Received: 05.08.2010 / **Accepted:** 30.05.2011
DOI: 10.5137/1019-5149.JTN.3518-10.2

Spinal Meningiomas: Recurrence in Ventrally Located Individuals on Long-Term Follow-Up; A Review of 46 Operated Cases

Spinal Meningiomlar: Ventral Lokalizasyonlarda Uzun Dönemde Görülen Rekürrens; Opere Edilen 46 Olgunun Retrospektif İncelemesi

Lutfu POSTALCI[1], Bekir TUGCU[1], Abuzer GUNGOR[1], Gucluhan GUCLU[2]

[1]Bakırkoy Psychiatric Hospital, Department of Neurosurgery, Istanbul, Turkey
[2]Bakırkoy Sadi Konuk Hospital, Department of Neurosurgery, Istanbul, Turkey

Correspondence address: Lutfu POSTALCI / E-mail: postalcil@hotmail.com

ABSTRACT

AIM: Surgical removal of spinal meningiomas is usually not difficult. In neurosurgical practice, their locations and growing patterns may affect surgical results. Ventrally located and en plaque meningiomas may not be removed totally. The aim of this study was to present the results of surgery in cases with spinal meningiomas, and reveal the factors affecting outcome.

MATERIAL and METHODS: There were 46 cases operated between January 1995 and December 2009 in single clinic. There were 33 female and 13 male patients. The mean age was 52. All patients underwent microsurgical resection using posterior approach.

RESULTS: Total resection was obtained in 38 patients (82%). Twenty-eight (61%) patients experienced clinical improvement after surgery. The tumor was completely dorsal to the spinal cord in 30 cases, dorsolateral in nine and ventral to the spinal cord in seven cases. We experienced eight recurrences (17%). Recurrences were seen most commonly seen in ventrally located tumors (62%).

CONCLUSION: Complete resection of spinal meningiomas seems to produce a good clinical outcome. Recently, advances in microneurosurgery and neuroimaging techniques have resulted in decreases in morbidity and recurrence rates in spinal meningiomas.

KEYWORDS: Meningiomas, Outcome, Recurrence, Spinal meningioma, Spinal tumours, Surgery

ÖZ

AMAÇ: Spinal meningiomların cerrahi tedavisi genellikle zor değildir. Nöröşirürji pratiğinde bu lezyonların büyüme şekli ve lokalizasyonları cerrahi sonuçları etkileyebilir. Ventral yerleşimli olan ve en plak meningiomlar total olarak çıkarılamayabilir. Bu çalışmanın amacı spinal meningiomlu olgularda cerrahi sonuçları sunmak, izlemde ve rekürrenste etkili olabilen faktörleri incelemektir.

YÖNTEM ve GEREÇLER: Ocak 1995- Aralık 2009 tarihleri arasında tek bir klinikte opere olmuş 46 olgu incelendi. Olguların 33'ü kadın 13'ü erkekti ve yaş ortalaması 52 idi. Tüm hastalara posterior yaklaşım ile mikrocerrahi rezeksiyon yapıldı.

BULGULAR: 38 hastada (%82) total rezeksiyon sağlandı. 28 hastada (%61) cerrahi sonrası klinik düzelme gözlendi. 30 olguda tumor tümü ile spinal kordun dorsalinde yerleşimli idi. 8 olguda (%17) cerrahi sonrası tumor tekrarladı. Rekürrens en çok ventral yerleşimli tümörlerde izlendi (%62).

SONUÇ: Spinal meningiomalarda total rezeksiyon, iyi klinik sonuç ile ilintili gözlenmektedir. Son zamanlarda, mikrocerrahi ve görüntüleme tekniklerindeki gelişmelerin ışığında spinal meningiomlarda düşük morbidite ve rekürrens oranları sağlanabilmektedir.

ANAHTAR SÖZCÜKLER: Meningiomlar, Sonuç, Rekürrens, Spinal meningioma, Spinal tümörler

INTRODUCTION

Spinal meningiomas are relatively rare compared to the intracranial compartment accounting for approximately 1.2% of all meningiomas of the central nervous system. They are mostly located in the intradural compartment, generally respecting the pial layer of the spinal cord. Spinal meningiomas are almost always adherent to the inner layer of the dura. Isolated extradural spinal meningiomas are rare (13,14,15). These tumours can be removed with a low morbidity.

Spinal meningiomas are more common in elderly patients (2). The symptoms change in a high range like local pain and evidence of a myelopathy. However, for a large number of patients, diagnosis is not confirmed until gait disturbance or motor weakness is present. Total resection of a spinal meningioma is usually not difficult, but if the tumour is located

ventral to the spinal cord and calcified, surgery becomes more difficult. As with intracranial meningiomas, the extent of the resection is the most important factor determining the recurrence rate in spinal meningiomas.

In this study, the results of the surgical treatment of 46 patients were reviewed. Special consideration was given to the factors affecting postoperative outcome and recurrence rate.

PATIENTS and METHODS

A total of 46 patients who were referred to our clinic and underwent surgical resection between 1995 and 2009 were retrospectively analyzed. Clinical presentations, the micro neurosurgical technique that was used and the outcome were analyzed. There were 33 female patients (72%) and 13 male patients (28%). The age of patients ranged from 17 to 76 years with a mean age of 52 years. The patients' pre- and postoperative neurological states were classified according to the Frankel scale in order to achieve a grading of functional disturbance of activities and gait disturbance. Most of the operations (40/46) were performed using a microsurgical technique and when necessary a surgical aspirator (Cavitron Ultrasonic Surgical Aspirator). Posterior approaches were performed in all patients. Total removal of tumour was aimed and often possible. Tumour resections were evaluated with Simpson's classification. The resection of the involved dura or the attachment of the tumour was also performed if the tumour location was convenient. The dura was closed in most of the patients with primary sutures and repaired with autogenous graft.

Mean duration of follow-up is 60 months. Patients were followed up both clinically and radiologically. Thirteen cases were not available for assessment of results after 5 years from operation due to lost from follow-up (Figure 1A-D).

RESULTS

Motor weakness of the lower extremities and hypoesthesia were the predominant symptoms in the majority of cases (36 patients, 78%). Dorsal pain was the first sign in forty patients (87%). Bladder and sphincter disturbances were found in four patients (9 %). Four patients had no complaint due to spinal meningioma (9%), (Table I).

Four cases' (9 %) spinal meningiomas were located at the cervical spine, thirty-nine (84%) at the thoracic spine and three (7%) at the lumbar spine. Two cases had an extradural component (9%). Tumour location was completely dorsal in 30 (65%), dorsolateral in nine (20%), and ventral in seven cases (15%).

Surgical treatment was almost always performed in the prone position except in two cases located in the upper cervicothoracic region. Laminectomy or hemilaminectomy were performed to access the tumour. Reconstruction of the posterior spinal column with osteoplastic laminatomy or stabilization was not needed in any patient.

In 38 patients (82%) the spinal meningioma was resected completely (Simpson's grade 1 or 2), and in eight patients (18 %) was resected incompletely (Simpson grade 3 and 4) (Table II). The dural attachment was not resected if the spinal meningioma was located ventrally. These lesions were extensively coagulated with bipolar forceps. The locations of incompletely resected cases were as follows: five (63%) cases were located anteriorly and three (37%) cases anterolaterally.

Surgical results showed improvement in 28 patients (61%), for 14 patients (30%) there were no change and deterioration were seen due to surgical trauma in four patients (9%). The preoperative and postoperative Frankel grades were shown in Table III. These results were observed in early postoperative period.

Recurrences occurred due to tumour regrowth in all cases that were resected incompletely during the first surgery. There were eight recurrences (17%) after the first surgery, including five recurrences that were located ventrally and three anterolaterally located. Tumour recurrence showed

Table I: Relationship Between Tumour Localization and Symptoms in Spinal Meningiomas

Symptom	Dorsal	Dorsolateral	Ventral	Total
Pain	29	5	6	40
Motor and sensory deficits	27	4	5	36
Sphincter problems	-	2	2	4
No symptom	1	2	1	4

Table II: Relationship Between Tumour Localization and Extent of Resection Based on the Sympson Grading

	Simpson Grade				
Tumour localization	1	2	3	4	Total
Dorsal	28	1	1	-	30
Ventral	-	1	4	2	7
Lateral	6	2	-	1	9
Total	34	4	5	3	46

Table III: Pre- and Postoperative Neurological Status According to the Frankel Classification

Preoperative \ Postoperative	A	B	C	D	E
A	-	-	-	-	-
B		1	-	-	-
C	-		4	3	-
D	-	-	2	1	25
E	-	-	-	2	8

The Frankel classification: A: *complete paralysis,* ***B:*** *sensory function only below level,* ***C:*** *incomplete motor function below level,* ***D:*** *fair to good motor function below level,* ***E:*** *normal function.*

Figure 1: A 37-year-old lady with dorsal pain and sensorial deficit four years after her first operation. Preoperative (**A and B**) and after second operation (**C and D**) MR images of meningioma located ventral to the spinal cord at the level of thoracal 11.

correlation with the localization of the lesion. There were five recurrences among seven ventrally located tumours (71%), three recurrences among nine laterally located tumours (33%). There was no recurrence among 30 dorsally located tumours (0%). On the other hand, all tumour recurrence occurred in incompletely resected cases (100%). There was no recurrence in completely resected tumours. A second operation was performed for seven patients whereas no surgical procedure was planned for a 72-year-old lady in poor medical condition.

Major complications were seen in seven cases as (15%) transient neurological deficits in four (8%) cases, and cerebrospinal fluid fistula in three (7%) cases.

Histological examination of the specimen confirmed a grade 1 meningioma according to WHO classification in 44 patients and an atypical meningioma grade 2 in two patients. Histological examination also confirmed grade 1 tumours in recurrent cases.

DISCUSSION

Meningiomas are benign tumours arising from arachnoid cells and mostly located in the intracranial compartment. Extradural meningiomas without an intradural component are rare (5,11). Two cases in this series (4,3%) had both extradural and intradural component. The rate of extradural meningiomas is reported as 3.5-15% in the literature. Spinal meningiomas represent about 1.2% of all meningiomas and 25% of primary spinal cord tumours (3, 12, 13, and 14). The female to male ratio has been reported as 5:1 and 4:1 (4,7,9). In our series this ratio is 2.5 to 1.

In the current series, spinal meningiomas are most prevalent in the thoracic region, followed by the cervical region. (4,10). 84% of our cases were thoracic, 9% cervical and 7% lumbar. The ratio between thoracic and cervical location has been reported as 8:1 in spinal meningiomas in the literature (9). This ratio is 10:1 in our series. Among thoracic meningiomas, lower thoracic locations were predominated (24 of 39).

Pain had been reported as the most common sign in the recent series (1,11,12,13). In our series 87% of patients had dorsal pain whereas paraparesis was the predominant symptom (78%). It has usually been confused because the neurological impairment of spinal meningiomas is very similar to that seen in degenerative spinal disorders. Although even unspecific symptoms such as local pain are now routinely investigated by colleagues in our country, 9% of patients in our series had no complaint due to spinal meningiomas and were incidentally diagnosed.

The rate of motor deficits as the presenting symptom (78%) was higher in the present series with compared with Solero's series (2) who reported a rate of only 25% but in accordance with Sandalcioglu's series (84%) (8).

The functional results of surgically treated spinal meningiomas are generally good. In our series the outcome was improved in 61 %, unchanged in 30 % at the time of last follow up.

Resectability of spinal meningiomas is generally related to tumour location with respect to the spinal cord. In contrast to cerebral meningiomas, resection of the dural attachment is less radical and not routinely performed in spinal meningiomas. Infiltrating and en plaque meningiomas in the spinal cord may be adherent to the spinal cord. Complete resection may be prevented in such a situation.

Dural reconstruction ventral to the spinal cord is difficult and tumour resection and subsequent bipolar coagulation is considered to be adequate and effective in many cases.

In our series, the rate of complete resection of spinal meningiomas was 82%. This rate is in accordance with the literature (82 and 98%) (5,6,11,13).

The late recurrence rate was reported to be 4% by Levy (15), and 1.3% by Solero (13). Excision of the dural margin is actually not possible in all cases, in contrast to simply cauterizing the margins, is associated with lower recurrence rate (4-8% to 0-5.6%) according to Roux and Levy (9,11). In the current series, we experienced eight recurrences (17%) and five of them were localized ventrally and removed subtotally (Simpson grade 4), observed in the early postoperative period and thought to be residual tumour. Late recurrences were seen in 3 cases (6%) after 5 years of follow up. Higher recurrence rates will probably be observed in spinal meningiomas that were removed subtotally in studies with larger series and longer periods.

There has been no convincing data in the literature to show any clear relationship between the tumour localization and tumour resection amount, as well as a relation between the tumour localization and recurrence rates (13). The results of the current study showed that complete resection is more difficult when the tumour is located ventrally and ventrolaterally than dorsally located cases. Our results also demonstrated recurrence in all incompletely resected cases.

The role of radiotherapy in the treatment of spinal meningioma remains controversial because of the potential damage caused by radiation (16). Although total removal of the tumour by microsurgery is the best favorable treatment for a spinal meningioma, some authors suggested that radiotherapy should be considered as an adjunctive treatment after subtotal excision (5,10). We did not give any adjuvant therapy for recurrent cases. Therefore, we did not recommend radiotherapy even in incompletely resected cases. We also did not apply radiotherapy in grade 2 meningiomas.

The best option for anterior or anterolateral meningiomas alternative approaches such as lateral extracavitary or anterior approach may be used.

REFERENCES

1. Albanese V, Platania N: Spinal intradural extamedullary tumours. Personal experience. J Neurosurg Sci 46: 18-24, 2002
2. Cohen-Gadol AA, Zikel OM, Koch CA, Scheithauer BW, Krauss WE: Spinal meningiomas in patients younger than 50 years of age: A 21-year experience. J Neurosurg 98:258-263, 2003

3. Cushing H, Eisenhardt L: Meningiomas:their classification, regional behavoir, life history and surgical and results. Springfield IL, Charles C. Thomas,1938, p.735
4. Deen HG, Scheithauer BW: Clinical and pathological study of meningiomas of the first two decades of life. J Neurosurg 56: 317-322, 1982
5. Gezen F, Kahraman S, Canakci Z, Beduk A : Review of 36 cases of spinal meningioma. Spine 25: 727-731, 2000
6. Gottfried ON, Gluf W, Quinones-Hinojosa A, Kan P, Schmidt MH: Spinal meningiomas: Surgical management and outcome. Neurosurg Focus 14:e2, 2003
7. Henderson BE, Ross RK, Pike MC: Endogenous hormones as a major factor in cancer. Cancer Res 42: 3232-3239, 1982
8. Klekamp J, Samii M: Surgery of spinal tumours; Springer-Verleg-Berlin, Heidelberg: 248-260, 2007
9. Levy WJ, Bay J, Dohn D: Spinal cord menengioma. J Neurosurg 57:804-812, 1982
10. Mirimanoff RO, Dosretz DE, Lingood RM, Ojemann RG, Martuza RL: Meningioma: Analysis of recurrence and progression following neurosurgical resection. J Neurosurg 62:18-24,1985
11. Roux FX, Nataf F, Pinaudeau M, Borne G, Devaux B, Meder JF: Intraspinal meningiomas: Review of 54 cases with discussion of poor prognosis factors and modern therapeutic management. Surg Neurol 46:458-463: discussion 463-464, 1996
12. Sandalcıoğlu I E, Hunold A, Müller O, Bassiouni H, Stolke D, Asgari S: Spinal meningiomas: Critical review of 131 surgically treated patients. Eur Spine J 17:1035-1041, 2008
13. Solero CL, Fornari M, Giombini S, Lasio G, Oliveri G, Cimino C, Pluchino P: Spinal meningiomas: Review of 174 operated cases. Neurosurgery 25:153-60, 1989
14. Souweidane NM, Benjamin V: Spinal cord meningiomas. Neurosurgery Clinics of North America 5(2):283-291,1994
15. Weil SM,Gewirtz RJ, Tew JM: Concurrent intradural and extradural meningiomas of cervical spine. Neurosurgery 27:629-630, 1990
16. Yoon SH, Chung CK, Jahng TA: Surgical outcome of spinal canal meningiomas. J Korean Neurosurg Soc 42:300-304, 2007