ORIGINAL ARTICLE

Spinal Tumours: - Experience at Mayo Hospital

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ABSTRACT

Objective: *Spinal tumours are mostly benign, having devastating effects on patients in terms of patient's disability, morbidity and mortality. Depending upon their site, size and growth potential, they have different clinical effects on the patients. We are presenting a case series of 138 patients managed in neurosurgery department Mayo hospital from Nov 2011 to Sept 2014.metastatic bony spinal lesions were not included in this study . The objectives of my study are to determine: Types of spinal tumours treated in this setting. Common and differentiating clinical features among subjects, different locations of the same types and the role of microsurgery.*

Materials and Methods: *It is a retrospective study. 55 Schawanomas, 34 Menengiomas, 15 Ependimomas, 06 Dermoids, 17 Astrocytomas, 07 Plasmacytomas, 02 Aneurysm bone cyst and 02 Teratomas were managed surgically. Schwanoma and meningioma's prevalence was more in cervical and dorsal areas. plasmacytomas mainly affected dorsal spine, astrocytomas and ependymomas hade different locations. Teratomas occupied conus medullaris. Multiple laminectomies and laminotomies were performed according to situation. Radical resections for intradural extramedullary and gross total debulking for intramedullary lesions, under high resolution Microscope was done. Post operative improvements and complications were noted.*

Results: *A radical resection of these tumors results in a good long-term outcome, since the majority is histologically benign. For intradural intramedullary tumours gross total debulking is more appropriate. Adjuvant radiation therapy should only be administered for the high grade or malignant tumor. Malignant tumors have a dismal outcome and surgery in these patients should be a conservative debulking. Open door laminotomies are preferable in intradural extramedulary lesions and does not cause post op spinal deformity.*

Conclusion: *Radical surgery for spinal tumors with laminotomies gives good results in terms of patient's functionality and spinal stability.*

Keywords: *Intradural extramedullary, Intramedullary, Spinal Cord tumors.*

INTRODUCTION

Intradural or primary spinal cord tumors (neoplasm) are uncommon lesions. They contribute 2% of the total CNS tumors in adults. They show a slow and progressive growth. Once achieved a significant size, compress the spinal cord, and cause pain, limb dysfunction, motor and sensation loss, and sphincter disturbances. Tumors are grossly divided in to intradural and extradural. Intra dural are further subdivided in intra medullary and extramedullary. Primary spinal tumors are typically intradural in location, where extradural spinal tumors are typically due to metastatic disease.

In 1887, Sir Victor Horsley performed the first successful resection of an intradural neoplasm. Whereas, first successful removal of an intradural intramedullary tumor was performed by Eiselsberg – Renzi, in 1907. With the advancement in radiological diagnostic tools and use of modern high resolution Microscopes and other modalities like CUSA, good bipolar diathermies and evocked potentials, the results of spinal tumor surgery are very good as compared to past era.

The objectives of my study were to determine types of spinal tumours treated in this setting, common and differentiating clinical features among subjects,

different locations of the same types and the role of microsurgery.

MATERIALS AND METHODS

This study is retrospective containing consecutive cases which were treated in department of neurosurgery. The main mode of admission was through out – patient department but referral from medical wards and medical / surgical emergencies had also their contributions.

Total 138 patients were operated. No age and gender discrimination was done. All patients with primary intradural, intramedullary and extradural neoplasm were included, involving any region of the cord. Other patients with secondary metastatic lesions were not included in this study. Record of age, gender, first symptom, duration between onset of symptom and admission in hospital, sensory and motor deficit (MRC grading symptom) was maintained.

Baseline investigations, x-ray spine and MRI spine were done in all patients.

All patients were operated in the same settings. Laminectomies or laminotomies were performed according to situation. Microsurgical excision of the tumors was done. Post operative recovery, improvements and complications were recorded and analyzed.

RESULTS

Total 138 patients with primary spinal tumours were managed during this period. 61were male and 77 were female. Their age ranged from 15 year up to 60 year with mean age 37.5 years.

Percentage of different types of tumours (Fig. 1) shows that most common were nerve sheath tumours most of them were schwanomas 52 out of 55 and most usual site of these tumours was cervical (34) and among cervical most common root involvement was C 2 – 3. Ten were in thoracic and eleven in lumber area. Meningeomas were most common in thoracic area 30 out of 34 but 04 were in cervical area. Ependymomas were mainly at conus medullaris level (11 out of 15) the other 4 were in lower thoracic area.Seven of the astracytoma tumors were in cervical area and the others in dorso-lumber area.

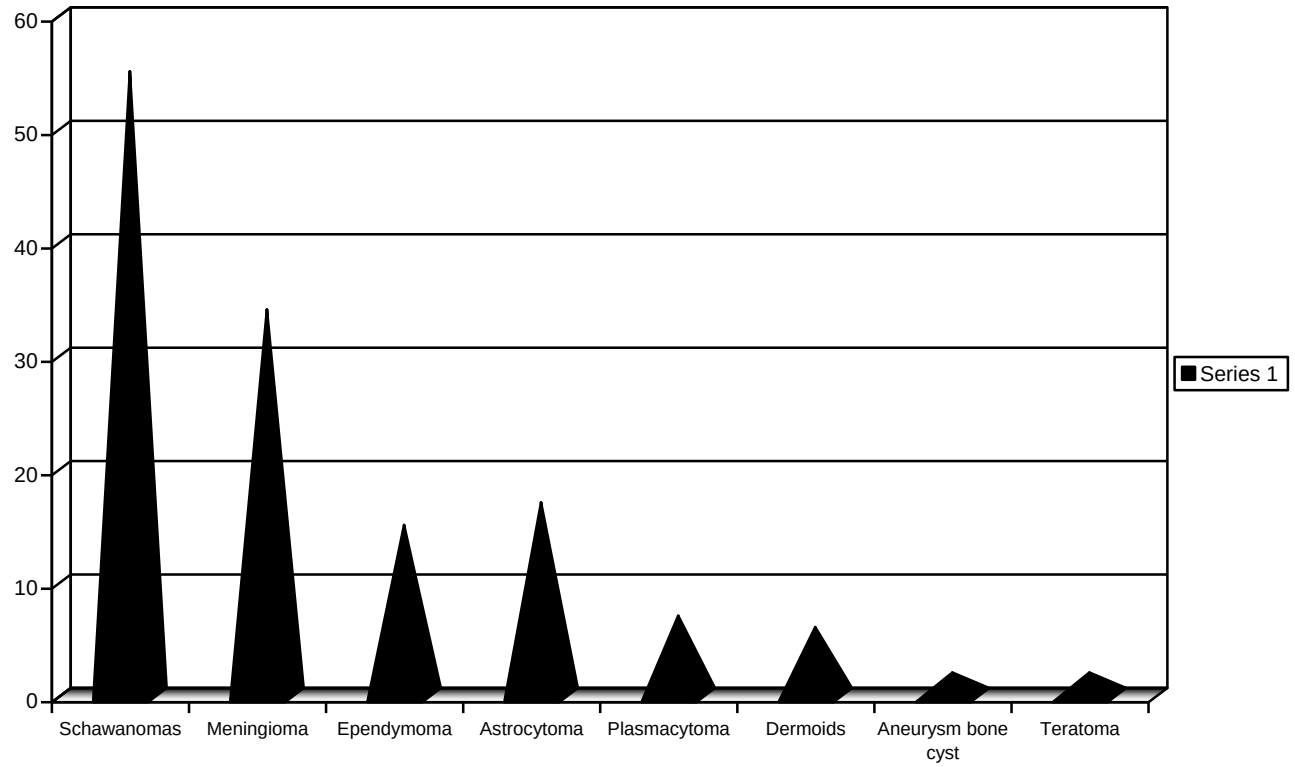

Fig. 1: *Types of Tumors.*

Table 1: *Age wise Distribution.*

Age in Years	Nerve sheath tumours	Menengioma	Ependymoma	Dermoids	Astrocytoma	Teratoma	Aneurysm bone cyst	Plasmacytoma	Total n=138
15 – 20	11	03			01				15
20 – 30	37	04	07	02	03				53
30 – 40	06	17	03		03		02	04	35
40 – 50	01	08	02	04	01	02		03	21
50 – 60		02	03		09				14

Two teratomas were at conus medullaris level and one in dorsal area. All plasmacytomas were dorsal. Although maximum tumors were in dorsal area but maximum verity was in lumber areas.

Most of our patients were in their 3rd and 4th decade of life (Table 1). The tumour of younger age group was nerve sheath tumours. Another observation was that maximum number of patients came to us in middle age and this age group carried almost all variety of tumours.

Table 2: *Percentage of different types of spinal tumours.*

Type of tumour	No. of Cases	Percentage
Nerve sheath tumours	55	39.85%
Menengiomas	34	24.63%
Ependymomas	15	10.86%
Astrocytoma	17	12.31%
Teratomas	2	1.44%
Dermoid	6	4.34%
Plasmacytomas	7	5.07%
Aneurysm bone cyst	2	1.44%
Total	138	

Male female ratio was 1:1.5. Common tumors among female were menengiomas and nerve sheath tumours. Among male, rare tumors like teratoma and plasmacytomas were more common. The nerve sheath tumours were the commonest and common in younger age group in male s and females. One of the female with quadriparesis and cervical schawanoma was 6 month pregnant. Common tumours were common in females and rare ones etc, like teratoma, plasmacytoma in males.

Table 3: *Area distribution of different spinal tumours.*

Type of Tumuor	Cervical	Thoracic	Lumber
Nerve sheath tumor	34	10	11
Menengioma	4	30	
Ependymoma		4	11
Astrocytoma	7	10	
Teratoma			2
Dermoid		2	4
Aneurymal bone cyst		2	
plasmasytoma		7	
Total	45	65	28

According to our preoperative observation we had to deviate from classical classification as some tumours were not clearly intramedullary and likewise some tumours were not clearly intradural.

Most common symptoms were pain, sensory deficit, motor weakness, spasticity and sphincter problems but nerve sheath tumors had sensory abnormalities as first symptom followed by pain and motor weakness. Sphincter problems were last in nerve sheath tumours.

In all other tumours pain and motor deficit were most common first presenting complaints.

The duration between onset of symptom and admission varied in different tumours but a common feature was that patients presented very late, minimum duration was in a female with schawanoma who presented within 6 months of onset of symptom. Maximum duration was 132 months with astrocytoma, this patient had dysaesthesias but pain was the

Table 4: *Sex Distribution.*

Type of tumour	Nerve sheath tumours	Menengiomas	Ependymomas	Glial tumours	Teratoma	Plasmacytoma	Dermoid	Aneurysmal bone cyst	Total
Male 61	25	9	8	8	2	5	2		59
Female 77	30	25	7	9		2	4	2	79

Table 5:-*Motor power.*

Motor Power	Nerve sheath tumours	Menengiomas	Ependymomas	Astrocytomas	Dermoids	Teratoma	Aneurysmal bone cysts	Plasmacytoma	Total	
Above 3/5	14	05	11	8	2	1	1	6	48	29%
2/5 and below	41	29	4	9	4	1	1	1	90	71%

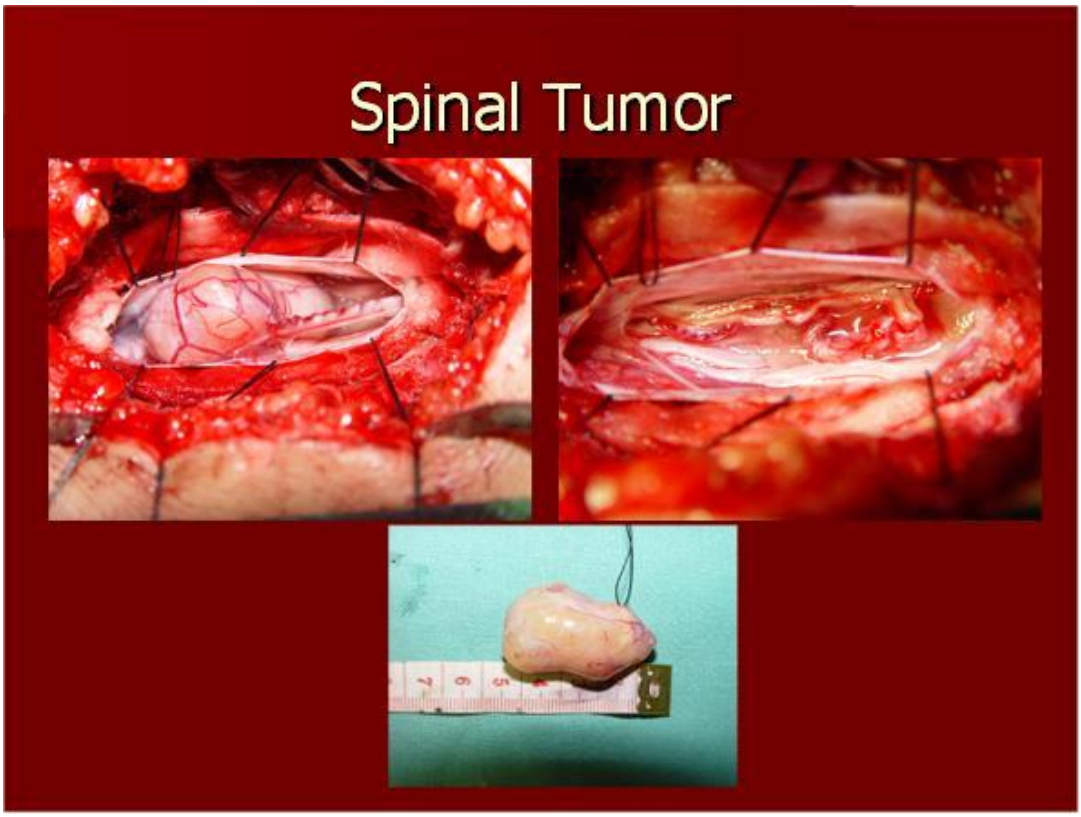

Fig. 2:

triggering factor for seeking help. Usually patients present after 24 month of onset of symptoms.

Probably due to late presentation most of the patients were severely disabled, 66% of the patients had motor power (according to MRC grading) 2/5 or below that. Other features associated with that were pain, spasticity and urinary retention. Among the patients with motor power 3/5 or above, most common were with schawannomas and those who presented earlier.

MRI was adopted as primary diagnostic tool. T_1W, T_2W and gadolinium enhanced images were taken. MRI proved itself to be the investigation of choice as it specified the exact location of the tumour and gives the best guess about its nature. In plasmacytoma x-rays spine was indicating factor and MRI gave more conformation.

Fig. 3:

After preoperative fitness and informed consent, all patients were operated on elective list. Laminectomy up to two levels was adopted in 79 cases to reach the dura. Laminotomies were done with high speed drill, 1 mm cutting burr, for multiple levels in 59 cases, mainly with intradural extramedullary lesions. Microsurgical excision was performed. The spine of patients with plasmacytoma was fixed with titanium cage from anterolateral approach.

Post operative period was smooth in most of the patients. Patients with schawanomas of cervical area were kept in ICU for first 24 hours then shifted to ward. Average surgery time was 150 minutes.

Post operative complications like CSF leakage were observed in one meningioma and in one dumbell shape neurofibroma. Wound dehiscence was observed in one plasmacytom

a. Pattern of neurological recovery was different in different types of tumours.

In extramedullary tumours patients showed early recovery. Pain was subsided in 91%of patients sensory improvement was observed in 84% of patients within 24 hours of operation. Motor power was upgraded in most of cases of extramedullady lesion. 15% Patients with intramedullary lesions had early deterioration of symptoms and motor power but it improved within 56 hours. There was no improvement in sphincter problems in 45%of patient mostly in meningiomas and tumour of lumber area.

DISCUSSION

Due to the rarity of spinal tumors, it is not easy to enroll a large enough study population to assess a surgical procedure for treating such tumors. Accordingly, there have been large time gaps among the reports and studies that involve cases collected for more than a 10 year period or the reports have been focused on an analysis of the existing literature. In other words, it is difficult to find studies that are focused on a certain radiological examination technique or a surgical procedure. The annual incidence of primary intraspinal neoplasmis approximately 5 per million for females and three per million for males.[1] Spinal intradural extramedullary tumors account for two thirds of all intraspinal neoplasms and include neuromas and meningiomas.[2] Overall, meningiomas account for 25 to 46% of primary spinal neoplasms and are the second most common intradural spine tumor after neuromas.[1] Spinal meningiomas occur less frequently than intracranial ones and account for approximately 7.5 to 12.7% of all meningiomas.[3] Spinal meningiomas most often affect middle – aged women. The female/male ratio is overrepresented compared with intracranial meningiomas. Male to female ratio in literature was reported to be between 3and 4.2:1 (mean age range

49 – 62 years). In our study male to female ratio was 1:1.5 and mean age of male and female patients was 15 – 60 years with average 37.5 years. According to the results of the study conducted in Mexico at National Institute of Rehabilitation for treating Primary intradural extramedullary tumors shows that there were 11 men and 16 women with an average age of 47.33 years.[4] Study done by Dong LQ also reported the similar trend in relation to gender and age of patients who were surgically treated for the intradural extramedullary tumor in the spinal canal.[5] It has been suggested that spinal meningiomas occur more frequently in women because of a possible dependence on sex hormones.[3,6] Although the effect of sex hormones on meningiomas is controversial, the authors of hormone studies have shown the existence of various other receptor types (steroid, peptidergic, growth factor, and aminergic) that may contribute to tumor formation.[6]

Tumor location was identified on MRI. According to MRI results 30 patients had meningioma in the dorsal region, 4 patients had tumor in their cervical region. According to a review,[7] the most frequent location of spinal meningiomas was the thoracic region (67 – 84%). They occurred far less frequently in the cervical spine (14 – 27%) and only rarely in the lumbar spine (2 – 14%). Cohen – Gadol, et al[8] found that in patients younger than 50 years of age there tended to be a higher frequency (39%) of spinal meningiomas located in the cervical spine, and the majority were located in the high cervical region. Levy, et al.,[82] reported that tumor location varied according to sex, with significantly more thoracic spine meningiomas appearing in female patients. In addition, they found that cervical meningiomas were more likely to be located ventral to the cord. Spinal meningiomas were located lateral to the spinal cord or had a component that extended laterally. A posterior location was more frequent than an anterior one. spinal meningiomas were typically intradural and extramedullary (83 – 94%).[7] Review conducted by Gottfried reported that all 25 patients harbored intradural extramedullary meningiomas, whereas in the reviewed series 5 to 14% of tumors had an extradural component. There were several cases of entirely extradural meningiomas (3 – 9%).[10,3,9,11]

Surgery is the best treatment option producing excellent overall results, with complete microsurgical excision being the modality of choice.[12,13] Modern techniques enable good surgical outcomes with minimal morbidity and mortality.[14,2,12,15] The current series corroborates this contention in that mostly Excellent or Good results were achieved with few complications. In fact, no Poor results were noted in a study conducted by Stawicki at the mean 8.5 – month follow-up.[16] Findings regarding improvement agree with those of others, with majority of clinical improvement noted either immediately or within 6 months of the operative intervention, with less notable clinical change after this initial period.[14,16] Other studies reported that duration of preoperative symptoms appears to correlate with postoperative improvement, and that successful complete microsurgical tumor excision is of utmost importance.[14,17,18] In terms of mortality other series a reported ranges between 0 – 4.4%.[14,8,19,20]

Our results regarding mortality were consistent with the reported results in literature. None of the patients had mortality after surgery. Approximately 20% of patients in this study experienced residual focal deficits, none of which were disabling. Others report similar outcomes among patients with similarities to our patient sample, with significant improvement in 62 – 88% of cases and clinical worsening in only a minority of patients (1 – 5%). Some of the patient outcomes and functional scores on discharge and / or follow-up may differ across studies because of different assessment tools being used by different authors.[14,2] In our study MRC grading of muscle power was used to see the improvement in patients. Patients were followed up till 3 month post operatively during this time span significant improvement was observed that in 60% of the patients.

Overall, functional improvement occurred in 53 to 95% of cases and neurological deterioration was demonstrated in 0 to 10%.[10,9,11] The mean follow-up intervals ranged from 20 to 180 months. In a review it was found that even patients with severe preoperative neurological deficits may experience a full neurological recovery after careful surgical interventions and appropriate rehabilitation.[10,7,9] For example, King, et al,[21] found that three of four patients with preoperative paraplegia were independently mobile and asymptomatic in the postoperative period. King, et al,[21] found that 35 (95%) of 37 patients with preoperative bladder dysfunction exhibited normal function after surgery. Some patients suffered transient neurological worsening postoperatively, typically secondary to vasogenic edema or as a result of dissection, but function generally recovered after 6 months.[10,7,9]

Surgery is the preferred treatment in cases of spinal meningiomas because of its associated excellent functional improvement and low recurrence rates. Radiosurgery should be considered for the exceptional

case involving recurrent and symptomatic spinal meningiomas.

CONCLUSIONS

Frequency and variety of spinal tumour increases with age. Patients usually present very late in all types of spinal tumours. In few cases more than 10 years. Common tumours like nerve sheath tumours and meningeomas were common in females and rare tumours were common in males. Meningiomas were commonly found in dorsal region and in middle age Nerve sheath tumours were commonly found in cervical area during 2nd and 3rd decade of life. Nerve sheath tumours were common in females and in younger age group. Males are affected more in middle age group. Laminotomy should be preferred whenever possible as it gives adequate exposure and is promising in post operative spinal stability. Microsurgical techniques are required for maximum excision of tumors and better neurological recovery.

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