The Further Surgical Experiences in Intracranial Meningiomas at Songklanagarind Hospital

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Abstract

Meningioma is a common benign intracranial tumor documented in many reports. We retrospectively reviewed 81 patients with a total of 84 meningiomas. There were 61 females and 20 males. Most patients were in the third to sixth decades of life. The most common presenting symptoms were headache and decreased visual acuity. Focal neurological deficits and signs of increased intracranial pressure were found in most patients. The three most common tumor locations were falx and parasagittal, sphenoid wing and convexity. Of the 84 meningiomas, 67 were completely resected and 17 were partially resected. Operative morbidities were accounted for by hemiparesis, cranial nerve palsy and infection. There was only one operative death in our series. 70 patients had normal and good results, 4 patients had severe disabilities and results were unknown in 6 patients. Recurrences were detected in 8 patients and 5 patients underwent surgery again with good results in 4 patients. Recurrences occurred in 3 patients with total and 5 patients with subtotal resections. The most significant factor for recurrence was the extent of tumor resection.

Meningiomas have been recognized by neurosurgeons for a long time. Cushing first called this tumor a meningioma and found that it derived from arachnoid cap cells[1]. Surgical removal of meningiomas has been attempted for a long time. In 1743, Quensay, a French surgeon, attempted surgical removal of an intracranial meningioma but the patient developed infection and died[1]. On June 1, 1885, Francesco Durante of Rome operated successfully on a left olfactory groove meningioma. This patient, however, died from a second operation performed when the tumor recurred 12 years after the first operation[1,2]. Robert F. Weir, an American, was the first surgeon to attempt the complete removal of a meningioma on March 9, 1887. Unfortunately, this patient died 11 hours after the operation due to uncontrolled bleeding[1,3]. The first successful, complete removal of a meningioma was by William W. Keen on December 15, 1887. The patient survived for 35 years and 45

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days and no tumor was presented upon autopsy (1,3,4). In the past, the major cause of operative mortality was uncontrolled bleeding but now meticulous operative technique and anesthesia technique have produced good outcome. The main objective of our report is to relay our experiences with the surgical management of intracranial meningiomas at Songklanagarind Hospital of Thailand. The present study involves more cases than the 1990 report(5) and might be the basis for future research and developments in this field.

MATERIAL AND METHOD

Eighty-one patients diagnosed with intracranial meningiomas were surgically treated at Songklanagarind Hospital between October 1984 and April 1996. Clinical information was obtained from a review of patient records, operative notes, outpatient records and films. Histological reports were confirmed in all cases. Atypical and malignant meningiomas were excluded from this report. We retrospectively reviewed data about age, sex, presenting symptoms, physical examinations, tumor location, extention of resection, morbidity and mortality and follow-up evaluation. An operative approach was standardly used and not described in detail here. The extent of surgical resection was divided into 2 categories: total or complete removal and subtotal or partial removal. The total removal meant all of the tumor, involved dura and bone were removed. Subtotal removal meant at least 70 per cent of the tumor was removed. The results were defined in 4 categories: normal, good, severe disability and death. Normal results meant the patient had no neurological deficit. Good results meant there was some neurological deficit but the patient could help himself very well. Severe disability meant the patient could not help himself at all. Patients were followed-up in the out patient department at regular intervals.

RESULTS

Between October, 1984 and April, 1996, 536 primary brain tumors were treated surgically at Songklanagarind Hospital, meningiomas composed 15.67 per cent of these tumors. The most common brain tumor diagnosed at our hospital was glioma (31 per cent). We operated on 84 meningiomas in 81 patients. Three of the patients had two meningiomas. There were 61 females and 20 males with a female to male ratio of 3:1 (Fig. 1). 68 patients were in the third to sixth decades. Mean age of all patients was 47.84 years. Mean age of the female group was slightly higher than the male

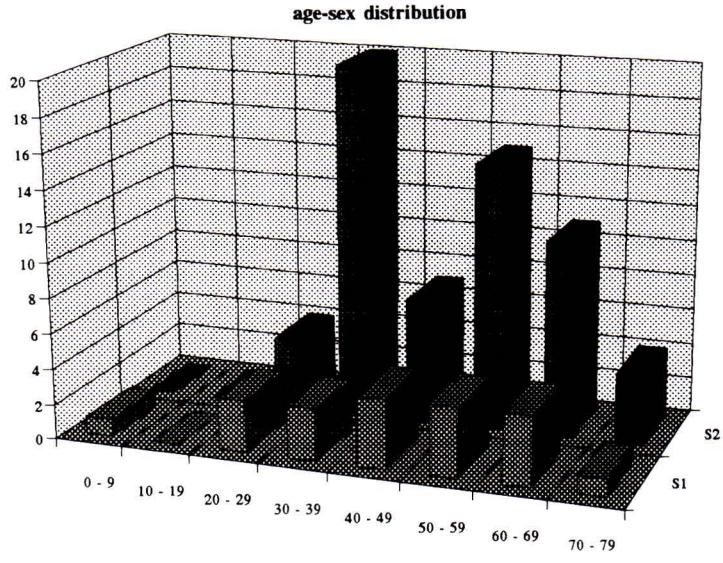

Fig. 1. Age & sex distribution.
S1 : male
S2 : female

group (48.48 years *vs* 45.9 years). The youngest patient was a 5 year-old boy with a sphenoid wing meningioma and the oldest was a 78 year-old woman with a convexity meningioma.

The most common presenting symptoms were headache, decreased visual acuity, seizure and motor weakness (Table 1). Physical examinations revealed motor weakness, papilledema and decreased visual acuity (Table 2). 6 patients had a normal physical exam and presented only with headache or seizure. Their tumors consisted of 3 falx and parasagittal, 1 olfactory groove, 1 middle fossa and 1 tentorial meningioma. All of these tumors were successfully removed with good results. The three most common tumor locations in this study were falx and parasagittal, sphenoid wing and convexity (Tables 3 & 5).

Of the 84 meningiomas, 67 were completely resected and 17 were partially resected (Table 3). Operative morbidity was recorded in 30 patients such as hemiparesis, cranial nerve palsy and infection (Table 4). There was only 1 operative mortality in our series. She was a 49 year-old with an olfactory groove meningioma who presented with decreased visual acuity. Physical examination revealed Foster-Kennedy Syndrome. This patient died 1 month after surgery from sepsis and a large cerebral infarction from tearing of the internal carotid artery during total tumor removal. Another patient died from metastatic CA breast 84 months after total removal of a parasagittal meningioma. At that time, she had no signs of recurrence.

Table 1. Presenting symptoms.

Presenting symptom	Number
Headache	39
Decreased VA	26
Seizure	15
Motor weakness	15
Decreased consciousness	8
Proptosis	7
Dysphasia, aphasia	2
Anosmia	1
Abnormal behavior	1
Ataxia	1
Pneumonia	1
Total	118

Table 2. Physical examinations.

Physical examination	Number
Motor weakness	32
Papilledema	27
Decreased VA	27
Cranial nerve palsy	13
Optic atrophy	7
Decreased consciousness	7
Proptosis	6
Normal	6
Foster-kennedy syndrome	5
VF defect	5
Dysphasia, aphasia	4
CBL sign	3
Sensory deficit	2
Total	144

Table 3. Site distributions & extention of resections.

Sites	Number	Males	Females	Total	Subtotal
Falx&parasagittal	20	5	15	19	1
Sphenoid wing	17	5	12	12	5
Convexity	16	5	11	15	1
Olfactory groove	10	2	8	9	1
Sellar, clinoidal	8	0	8	5	3
Petroclival	4	1	3	0	4
Foramen magnum	2	0	2	1	1
Tentorial	2	0	2	1	1
Diploe enplaque	1	1	0	1	0
Intraventricular	1	0	1	1	0
Middle fossa	1	0	1	1	0
CBL convexity	1	1	0	1	0
Intraorbital	1	1	0	1	0
Total	84	21	63	67	17

Table 4. Operative morbidity in 30 patients.

Operative morbidity	Number
Hemiparesis	7
Infection, meningitis	6
Hematoma	5
Seizure	4
Cranial nerve palsy	4
Wound dehiscene & infection	3
CSF leakage	2
Tear ICA	1
Subgaleal collection	1
Aphasia	1
VF defect	1
Electrolyte imbalance	1
Total	36

59 patients were followed-up in the out-patient department from 1-137 months with a mean time of follow-up of 35.7 months. 24 patients were followed less than 1 year. 6 patients were lost to follow-up and, as a result, not evaluated. 16 patients were evaluated before they were discharged from the hospital. These patients were evaluated as follows,11 patients, normal; 3 patients, good and 2 patients, severe disability. The results of treatment were normal in 48 patients and good in 22 patients (Fig. 2). Four patients which were right parasagittal, convexity, olfactory groove and petroclival meningiomas had severe disabilities. Three of these four cases had a postoperative hematoma which required immediate evacuation.

Table 5 Common location of meningiomas compare with other literatures.

Location	Cushing et al (3)	Adegbite et al (10)	Mirimanof et al (11)	Chan et al (13)	MacCarty et al (18)	Ojemann et al (19)	Kallio et al (20)	Present study
Falx&parasagittal	65	23	38	80	582	28	255	20
Convexity	54	24	47	53	247	51	209	16
Sphenoid wing	53	27	36	35	357	31	211	17
Olfactory groove	19	8	22	20	105	-	169*	10
Suprasellar	18	8	28	12	180	18		8
Posterior fossa	23	9	31	41	190	27	92	8**
Diploe-enplaque	-	-	-	-	-	-	-	1
Other	-	15	23	16	-	-	-	4
Total	252	114	225	257	1,661	155	935	84

* include olfactory groove and suprasellar meningiomas
** include - 4 petroclival meningiomas
- 2 foramen magnum meningiomas
- 1 tentorial meningioma
- 1 cerebellar convexity meningioma

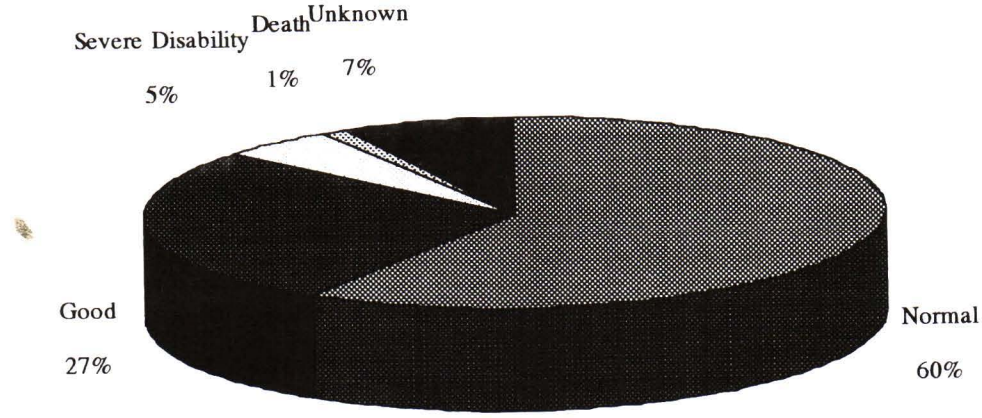

Fig. 2. Result of treatment.

The other causes of disability were hydrocephalus and pneumonia in 1 case and a difficult tumor location in 1 case. These patients were older than the mean age. It is interesting that all of them had operative morbidity.

Recurrences were detected in 8 patients (9.52 per cent). 4.48 per cent of these cases had a total excision (3/67 patients) and 29.4 per cent had a partial excision (5/17 patients). These cases consisted of 2 sphenoid wing, 2 olfactory groove, 2 petroclival, 1 frontal diploe enplaque and 1 foramen magnum meningioma. Five of them had a second operation with good and normal results in 4 patients and one resulting in severe disability. The 3 patients not having a second operation were 1 sphenoid wing, 1 olfactory groove & 1 petroclival meningioma. The patient with the olfactory groove meningioma was evaluated as having a good result but the other two were lost to follow-up. Most of the patients in this study returned to work.

DISCUSSION

Meningioma is one of the most common benign intracranial tumors. It may be found at autopsy as an incidental tumor in approximately 30 per cent of cases[6]. The incidence of meningioma is between 13.4 and 20 per cent[3,6-11]. Kuratsu et al reported a higher incidence of meningioma (31 per cent), which is the most common brain tumor in the southern part of Japan[12]. Meningiomas represented 15.67 per cent of all 536 intracranial tumors treated surgically at our hospital. This incidence is not different from other literature[3,6-11]. Most of our patients were in the third to sixth decades of life with mean age of 47.84 years. This age was slightly lower than other literature[10,13,14]. The female to male ratio was 3:1 which was slightly higher than other literature[9-11,13,14,16,17]. The three most common locations in our series were falx and parasagittal, sphenoid wing and convexity which is not different from other literature[3,10,11,13,18-20] (Table 5).

The extent of tumor resection is the most important factor in predicting tumor recurrence. Recurrence in patients who underwent a total resection was lower than recurrence patients receiving partial resection[11,13,21]. Recurrences occurred in 9.52 per cent of all meningiomas we treated surgically. The recurrence rate in patients with complete resection was 4.48 per cent. The recurrence rate (29.4 per cent) in patients with a partial resection was much higher. This rate, however, was lower than the rate reported in existing literature[13] possibly because our series had a smaller case number and shorter follow-up time. Of the 8 recurrent meningiomas, we operated on 5 patients because of increasing focal neurological deficits and increased intracranial pressure. Four of them had good results. Second operations in our hospital had good results. In the other 3 patients, we did not operate because one was lost to follow-up, one was evaluated as having severe disablity and one was evaluated as being in good condition. All of these patients did not want another operation.

The most significant factor on recurrence is the extent of tumor resection. The location of the tumor can influence recurrence by limiting the extent of tumor resection[22]. In our series, total tumor removal was achieved in 67 meningiomas. We had many cases with a difficult approach, such as medial sphenoid wing, tuberculum sellae, petroclival, olfactory groove and foramen magnum. These tumors adhered to or involved vital structures such as the internal carotid artery, cavernous sinus, cranial nerve and brainstem, so total removal was not possible without risking severe neurological deficit[14,17,23,24]. The other factors that may limit the extention of tumor removal were the surgeon's experience and skill, inadequate intraoperative monitoring and operative instrumentations. Skull base technique such as petrosal approach[15,24,25] was useful in petroclival meningiomas. We successfully removed petroclival meningiomas using this approach.

Postoperative irradiation showed a high tumor control rate in patients who could not have a total resection[26,27]. Radiation therapy for partially resected meningiomas was effective and safe[27]. Stereotactic radiosurgery was an alternative therapy[26]. In our series, we did not routinely use radiation in patients with a subtotal resection because we thought a second operation was more effective treatment.

In our series, there were normal results in 48 patients and good results in 22 patients. These patients had complete and partial tumor removal. Total removal should not be done if some part of the tumors adhere or involve vital structures. We had 4 patients evaluated who had severe disabilities. We found that all of them were older in age and had operative morbidity such as intracranial hematoma, hydrocephalus, infection, difficult tumor

and poor preoperative condition. If we can reduce operative morbidity, we might improve our outcome. Chan et al[13] discussed prognostic factors in patients with intracranial meningiomas. These factors included preoperative patient condition, location, size, degree of tumor removal, tumor histology and effect of various therapeutic modalities. Our report supports this report.

The mortality in our series was 1.23 per cent which is lower than other literature[10,13,20]. This rate might be due to our careful evaluation of patients, use of appropriate instrumentation and good surgical skill. We will try to keep this rate as long as possible.

SUMMARY

Meningiomas at Songklanagarind Hospital are not different when compared to the published literature. We have more experience and improved instrumentation than when our previous report was published. Morbidity and mortality were low. However, most of the tumors in our series were so large that total removal was difficult. Early detection of focal neurological deficits and signs of increased intracranial pressure might be useful for patient outcome. Early treatment of small tumors may lead to lower morbidity and mortality. Total tumor removal is the first goal for meningioma treatment but this might not be possible if some part of the tumor adheres or involves vital structures. Postoperative irradiation might be useful in these cases. The most significant factor for tumor recurrence is the extent of tumor resection but other factors may influence tumor resection also, such as tumor location, inadequate intraoperative monitoring, instrumentation and surgeon's experience. Results may be improved and recurrence of this tumor may be lower than in this report.

(Received for publication on April 28, 1997)

REFERRENCES

1. Nayef RF, Al-Rodhan, Laws ER. Meningioma : A history study of the tumor and its surgical management. Neurosurgery 1990; 26: 832-47.
2. Cushing H, Eisenhardt L. Meningiomas : Their classification, regional behavior, life history and surgical end result. New York : Hafner Publishing Company, 1962: 56-73, 737-42.
3. Weir B. The American Centennial of Brain Tumor Surgery. Neurosurgery 1988; 22: 986-93.
4. Black PM. Meningiomas. Neurosurgery 1993; 32: 643 - 57.
5. Pheunpathom N, Ratanalert S, Chonchitnant N. The surgical treatment of intracranial meningiomas at Songklanagarind Hospital. J Med Assoc Thai 1990; 7: 366-9.
6. McDermott MW, Wilson CB. Meningiomas. In : Youmans JR, ed. Neurological Surgery 4th ed. California : W.B. Saunder Company, 1996 ; Vol 4 : 2782-825.
7. Rachlin JR, Rosenblum ML. Etiology and Biology of Meningiomas. In: Al-Mefty O, ed. Meningiomas. New York : Raven Press, 1991: 27-35.
8. Zulch KJ. Brain Tumors. Their biology and pathology. 3rd ed. Berlin : Springer-Verlag, 1986: 357-65.
9. DeMonte F, Al-Mefty O. meningiomas. In : Kaye AH, ed. Brain Tumors, An Encyclopedic Approach. Edinburgh : Churchill Livingstone, 1995: 675-704.
10. Adegbite AB, Khan MI, Kenneth WE Paine, Tan LK. The recurrence of intracranial meningiomas after surgical treatment. J Neurosurg 1983; 58: 51-6.
11. Mirimanoff RO, Dororetz DE, Linggood RM, Ojemann RG, Martusa RL. Meningioma: analysis of recurrence and progression following neurosurgical resection. J Neurosurg 1985; 62: 18-24.
12. Kuratsu JI, Ushio Y. Epidemiological study of primary intracranial tumors: a regional survey in Kumamoto Prefecture in the southern part of Japan. J Neurosurg 1996; 84: 946-50.
13. Chan RC, Thompson GB. Morbidity, mortality, and quality of life following surgery for intracranial meningiomas. J Neurosurg 1984; 60: 52-60.
14. DeMonte F, Smith HK, Al-Mefty O. Outcome of aggressive removal of cavernous meningiomas. J Neurosurg 1994; 81: 245-51.
15. Samii M, Ammirati M, Mahran A, Bini W, Sepehrnia A. Surgery of petroclival meningiomas: Report of 24 cases. Neurosurgery 1989; 24: 12-7.
16. Haddad G, Al-Mefty O. Meningiomas : an Overview. In : Wilkin RH, Rengachary SS, eds. Neurosurgery. New York : McGraw-Hill, 1996: 833-41.

17. Mayberg MR, Symon L. Meningiomas of the clival and apical petrous bone. J Neurosurg 1986; 65: 160-7.
18. MacCarty CS, Piepgras DG, Ebersold MJ. Meningeal tumors of the brain. In : Youmans JR, ed. Neurological Surgery. 2nd ed. Philadelphia : W.B. Saunder, 1982: 2936-66.
19. Ojemann RG. Meningiomas : Clinical feature and surgical management. In : Wilkins RH, Rengachary SS, eds. Neurosurgery. Newyork: McGraw-Hill. 1985: 635-54.
20. Kallio M, Sankila R, Hakulinen T, Jaaskelainen. Factor affecting operative and excess long-term mortality in 935 patients with intracranial meningioma. Neurosurgery 1992; 31: 2-12.
21. Simpson D. The recurrence of intracranial meningiomas after surgical treatment. J Neurol Neurosurg Psychiatry 1957; 20: 22-39.
22. Mathiesen T, Lindquist C, Kihlstrom L, Karlsson B. Recurrence of cranial base meningiomas. Neurosurgery 1996; 39: 2-9.
23. Knosp E, Perneczky A, Koos WT, Fries G, Matula C. Meningiomas of the space of the cavernous sinus. Neurosurgery 1996; 38: 434-44.
24. Kawase T, Shiobara R, Toya S. Anterior transpetrosal - trans tentorial approach for sphenopetroclival meningiomas: Surgical method and results in 10 patients. Neurosurgery 1991; 28: 869-76.
25 Couldwell WT, Fukushima T, Giannotta SL, Weiss MH. Petroclival meningioma: surgical experience in 109 cases. J Neurosurg 1996; 84: 20-8.
26 Lunsford LD. Contemporary management of meningiomas:radiation therapy as as adjuvant and radiosurgery as an alternative to surgical removal? J Neurosurg 1994; 80: 187-90.
27 Goldsmith BJ, Wara WM, Wilson CB, Larson DA. Postoperative irradiation for subtotally resected meningiomas. J Neurosurg 1994; 80: 195-201.

การผ่าตัดเมนิงจิโอมาในกระโหลกศีรษะ : ประสบการณ์เพิ่มเติมที่โรงพยาบาลสงขลานครินทร์

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เนื้องอกของเยื่อหุ้มสมอง Meningioma เป็นเนื้องอกที่พบได้บ่อยในรายงานทั่วไป คณะผู้ศึกษาได้รวบรวมผู้ป่วย 81 ราย มีเนื้องอก Meningioma ทั้งสิ้น 84 ก้อน เป็นผู้หญิง 61 ราย และผู้ชาย 20 ราย มักพบในช่วงอายุ 30–70 ปี ส่วนใหญ่มักมาพบแพทย์ด้วยอาการปวดศีรษะและมีความผิดปกติของการมองเห็น อาการที่ตรวจพบส่วนใหญ่จะมีความผิดปกติทางระบบประสาทและมีภาวะความดันในกะโหลกศีรษะเพิ่มขึ้น ตำแหน่งที่พบบ่อยได้แก่ falx and parasagittal, sphenoid wing และ convexity จากจำนวนเนื้องอกทั้งสิ้น 84 ก้อน สามารถผ่าตัดออกได้ทั้งหมดเป็นจำนวน 67 ก้อน ที่เหลืออีก 17 ก้อน สามารถตัดออกได้เพียงบางส่วน ภาวะแทรกซ้อนที่เกิดขึ้นได้แก่ แขนขาอ่อนแรง, เส้นประสาทสมองถูกกระทบกระเทือน และ การติดเชื้อ เป็นต้น มีผู้ป่วยที่เสียชีวิตจากการผ่าตัดเพียง 1 รายเท่านั้น สรุปผลการรักษา พบว่าคนไข้ 70 ราย ได้ผลการรักษา ดีหรือเป็นปกติ มีคนไข้ 4 รายที่ต้องทุพพลภาพ และอีก 6 ราย ไม่สามารถติดตามผลการรักษาได้ สามารถตรวจพบเนื้องอกที่เกิดขึ้นใหม่ได้ในคนไข้ 8 รายซึ่ง 5 รายได้รับการผ่าตัดเนื้องอกออกเพียงบางส่วน และ 3 ราย ได้รับการผ่าตัดเนื้องอกออกทั้งหมด ในจำนวน 8 รายนี้มี 5 รายได้รับการผ่าตัดเนื้องอกซ้ำและได้ผลดีในคนไข้ 4 ราย พบว่าปัจจัยที่มีผลต่อการเกิดซ้ำของเนื้องอก meningioma ที่สำคัญที่สุดคือ ปริมาณการผ่าตัดเอาเนื้องอกออก

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