of the middle cerebral

artery was exposed. The internal carotid artery was identified as well as the ipsilateral optic nerve. The tumor capsule was opened and the basal blood supply was interrupted by lifting the tumor and coagulating the feeding arteries until the ipsilateral optic nerve appeared. The tumor was further debulked to reduce its volume until the contralateral optic nerve became visible. All the steps respected the dissection and preservation of the arachnoidal plane. After interruption of the basal blood supply, the tumor could easily be detached from the arachnoidea of the gyrus rectus, the A1 segment of the anterior cerebral artery, or the anterior communicating artery. Finally, the tumor was removed from the A1 segment and the chiasm.

Protection of the optic and chiasmatic blood supply is extremely important to preserve vision.

In particular, the small vessels from the carotid artery to the optic nerve have to remain in their

arachnoidal layer and should not be occluded.

The most important steps remain the interruption of the basal blood supply and hollowing of the tumor. The most important structure to be exposed is the contralateral optic nerve to obtain an anatomical overview. Close to the optic nerves, no active coagulation was used and the tumor was sucked within its arachnoidal plane.

RESULTS

Of the thirteen patients 10 (76.9%) were females and 3 (23%) were males. The youngest patient was 39 years old and the oldest was 58 years old (mean 48.8years). Most patients were between 40-60 years of age and females predominated in all age groups. (Table 1)

Tumor sizes ranged from 1.9 to 5.6 cm (mean 3.3 cm) in diameter. (Table 1)

Table 1 : Clinical data of 13 patients with suprasellar meningiomas in this study

Case no.	Sex/Age (yr)	Duration of symptoms	Tumor size (cm)	Follow up period(months)
1	F/45	11 months	2.5	9
2	F/54	2.6 years	3.7	14
3	F/43	3.5 years	4.2	8
4	M/56	3.9 years	5.6	15
5	F/41	9 months	1.9	10
6	M/57	2.4 years	4.2	12
7	M/47	4 years	3.4	13
8	F/39	10 months	2.8	11
9	F/58	1 year	2.1	7
10	F/42	2.5 years	3.0	16
11	F/51	11 months	2.7	7
12	F/49	4.7 years	2.9	8
13	F/53	5.0 years	3.7	10

We grouped the patients into two groups concerning the size of the tumor. One group included patients with tumor sizes of 3cm or less with a mean size of (2.5cm), while the other group included patients with tumor sizes more than 3 cm, with a mean size of (4.1 cm). (Table 3)

Seven patients (53.8%) had a tumor size of 3 cm or less and six patients (46.2%) had tumor size larger than 3 cm. (Table 3)

The duration of symptoms preoperatively ranged from 9 months to 5 years with a mean of (2.5 years).(Table 1)

The shortest duration (nine months) was noted in a female patient 41 years old presented with headache (case 5). This female patient did not have any visual complaint preoperatively.

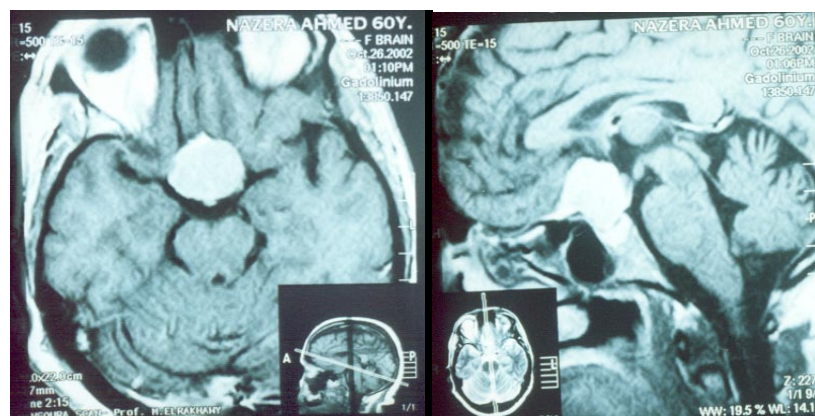


Fig. 1: Preoperative MRI axial and sagittal views of suprasellar meningioma

The longest duration of symptoms (5 years) was in case number 13. This 53 years old female patient presented with very slowly progressive deterioration of vision and non specific headache and was

followed up at the ophthalmological department where she has been told she had optic atrophy, and her CT showed large suprasellar meningioma. (Fig.2).

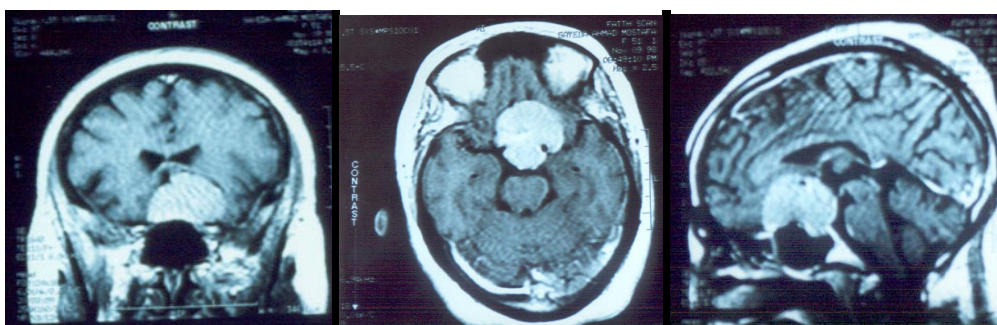


Fig. 2: Preoperative MRI coronal, axial and sagittal cuts of huge longstanding suprasellar meningioma.

We also grouped the patients into two groups concerning the duration of symptoms. In one group the patients with duration of symptoms of one year or less were included with a mean duration of (0.9 years), while the other group included the patients with symptoms lasting preoperatively for more than one year with a mean duration of symptoms of (3.6 years). (Table 3)

Five patients (38.4%) had duration of symptom for one year or less, while eight patients (61.5%)

presented with symptoms lasting for more than one year. (Table 3)

Visual loss was the most common complaint. It occurred in 11 patients (84.6%). Binocular visual affection occurred in 9 patients (81.8%), while monocular visual affection occurred in 2 patients (18.2%). (Table 2)

Table 2: Clinical presentation of the patients with suprasellar meningiomas in this study.

Presenting symptoms	No. (%) of cases
Visual loss	11 (84.6)
Monocular	2 (18.2)
Binocular	9 (81.8)
Visual field affection	11 (84.6)
Headache	6 (46.1)
Endocrinal dysfunction	1 (7.7)
Mental changes	1 (7.7)
Anosmia	2 (15.3)
convulsions	1 (7.7)

Visual field affection occurred in 11 patients (84.6%).(Table 2). Headache (non specific) was the second most common complaint present in 6 patients (46.1%). (Table 2)

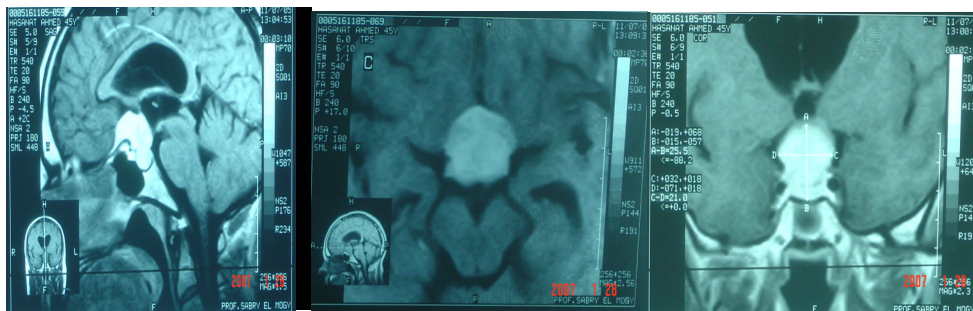


Fig. 3: Preoperative MRI sagittal , axial and coronal views of suprasellar meningioma

Among the seven patients with tumor size of 3 cm or less, Improvement in the visual outcome postoperatively was noted in 4 patients (57.1%) ,while in one patient (14.3%)

there was no change in the visual outcome, and in 2 patients (28.6%) the vision became worse postoperatively. (Table 3)

Table 3: Effect of tumor size and duration of symptoms on patient's visual outcome

Factor	Tumor size		Duration of symptom	
	≤ 3 cm (n = 7)	> 3 cm (n = 6)	≤ 1 yr (n = 5)	> 1 yr (n = 8)
Mean tumor size (cm)	2.5	4.1		
Mean duration of symptom (yr)			0.9	3.6
Visual outcome				
Improved	4 (57.1%)	1 (17%)	3 (60%)	3 (37.5%)
Unchanged	1 (14.3%)	2 (33%)	1 (20%)	1 (12.5%)
Worse	2 (28.6%)	3 (50%)	1 (20%)	4 (50%)
Operative mortality	0 (0%)	1 (16.7%)	0 (0%)	1 (12.5%)
Total removal of the tumor	6 (85.5%)	4 (66.7%)	3 (60%)	3 (37.5%)
Recurrence of tumor	1 (14.3%)	2 (33.4%)	1 (20%)	2 (25%)

Among the six patients with tumor size of more than 3 cm, Improvement in the visual outcome postoperatively was noted in one patients (17%), while in two patients (33%) there was no change in the visual outcome, and in 3 patients (50%) the vision became worse postoperatively. (Table 3)

In the five patients with duration of symptoms lasting for one year or less, improvement in the visual outcome postoperatively was noted in 3 patients (60%), while in one patient (20%) there was no change in the visual outcome, and in one patient (20%) the vision became worse postoperatively. (Table 3)

In the eight patients with duration of symptoms lasting for one year or more, improvement in the visual outcome postoperatively was noted in 3 patients (37.5%), while in

one patient (12.5%) there was no change in the visual outcome, and in four patients (50%) the vision became worse postoperatively. (Table 3)

No Operative mortality occurred in patients with a tumor size of 3 cm or less, or in patients with preoperative duration of symptoms of one year or less. (Table 3)

Total tumor removal was achieved in 6 patients (85.5%) in patients with tumor size of 3 cm or less, compared to only 4 patients (66.7%) with tumor size of more than 3 cm. (Table 3)

DISCUSSION

Early diagnosis and treatment of suprasellar meningiomas remains a challenge to every neurosurgeon. Because of the close relation of suprasellar meningiomas to optic tract,

optic chiasm and optic nerve, great respect should be taken during microsurgical removal of the tumors.

Early diagnosis of tumors in these regions may be difficult because the onset of symptoms may be so subtle and progress so insidiously that the patient may not be aware of his visual deficit until the symptoms become aggravated. He may visit an ophthalmologist and to be told of having retro bulbar neuritis or optic atrophy, thus delaying proper diagnosis.

In our retrospective analysis for 13 patients with histopathologically proved suprasellar meningiomas, we found that most of the cases (76.9%) were females, with a female to male ratio of (3.3 to 1). This finding was commonly noticed by many authors in their studies [7, 8, 9].

The age of the patients ranged from 39 years to 58 years (mean 48.8 years). Zevgaridis et al. [10] and Al-Mefty O et al. [11] confirmed this mean of age in their series.

In our work we didn't find a strong correlation between the patient's age at the time of diagnosis and the visual outcome postoperatively. Cornu P et al. [12] and Puchner MJ et al. [13] agreed upon this opinion, while Pamir MN et al., [14]

concluded that, patients' age of more than 60 years at the time of diagnosis correlates with a poor visual outcome. John H et al. [2] stated that age serves as a predictor of outcome, with older age predisposing to less post treatment improvement in vision. Several age limits, 54 and 64 years of age have been suggested, but these parameters are arbitrary. Rosenstein J et al, [15] mentioned that age had some effect on prognosis, but he didn't clearly state the age limits which can be prognostic factor for the visual outcome.

Sen-Lei et al.[1] stated that age was negatively correlated with the post operative visual acuity.

In our work we found that tumor sizes ranged from 1.9 to 5.6 cm (mean 3.3 cm) in diameter. The variations in the size of the tumors have been previously reported in many studies [16, 17, 18].

The duration of symptoms preoperatively ranged from 9 months to 5 years with a mean of (2.5 years). This wide range of duration of symptoms are consistent with many previous studies [1,12,15,17].

It was clear from our analysis that visual loss was the most common complaint. It occurred in 11 patients (84.6%), a finding that has been agreed

upon in most of the published studies[2,19,20,21,22].

Headache was the second most common complaint present in (46.1%) of the patients included in our study, which is similar to the studies reported by Brihaye J et al. [23] and DeMonte F [24].

We found intimate relation between the tumor size and duration of symptoms as prognostic factors for visual outcome postoperatively. It was clear that the visual outcome improved markedly in patients having tumor size of 3 cm or less, and presenting with symptoms lasting for one year or less, compared to patients having tumors with more than 3 cm in size and symptomatizing for more than one year. Both factors have been repeatedly identified as major prognostic factors in patient's visual outcome post operatively [1, 2, 7, 14, 25].

On the contrary, though Symon et al. [3] reported that better overall outcomes concerning the visual parameters occurred with tumor sizes of 3 cm or less, they found that the favorable duration of symptoms was of two years or less.

Andrews and Wilson [4] reported that patients with tumor size larger than 6 cm had a greater tendency

for post operative visual deterioration, while patients with symptoms lasting for less than six months tended to have normal visual acuity and field post operatively.

John H et al.[2] stated in his several case series that patients with symptoms lasting fewer than 6 months tend to recover more visual function than those with symptoms lasting longer than 1 year

Rosenstein J et al. [15] concluded that prognosis was favorably affected by a mean duration of symptoms of less than 2 years, and a tumor size of less than 3 cm.

An interesting observation reported by Kadis et al. [26] that favorable outcomes in visual acuity were found in patients with tumor size of 3 cm or less irrespective to the duration of symptoms.

Finn ad mount [27] concluded that patients with duration of symptoms less than three months had better results than those with symptom durations longer than one year; hence early diagnosis and early surgical therapy would provide better overall outcome.

Grisoli F et al. [17] concluded that best results were obtained in patients operated upon within one year of the onset of visual symptoms.

In the series by Zevgaridis *et al.* [10] visual prognosis was favorably affected by age under 54 years, duration of symptoms of less than seven months, and the presence of an intact arachnoid membrane around the lesion.

Rosenstein J *et al.* [15] in his series mentioned the importance of the visual condition preoperatively. He stated that prognosis was favorably affected by a preoperative visual loss of less than 50%, and the presence of normal optic discs on funduscopic examination. Those factors together with the size of the tumor and duration of symptoms were taken as guidelines for predicting the visual outcome post operatively.

Andrew *et al.* [4] again emphasized on the importance of the tumor size and duration of symptoms as prognostic indicators for visual status post operatively, in addition to another important factor in his study which is the tumor location. . He found that patients with tumors affecting the optic canal had severe unilateral visual loss more often than those with tumors at other sites. Tumors limited to the tuberculum sellae were most often completely resected; postoperative recovery of vision was also most frequent in patients with tumors at this

site. Tumors involving the diaphragma sellae or the medial sphenoid wing were least often completely removed and most likely to be associated with postoperative visual deterioration.

Gregorius FK *et al.*[28] found that lengthy duration of acuity loss and severe visual deficit did not preclude postoperative recovery of vision. Improvement in sight most frequently occurred within the first several weeks after operation, and further return of vision was not noted after 1 year.

CONCLUSION

Suprasellar meningiomas should be resected early in their course in patients presenting with symptoms of optic chiasm compression.

Although there is still a debate regarding considering the duration of symptoms and the size of the tumors as the only predicting factors for visual outcome post operatively, it was found that better visual outcome postoperatively was favorably affected by a tumor size of 3 cm or less, and duration of symptoms of one year or less.

Thus, both factors can allow for objective evaluation of postoperative visual outcome.

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تأثير حجم الورم ومدة الأعراض علي النتائج البصري بعد العمليات الميكروسكوبية

لمعالجة الأورام اللحمية الفوق سرجية

المخص العربي

تمت هذه الدراسة علي 13 مريض يعانون من الأورام اللحمية الفوق سرجية . تناول البحث دراسة الأشعات ، وكذلك مقارنة الحالة البصرية قبل وبعد إجراء الجراحة مع التركيز علي مدة الأعراض قبل العملية وكذلك حجم الورم.

جاءت النتائج تؤكد أن التحسن في الحالة البصرية للمرضي بعد العمليات الجراحية كان تفضيلاً مع الأورام الأقل من 3 سم حجماً وكذلك لمدة أعراض أقل من عام ، عن هؤلاء الذين يعانون من نفس الأورام ولكن لمدة أعراض تزيد عن عام وكذلك عن هؤلاء الذين يعانون من أورام أكبر من 3 سم حجماً.