Clinical profile and surgical outcome of spinal tumors at a tertiary care hospital

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Abstract

Background: Published literature on spinal cord tumors is relatively lesser compared to tumors of central nervous system. In case of spinal tumors, early diagnosis followed by surgery can bring back almost all functions of affected compared to other body organs.

Objective: To study clinical profile and surgical outcome of spinal tumors

Methods: A hospital based follow up study was carried out among 55 eligible cases of spinal tumors for three years. After recruitment, patients were operated and followed for six months at six weeks, three months and six months. At recruitment, and during follow up detailed history, thorough clinical examination was done. Samples for histopathology were sent after surgery.

Results: Females (54.5%) were more than males (45.5%). Most commonly affected age group was 40-49 years (25.5%). Most common location of spinal tumors was dorsal (50.9%). Pain was most common presenting symptoms (74.5%). Total resection was performed in 61.8% cases. Schwannoma was most common histopathology type (32.7%) followed by meningioma (21.8%). Only three cases developed complications immediately after surgery and among them; two improved at follow-up. One patient was incontinent post-operatively and continued to be same at 3 months follow-up and became continent at 6 months. One case developed urinary incontinence at 3 months and continued to be same. Overall 51 cases (85%) were absolutely normal from surgery to 6 months.

Conclusion:40-49 years of age people are commonly affected. It occurs more dorsally and presents commonly with pain. Surgical resection was successful in more than 90% of the cases.

Key words: Clinical profile, surgical outcome, spinal tumors, function, neurological deficit

Introduction

The There is lack of information on population data on spinal cord tumors. Schellinger KA et al attempted to estimate the incidence of spinal cord tumors. They searched cases of spinal cord tumors from 1998 to 2002 under the Surveillance, Epidemiology, and End Results (SEER) Program. 0.74/one lakh person years was the incidence of the spinal cord tumors; with almost similar incidence for males (0.77/100000 person-years) and for females (0.70/100000 person-years). It was highest in the age group of 75-84 years. Out of 3226 cases of spinal cord tumors, 69% were non-malignant. Meningioma was most common type in 29% of cases, 24% with nerve sheath tumors, 23% with ependymomas.[1]

As per Grimm S et al, "primary spinal cord tumors constitute about 2% to 4% of all the neoplasms of the central nervous system."[2]

Data on spinal cord tumors in India is lacking considerably. As per one small study from Northern India, of all the (N=111) spinal tumors studied over nine years; 27% were extradural, 36.1% were intradural extramedullary (IDEM), and remaining i.e. 36.9% were intramedullary spinal cord tumors (IMSCT). In IMSCT group, astrocytoma and ependymomas were the most common. In IDEM group, neurofibroma and schwanommas were the most common. Common signs and symptoms were sensory loss in 49.6%, motor weakness in 70.3%, sphincter weakness in 42.4% and pain in 41.4% cases.[3]

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Study from Japan carried out over nine years among 678 patients found that IDEM were 54.7%, IMSCT were 18.1%, epidural was 4.1%, and dumbbell were 22.9%. schwannomas predominated with 57.2% cases, followed by meningiomas in 11.6%, ependymomas in 8%, hemangioma in 4%, hemangioblastoma in 3.4%, neurofibroma in 3.4%, and astrocytoma in 1.3%.[4]

Spinal cord tumors can be broadly classified as intradural and extradural spinal cord tumors. Of these extradural spinal cord tumors (mostly metastatic) constitute 55% and remaining (45%) are intradural spinal cord tumors. Of these 45%, IDEM are 40% and 5% are IMSCT. Meningioma, schwannoma and neurofibroma are most common IDEM types while astrocytoma and ependymoma are most common IMSCT type.[5]

Meningiomas occur most commonly at 40-70 years; females are commonly affected; most common site is thoracic in 82% case. Meningiomas are completely intradural in 90% cases but may be extradural in 5% of the cases and mostly placed lateral to the spinal cord. Common motor symptoms are pyramidal signs, difficulty in walking, antigravity strength, flexion-extension with gravity removed and paralysis. Common sensory symptoms are radicular, long tract and sphincter deficit. Recurrence after complete resection is around 7%.[5]

Schwannoma are benign tumors that grow slowly with their origin from dorsal rootlets. Most common symptoms are radicular and recurrence after total excision is rare. They are composed of Antoni A "(compact, interwoven bundles of long, spindly Schwann cells)" and Antoni B "(sparse areas of Schwann cells in a loose eosinophilic matrix)" tissues[5].

Ependymoma are benign, slow growing and most commonly seen in lower spinal cord, conus and filum. Males are commonly affected and 30-60 years age group commonly affected. Filum is commonly involved in half of the cases followed by cervical location. Histologically they are papillary, cellular, epithelial or mixed. Myxopapillary ependymoma is most common in filum. Cystic degeneration is seen in 46% of cases. They are generally encapsulated and vascular supply is minimum. But papillary types may be highly vascular. In most of the cases symptoms appear after one year.[5]

Astrocytoma occur commonly in 30-50 years of age. There is slight male preponderance. Low grade type is three times more common than the high grade type. Astrocytoma can be seen at all levels but at thoracic it is more common. Most of the astrocytoma are cystic the fluid of which is rich in proteins.[5] Astrocytoma are seen as diffuse and heterogeneous mass in the spinal cord parenchyma.[6]

Most common symptom of spinal cord tumor is pain[7]. Spinal cord tumors causes compression of the spinal cord[8] and produce compression symptoms like loss of sensation, weakness of muscles, paralysis, incontinence of bladder and bowel and numbness of legs and hands.[7]

As stated above, there is lack of data on spinal cord tumors especially in country like India. Hence present study was carried out to study the clinical profile and surgical outcome of spinal cord tumors.

Methods:

Study design: Present study was hospital based follow up study

Settings: Present study was carried out at Department of Neurosurgery at a tertiary care hospital

Study period: Present study was carried out from January 2016 to December 2018

Sample size: During the study period, it was possible to include 55 cases of spinal cord tumors as per the inclusion and exclusion criteria laid down for the present study

Ethical considerations: Institutional Ethics Committee permission was obtained before the study. Informed written consent from all the eligible participants in the present study was obtained. All patients were given due follow-up and appropriate treatment as per the standard guidelines.

Inclusion criteria:

1. All cases of all ages and either sex presenting with spinal cord tumor either primary or secondary
2. Spinal cord tumors which are not recurrent and have not undergone radiotherapy
3. All such patients willing to participate

Exclusion criteria:

1. Patients not fit for the surgery during the study period
2. With severe co-morbidities like cardiac issues, bed-sores, respiratory issues

Methodology:

After Ethics clearance and after taking informed consent, eligible patients were recruited for the present study.

Demographic details like age, sex were recorded in the

pre designed, pre tested, and semi structured study questionnaire.

Clinical features pertaining to location, symptoms, and symptoms with duration, signs, and local examination findings were recorded.

All patients in the present study underwent MRI (MRI 1.5 TESLA, Contrast and plain) examination to confirm the type and extent of the spinal tumors. Pre anesthetic check-up was done and if the patient was found fit for surgery, he/she was taken for the surgery. Depending upon the lesion present, total, sub-total or near total resection of the spinal tumor was performed under general anesthesia as per the standard guidelines for resection of the spinal tumors. Extent of resection was based on type of spinal cord tumors. Complete excision was done in cases of well-defined tumors like meningioma, neurofibroma. Partial excision was done in cases where tumors was intramedullary and could not be excised completely. No neurophysiological monitoring was used.

Immediately after resection, the samples were sent to the Pathology department for histopathology examination for determining the type of the tumor. Post op MRI was done only for those patients who underwent sub-total resection.

The patients were followed up to six months after the surgery and all data pertaining to patient condition was recorded. During follow up the patient was examined immediately after surgery, at six weeks, at three months and at six months. Any complications occurring were recorded. Surgical outcome was determined on follow up based on patients able to do day to day activities and not dependent on others; leakage of CSF, power in the lower limbs, continuation of catheter for urinary incontinence. All such patients were managed appropriately from time to time as per the standard guidelines.

Statistical analysis: The data was entered in the Microsoft Excel worksheet. It was analyzed using proportions.

Results

Table 1: Distribution of study subjects as per age and sex

Age (years)	Male		Female		Total	
	Number	%	Number	%	Number	%
2-18	2	66.7	1	33.3	3	5.5
19-29	8	72.7	3	27.3	11	20
30-39	5	38.5	8	61.5	13	23.6
40-49	5	35.7	9	64.3	14	25.5
50-59	4	40	6	60	10	18.2
60 & above	1	25	3	75	4	7.3
Total	**25**	**45.5**	**30**	**54.5**	**55**	**100**

Table 1 shows distribution of study subjects as per age and sex. Females (54.5%) were more than males (45.5%). Most commonly affected age group was 40-49 years (25.5%). There was a trend seen in the age distribution. As the age increased from 2 years to 49 years, the incidence of the spinal tumors increased and then it showed the declining trend. In the younger age group of up to 29 years, males were more than females but afterwards, females preponderance increased.

Table 2: Distribution of study subjects as per location, clinical features and radiological findings

Variable		Number	%
Location (based on vertebral level)	Cervical& Cervicodorsal	8	14.5
	Dorsal	28	50.9
	Dorsolumbar& Lumbar	17	30.9
	Conus	1	1.8
	Sacrum	1	1.8
Symptoms	Low back pain and/or weakness or neck pain	41	74.5
	Urinary incontinence	5	9.1
	Spastic quadriparesis	6	10.9
	Hairy mole back with pus discharge	1	1.8
	Parasthesia	2	3.6
Signs	Straight leg rising test positive	2	3.6
	Hypertonia lower limbs	10	18.2
	Hypotonia lower limbs	4	7.3
	Radicular pain	2	3.6
	Sensory loss	19	34.5
	Decreased power	14	25.5
	Exaggerated deep tendon reflexes	4	7.3
Radiological findings	Intradural extramedullary tumors (IDEM)	39	70.9
	Intramedullary tumors	13	23.6
	Extradural tumors	3	5.5

Table 2 shows distribution of study subjects as per location, clinical features and radiological findings. The most common location of the spinal tumors was found to be dorsal in half of the cases. Pain either in the low back or neck and weakness was the most common presenting symptoms in 74.5% of the cases. Six cases presented with spastic quadriparesis. Urinary incontinence was seen in five cases. Most common sign was sensory loss in 34.5% of the cases. Most common type of spinal cord tumor on radiological finding was IDEM in 70.9% cases.

Table 3: Distribution of study subjects as per type of surgery performed on spinal tumors

Type of surgery	Number	%
Total resection	34	61.8
Near total resection	20	36.4
Sub-total resection	01	1.8
Total	55	100

Table 3 shows distribution of study subjects as per type of surgery performed on spinal tumors. All surgical procedures were done using posterior approach. Laminectomy and excision were carried out depending on the vertebral level. In 61.8% of the cases of spinal tumor total resection could be performed. In 36.4% of the cases the near total resection was performed. Sub-total resection was done in only one case.

Table 4: Distribution of study subjects as per histopathology reports

Histopathology reports	WHO grading	Number	%
Schwannoma	Not applicable	18	32.7
Meningioma	I	12	21.8
Neurofibroma	Not applicable	6	10.9
Ependymoma	II	6	10.9
Arachnoid cyst	Not applicable	4	7.3
Dermoid	Not applicable	1	1.8
B spindle cell	Not applicable	1	1.8
Mature teratoma	I	1	1.8
Neuroblastoma	I	1	1.8
MPNST	Not applicable	1	1.8
Metastasis	IV	1	1.8
Capillary hemangioblastoma	Not applicable	1	1.8
Astrocytoma	II	1	1.8
Paraganglioma	Not applicable	1	1.8
Total		55	100

Table 4 shows distribution of study subjects as per histopathology reports. Immunohistochemistry (IHC) grading was not done. World Health Organization (WHO) grading was done only for malignant tumors. Schwannoma was the most common histopathology type (32.7%) among the spinal cord tumors followed by meningioma in 21.8% of the cases. Neurofibroma, ependymona and arachnoid cyst was seen in 10.9%, 10.9% and 7.3% of cases respectively.

Table 5: Distribution of study subjects as per complications immediately (within 24 hours) after surgery

Complications	Number	%
CSF leak	1	1.8
Decreased lower limb power	1	1.8
On Foleys catheter	1	1.8
No complications	52	94.6
Total	55	100

Table 5 shows distribution of study subjects as per complications immediately (within 24 hours) after surgery. Only three cases developed complications immediately after surgery. Among them one case each of CSF Leak, Decreased lower limb power, and one case required insertion of Foleys catheter.

Discussion

Present hospital based follow-up study was carried out to study the clinical profile and surgical outcome of spinal tumors. Females (54.5%) were more than males (45.5%). Most commonly affected age group was 40-49 years (25.5%). Most common location of spinal tumors was dorsal (50.9%). Pain was most common presenting symptoms (74.5%). Total resection was performed in 61.8% cases. Schwannoma was most common histopathology type (32.7%) followed by meningioma (21.8%). Only three cases developed complications immediately after surgery and among them; two improved at follow up. One patient was incontinent post-operatively and continued to be same at 3 months follow-up and became continent at 6 months. One case developed urinary incontinence at 3 months and continued to be same till follow-up. Overall 51 cases (85%) were absolutely normal from surgery to 6 months.

Arora RK et al[3] found that the improvement rate in the functional status of the patients was 79.3% which is slightly lower than the present study (85%). Their mean follow-up period was 15.64 months compared to 18 months in the present study. Six of their cases remained worse at follow up compared to only two of our cases. In their case only one patient died while in our case two cases died.

Hirano K et al[4] studied 678 cases and noted that

males were more than females but in the present study we found that females were more than males. Schwannomas were the most common pathological diagnosis in their study followed by meningioma and this finding is similar to the finding of the present study.

Chikani MC et al[9] have found that the incidence of spinal cord tumors was 3.6% among the 472 spine procedures they performed. They noted that the age ranged from 17 to 77 years with mean of 45 years while in the present study the age range was from 2-72 years with mean of 39.8 years. They also found that females were more than males and this is consistent with the present study finding. They observed that meningioma was the most common histological diagnosis followed by schwannoma in their study but we found that schwannoma was the most common histological diagnosis followed by meningioma.

Joshi G et al[10] also noted like Chikani MC et al[9] that meningioma was the most common histological diagnosis followed by schwannoma in their study but we found that schwannoma was the most common histological diagnosis followed by meningioma. In their study, 52.6% of the cases had dorsal location which is consistent with the findings of the present study. The authors observed that the complete recovery was seen in 75% of the cases while we observed it in 85% of the cases.

Nizami FA et al[11] noted that males were more than females but we found that females were more than males. They also noted that schwannoma was the most common histological diagnosis followed by meningioma similar to the present study findings. The authors observed that the excellent outcome was present in 74% of the cases and remaining all cases had good or fair outcome. They did not report any mortality or any complications in their study.

Ozawa H et al[12] have found that 98% of all the primary spinal tumors were benign in nature. They found that the incidence of spinal tumors was 1.6 per one lakh person-years with incidence being more in males compared to females. They noted that the incidence was highest in the age group of 60-64 years while we found that maximum number of cases belonged to the age group of 40-49 years. They observed that schwannoma was the most common histological diagnosis followed by meningioma similar to the present study findings.

Engelhard HH et al[13] noticed that spinal tumors can constitute about 4.5% of all the central nervous system tumors with a mean age of 49.3 years. We found that the mean age of the patients with spinal tumor was 39.8 years in the present study. They observed that pain was the most common presenting symptom which is as per our findings. But they noticed that the most common histological diagnosis was meningioma followed by ependymoma and then schwannoma while we found that the most common histological diagnosis was schwannoma followed by meningioma.

Hsu S et al[14] used data of patients diagnosed with "primary, malignant, pathologically confirmed spinal cord gliomas" from 1973 to 2006. Highest incidence was seen in the age group of 35-49 years. We also found that highest incidence was in the age group of 40-49 years.

Jung KW et al[15] studied 3312 cases of primary spinal cord and appendage tumors. 83.4% of the cases were spinal cord tumors. 20.1% of the cases were meningioma; we also found that 21.8% of our cases were meningioma. 7.6% of cases in the author study were ependymomas while we found that they constituted 10.9% of cases in the present study.

Conclusion: Based on the findings of the present study and the review of literature, it is clear that spinal cord tumors present commonly in the age groups above 40 years of age and both sexes may be equally affected. Schwannoma and meningioma are the two most common histologic types which can be seen in spinal cord tumors. Pain is the most common presenting symptom and spinal cord tumors are commonly found to be dorsally located. Resection surgery is most useful in majority of the cases.

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