



Clinico-epidemiological profile of spinal meningioma

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Abstract

The aim of the study is to find out the access of clinico-epidemiological profile of spinal meningioma, this study was conducted in Sheri- Kashmir Institute of Medical Sciences Soura Srinagar, a tertiary care hospital in Jammu and Kashmir, India. This was a prospective and retrospective study which stretched over a span of approximately 10 years from August 2009 to July 2017 retrospectively and August 2017 to July 2019 prospectively. The study included all patients of spinal meningioma. The patients were evaluated by history, clinical examination, biochemical evaluation and radiological studies. The study found that the spinal meningioma is a slow growing tumor, duration of symptoms before diagnosis is long. Age of presentation is usually between 4th-5th decade with female to male ratio of 2:1. Pain is the commonest symptom at presentation. Surgery is mainstay treatment which may cause complications.

Keywords: clinico-epidemiological, spinal meningioma, SKIMS, Patients

Introduction

Spinal meningiomas are tumors originating from arachnoid cap cells most commonly situated in the intradural extramedullary region. They represent a high proportion of all spinal cord tumors. Spinal meningiomas tend to predominate in the thoracic region, although they are described in the cervical, lumbar, and rarely the sacral area. They pose varying surgical challenges based on their regional location, as well as their anterior/posterior orientation to the spinal cord and cauda equina. Intradural extramedullary spinal cord tumors account for approximately two-thirds of all spinal cord tumors in adults. Meningiomas, neurofibromas, and schwannomas are the most common type of tumor in this type of location. Meningiomas represent about 40% of these tumors. The vast majority of spinal cord meningiomas are located in the thoracic region. This predominance of thoracic located meningiomas is seen only in females. Spinal meningiomas occur about 2.5 times more often in females than males; with approximately 75-85% arising in women. Overall, spinal meningiomas account for about 7.5-12.7% of all meningiomas, occurring with less frequency than their intracranial counterpart. Most spinal cord meningiomas are located laterally. They typically arise from arachnoid cap cells embedded in the dural root sleeve. They can also arise from pial or dural fibroblasts. This may be accounted for by their mesodermal origin. MRI is the imaging modality of choice since it often delineates the characteristic dural origin of meningiomas. They are typically isointense or hypointense to gray matter on T1, and isointense or hyperintense on T2. Intraspinous meningiomas radiographically display avid homogenous enhancement with contrast. Enhancement of the adjacent dura, or dural tail, is also characteristic of a meningioma. CT scan will often demonstrate a calcified lesion in the spinal canal. More commonly, spinal meningiomas are grossly smooth and fibrous, or fleshy with friable features. Clinically, intraspinal meningiomas may have

varying presentations depending on where they are located along the spinal axis. Craniocervical junction and high cervical junction meningiomas typically present with some degree of myelopathic features and suboccipital pain. They may also cause atrophy of intrinsic hand muscles. Spinal tumors in general may cause a dull ache, and may also cause radicular symptoms if a nerve root is involved. Bowel and bladder involvement may be a late manifestation. A common complaint of patients with extramedullary meningiomas is pain with recumbancy. Microdissection and resection of spinal meningiomas remains the gold standard for treatment. Traditionally, a posterior or posterolateral approach has been employed for cervical meningiomas, whether they are predominantly located dorsally, laterally, or even ventrally. Cervical meningiomas often can be a surgical challenge, as they are more often situated anterior to the spinal cord, as opposed to thoracic meningiomas which have a predilection for more posterior and lateral locations. On rare occasion, a spinal meningioma may present as a dumbbell tumor, which has the appearance of a nerve sheath tumor. In order to resect this type of tumor, the nerve root at the level affected is typically sacrificed with minimal neurological sequelae. The exceedingly rare intramedullary meningioma has been treated using surgical cordectomy as the operative technique. Although uncommon, meningiomas have been described in the lumbosacral spine. Multiple spinal meningiomas are a relatively rare occurrence, especially outside the association with NF2. Treatment options for multiple spinal meningiomas must be tailored to their locations and the symptoms they are causing, as well as the pre-morbid condition of the patient. Meningiomas causing significant myelopathic or radiculopathic features should be treated, as opposed to watchful waiting. The patients may encounter various complications after surgery like CSF leak, wound infection, bladder/bowel dysfunction. The risk of complications is more

in case of elderly patients and patients with comorbidities. Surgery should be the mainstay of treatment for symptomatic multiple spinal meningiomas, although radiation treatment may play a role as well. Adjunctive radiation therapy is considered primarily in cases of subtotal resection of recurrent meningiomas and/or when the risk of surgery is too high given the patient's comorbidities or tumor location. The use of radiosurgery and adjunctive radiation therapy for the treatment of craniovertebral and spinal meningiomas is an evolving topic. The Department of Neurosurgery at Sheri-Kashmir Institute of Medical Sciences (SKIMS) has been managing spinal cord and spinal column tumors since 1982. It is well equipped and state of art centre for spinal cord tumor management.

Aims and Objectives

The aims and objectives of this study were:

1. To determine the demographic profile of Spinal meningiomas at SKIMS.
2. To assess the clinical and radiological findings.
3. To assess various modes of management, outcome and complications.

Material and Methodology

This study was conducted in Sheri- Kashmir Institute of Medical Sciences Soura Srinagar, a tertiary care hospital in Jammu and Kashmir, India. This was a prospective and retrospective study which stretched over a span of approximately 10 years from august 2009 to July 2017 retrospectively and August 2017 to July 2019 prospectively. The study included all patients of spinal meningioma. The patients were evaluated by history, clinical examination, biochemical evaluation and radiological studies. History included age, sex, symptoms (pain, numbness, swelling, bowel dysfunction, urinary symptoms, and weakness in legs), duration of symptoms, any associated comorbidity or malignancy and past surgical history. The clinical examination included general physical examination, systemic examination (chest/ CVS/ abdominal/ detailed neurological examination) and local examination. The examination was followed up by biochemical and hematological investigations. This was followed by radiological examination which includes plain x-ray of spine, CT scan which showed features of calcification in some patients. Then patients were subjected to MRI which showed characteristic features of spinal meningioma. The surgical interventions included laminectomy with gross total or subtotal of tumor by posterior approach. The patients were assessed for postoperative complication which include CSF leak, wound infection etc. The duration of hospital stay was calculated from date of surgery to date of discharge. The patients were followed up on outpatient basis for recurrence and metastasis. The patients with recurrence were subjected to re-operation or radiation therapy depending on disease status (locally recurrent or metastatic). The department of Neurosurgery, SKIMS has been managing all the spinal tumors surgically with the adjuvant support of all other sister departments.

Observations and Results

Table 1: Age distribution of study population

Age (Years)	N	%
0-9	0	0
10-18	2	9.09
19-30	1	4.54
31-40	3	13.63
41-50	9	40.90
51-60	5	22.72
61-70	1	4.54
71-80	1	4.54
Total	22	100
Mean	44 Years.	
Range	16-70 Years.	

Table 1 shows the age distribution of patients in study. Mean age was 44 years. Youngest patient was 16 years and eldest was 70 years. Maximum number of patients (40.90 %) belonged to 41 - 50 age group, followed by 22.72% patients in age group of 51 - 60.

Table 2: Gender Distribution

Gender	N	%
Male	7	31.81
Female	15	68.18

Table 2 depicts that out of 22 patients 15 (68.18%) were females and 7 (31.81%) were males with a female to male ratio of 2.1:1.

Table 3: Symptomatology

Symptoms	N	%
Pain	17	77.27
Weakness of legs	14	63.63
Swelling	3	13.63
Bowel dysfunction	6	27.27
Bladder symptoms	4	18.18
Mean duration of symptoms	20 months	

Table 3 shows symptomatology of the patients and the most common symptom was pain in 17 (77%) patients followed by weakness in 14 (63%) patients, followed by bladder dysfunction in 6 (27%).

Table 4: Neurological Grade (Power)

Neurological grade	N	%
Grade III/IV	13	59
Grade V	9	41

Table 4 shows that normal power (grade V) was present in 9 (41%) patients whereas power was decreased (grade III/IV) in 13 (59 %) patients.

Table 5: Location of tumor

Site/ Location	N	%
Cervical	01	4.54
Cervicothoracic	04	18.18
Thoracic	15	68.18
Thoraco Lumbar	02	09

Table 5 shows location of tumor in our study and tumor was thoracic in 15 (68%), cervicothoracic in 4 (18%), thoracolumbar in 2 (9%) and cervical in 1 (4.54%) of patients.

Table 6: Type of Approach

Type of Approach	N	%
Anterior	2	9
Posterior	20	91

Table 6 shows the type of surgical approach used for the excision of spinal meningioma. In our study most of the patients (91%) were operated by posterior approach. Anterior approach was used only in 2 patients.

Table 7: Size of Tumor (cm)

Tumor size	N	%
Number of Patients having size of Tumor < 2 cm	5	22.72
Number of Patients having size > 2 cm	17	77.27
Range of tumor size		1-4 cm
Mean greatest diameter		2.9 cm

Table 7 shows the tumor size of patients. In our study, 22.72% of the patients had tumor size less than 2 cm whereas in 77.27% patients tumor size was greater than 2 cm. Size of tumor ranged from 1 to 4 cm and mean greatest diameter was 2.9 cm.

Table 8: Postoperative complications

Complications	Number of Patients(N)	%
CSF leak	01	4.54
Wound infection	01	4.54
Total patients having complication	02	9
Total patients without complication	20	91

Table 8 depicts that in our study out of 22 patients 2 had postoperative complications with overall complication rate of 9.09 % which included complication in individual patients as CSF leak in 4.54%, wound infection in 4.54%. 91% of patients had no complication.

Table 9: Duration of hospital stay

Duration of hospital stay	No. of patients	Percentage
0-5 days	3	13.63
5-10 days	8	36.36
10-15 days	5	22.72
15-20 days	4	18.18
20-25 days	1	4.54
25-30 days	0	0
30-35 days	0	0
35-40 days	1	4.54
	Total=22	100

The duration of hospital stays between surgery and discharge from the hospital.

Out of 22 patients 13.63% patients had postoperative stay in hospital for 0-5 days, 36.36% patients had hospital stay for 5-10 days, 22.72% patients had stay in hospital for 10-15 days, 18.18% had stay in hospital for 15-20 days, 4.54% had stay in hospital for 20-25 days and 4.54% had hospital stay for 35-40 days and Range was between 5 - 40 days and mean duration of hospital stay was 11 days as shown in table 9.

Table 10: Local Recurrence

	N	%
Recurrence	02	9
No Recurrence	20	91

Table 10 shows local recurrence of the disease was found in 2 (9%) out of 22 patients after a period of 5 year after surgery and within 7 years of follow up.

Table 11: Adjuvant Therapy

Adjuvant therapy	N	%
Given	1	5
Not Given	21	95

Table 11 shows adjuvant therapy in the form of radiotherapy was given in 1 (4.54%) out of 22 patients.

Mean age of presentation

Spinal meningiomas are slow growing tumors. Most cases are seen in 4th to 5th decade of life. In our study the mean age of presentation was 44 years. Youngest patient was 16 years and eldest was 70 years old. Maximum number of patients belonged to 40-50 age group. Levy WJ *et al* in their study published in 1982 described mean age of 53 years [4]. G Iacob in study published in 2014 found mean age of 54 yrs.

Male: Female Ratio (sex)

In our study there were 22 patients of spinal meningioma. Out of 22 patients 7 were males and 15 were females. The female to male ratio in our study was 2:1. Many investigators have reported a higher prevalence of women in their series. Gezen F *et al* in their study found female to male ratio of 3:1. Namer IJ *et al* in their study published in 1987 had 29 patients with 22 females and 7 males with F:M ratio of approx 3:1. Roux FX *et al* in their study had 54 patients with 43 females and 11 males with F: M ratio of 3.9:1. It has been suggested that spinal meningioma occurs more frequently in fertile women, because of the possible dependency of these tumors on sex steroid hormones.

Symptomatology

In our study pain or low back ache was predominant symptom which was present in 17(77.27%). This corresponds to other studies which describe the most common symptom pain or low back ache. The other symptoms found were weakness and/ numbness in legs (63.63%), swelling (13.63%), bowel dysfunction (27.27%) and bladder symptoms (18.18%). Namer IJ *et al* in their study in 1987 described, Pain was the presenting symptom in all patients. Calogero JA in his study published in 1972 described pain was the commonest presenting symptom.

Duration of symptoms

The mean duration of symptoms from onset to presentation in Spinal meningioma is usually long. In our study the mean duration of symptoms between the onset of symptoms and presentation was 20 months. Levy WJ *et al* in their study described mean duration of symptoms 23 months. Riad *et al*. stated the clinical symptom formation range to be between 12-24 months and average complaint period to be 13.7 months.

Surgical treatment and approaches

Microdissection and resection of spinal meningiomas remains the gold standard for treatment. The only reasonable treatment method is laminectomy with complete excision of tumor. In our study the surgical procedure mostly used was tumor resection by posterior approach 20 patients (91%) had complete excision of tumor. Only 2(9%) patients had subtotal excision of tumor. The rate of total tumor resection was reported by Levy *et al* as 82%, by Roux *et al* as 92.6%, and by Solero *et al* as 97%. There were some technical difficulties of tumor resection especially because of location ventral to the cord, although even in those cases resection of the tumor can be performed with a careful microsurgical technique. Recent neuroradiologic and neurosurgical techniques have improved results of the surgical treatment of spinal tumors. The postoperative results varied according to preoperative neurologic status, the nature and location of tumor, and type of surgical resection. Some authors believed that epidural meningiomas and meningiomas located close to a radicomedullary artery may represent surgical challenges. It was thought that spinal meningiomas with epidural extension exhibited a more rapid clinical course and were more invasive. Others argued that these lesions did not represent a unique subgroup and had an indolent course. Roux, *et al* asserted that total resection of spinal meningiomas in proximity to a radicomedullary artery feeding the anterior spinal artery was dangerous, and they advocated the use of spinal angiography in all patients.

Tumor size and location

Spinal meningioma is most commonly seen in the thoracic region. In our study the location of tumor was thoracic in 15 (68.18%) and cervicothoracic in 4(18.18%) thoracolumbar in 2(9%) and cervical in 1(4.54%) of patients. This corresponds to the studies published in literature. Namer IJ *et al* in 1987 reported 29 patients of spinal meningiomas in whom 19 lesions were located in the thoracic regions and 10 involved the cervical region. Gezen F *et al* reported, 55% of tumors were located in the thoracic region. The incidence of thoracic location was reported by Levy *et al* as 75%, and by Roux *et al* as 79.5%. In our study the size of tumor ranged from 1 to 4 cm and mean greatest diameter was 2.9 cm. The tumor was greater than 2 cm in 17 (77.27%) of patients and less than 2 cm in 5 (22.72%) of patients. Namer IJ *et al* noted the size of the excised tumors varied between 1 x 1 cm and 4.5 x 1.5 cm.

Postoperative complications

In our study out of 22 patients only two patients (9.09%) had postoperative complications which included CSF leak in 1 patient and wound infection in 1 patient. Gezen F *et al* noted postoperative complications in three patients, including one with cerebrospinal fluid leakage and two with wound infection. Namer IJ *et al* noted postoperative complications in 7 patients

with wound infection in 2 patients (7%) pulmonary infection in one patient (4%); urinary infection in one patient (4%), haematemesis in one patient (4%) and thrombophlebitis in one patient (4%). One patient died on the 11th postoperative day. Gottfried ON *et al* noted the incidence of CSF leakage was low (0–4%).

Duration of hospital stay

In our study the mean duration of hospital stay postoperatively was 11 days. The duration of hospital stay was taken from day of surgery today of discharge. The patients with postoperative complications had more hospital stay. The hospital stay duration ranged from 5 days to 40 days.

Recurrence

Recurrence of spinal meningiomas is rare, and in most series the rate ranged from 1.3 to 6.4% [3-5, 9, 37]. Ketter, *et al* [38] reported that spinal meningiomas did not have the genetic abnormalities found in recurrent intracranial meningiomas, suggesting that they had a more indolent nature. The slow growth of spinal meningiomas and their presentation in patients at a late age contributed to the low recurrence rates [37]. In our study only 2(9%) patients were observed to have recurrence. The recurrence in the patient who underwent subtotal resection took place after 5 years. The tumor that was totally resected was observed to recur in 7 years. Only a few long term studies of spinal meningioma including the rate of late recurrences have been reported to date. The late recurrence rate was reported by Levy *et al* [4] as 4% and by Solero *et al* [5] as 1.3%. Mirimanoff *et al* [31] reported that after a total resection, the recurrence-free rates in 5, 10, and 15 years, were 93%, 80%, and 68%, respectively, whereas, after a subtotal resection, the progression-free rate was only 63%, 45%, and 9% during the same periods

Adjuvant therapy

Although the acceptable treatment method for spinal meningioma is total removal of the tumor by microsurgery. Mirimanoff *et al* [31] suggested that radiotherapy should be considered as an adjunctive treatment after subtotal excision. Radiotherapy can also control unexcised or recurrent meningioma. The role of radiotherapy in the treatment of spinal meningioma is still a controversial subject because of the indolent nature of the disease and potential damage due to radiation. Gezen *et al* [9] reported no recurrence in the two patients who underwent radiotherapy for recurrent spinal meningioma. Roux, *et al* [3] also performed radiosurgery in two patients with recurrences, and the patients were stable at a follow-up examination after 5 years. The authors recommend radiotherapy in the following cases: early recurrence after total or subtotal resection, when total resection cannot be performed because of tumor location or the patient's medical condition, and when there is high medical risk in surgical treatment. Reoperation should be performed in the case of early recurrence followed by radiotherapy. In our study adjuvant therapy in the form of radiotherapy was given in 1 patient who had recurrence of lesion after 5 years.

Conclusion

This study showed that Spinal meningioma is slow growing tumor, duration of symptoms before diagnosis is usually long,

age of presentation is usually between 4th - 5th decade with female to male ratio of 2:1. Pain is the commonest symptom at presentation. CT scan and MRI are radiological investigations which give presumptive diagnosis of Spinal meningioma which is confirmed by histopathological examination. Surgery is mainstay treatment which may be complicated by postoperative complications like wound infection, CSF leak or bowel or bladder dysfunction etc. Adjuvant therapy in the form of radiotherapy can be given for recurrence or advanced disease as palliation.

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