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Original Research Article

Clinical profile, management and surgical outcome of spinal cord tumors

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ABSTRACT

Background: Spinal cord tumors can result in dramatic neurological and functional disabilities in the patients. We aimed to know the incidence of different types of spinal tumors and correlation between clinical presentation and pathological findings and compare outcomes of these tumors postoperatively.
Methods: A total of 50 patients were included in the study group. After a thorough clinical evaluation, patients were subjected to a magnetic resonance imaging (MRI) and then surgery. They were described on the basis of age, sex, location of the tumor, type of the tumor, symptoms, histopathological type, surgical resection and complications.
Results: Study included 29 males and 21 females and their age ranged from 5 years to 70 years. Out of the 50 patients, 39 had intradural and 11 had extradural spinal tumors. Amongst the 39 intradural tumors, 27 were extramedullary and 12 were intramedullary in location. A predilection towards the thoracic region (44%) was seen followed by the cervical cord. The tumors were excised completely in 68% of the patients while subtotal resection was done in 18% and near total resection in 14% patients. There was significant drop in VAS score and improvement in McCormicks score at 3 months of follow up.
Conclusions: Based on this study it could be suggested that surgical excision and decompression should be attempted in all patients of intradural spinal tumor fit to undergo the procedure, as it not only helps in reaching a definitive histopathological diagnosis but also achieves neurological improvement in most patients without causing significant morbidity and mortality.

Keywords: Spinal cord tumors, Epidemiology, Pathological analysis, Outcome comparison

INTRODUCTION

Spinal cord tumors are one of the rarest tumors, comprising less than 6% of all tumors of central nervous system.[1] However, it should be noted that very few large population studies have been conducted which could measure the prevalence of these tumors. In addition, spinal cord classification can be confusing as tumor databases may use different categories than other published in literature. Briefly, these tumors are designated as intradural, contained within the thecal sac, or extradural.[2] Tumors may also involve both compartments, and extradural tumors are mostly derived from adjacent bone and connective tissue and include many bone and soft tissue sarcomas. The intraspinal tumors are almost ten times less frequent than intracranial tumors with majority of them being benign and more accessible in surgery. Spinal cord tumors can result in dramatic neurological and functional disabilities in the patients; however postoperative results are appeasing for both patients and neurosurgeons in comparisons to intracranial tumors. There is a dearth of literature which describes the prevalence of different spinal tumors in Indian patients.

Thus, the present study was aimed to describe the pattern, location, types and treatment outcomes in patients diagnosed with different spinal tumors.

METHODS

Study design and sampling

In this prospective observational study, we included 50 consecutive patients diagnosed with spinal cord tumor who were treated department of neurosurgery, Dr. D. Y. Patil Medical College and Hospital, Pune from July 2018 till December 2020. We included cases who were diagnosed with primary and secondary tumors of the spinal cord, of all cases and either gender. We excluded cases with recurrent tumors, and those who had follow up less than 2 months post-operative. Institutional ethical committee clearance was acquired prior to the start of the study. Informed written consent was obtained from the patients before enrolment in the study.

Data collection and data analysis

Using a pre-designed semi-structured study proforma, each patient's medical history, and findings of the physical examination performed in an out/in-patient department, radiological examination records were investigated. We used modified McCormicks grade to evaluate the neurological and functional status of patients.[3] Post-operative pain was assessed using Visual Analogue Scale for pain. All patients were investigated by contrast magnetic resonance imaging of the whole spine. Appropriate radiology was obtained during follow-up, as and when required, depending upon the clinical situation or to assess the extent of resection and recurrences. Descriptive analysis was performed using open source Epi Info software.

RESULTS

Study included 29 males and 21 females with age ranging from 5 years to 70 years (Table 1). Out of the 50 patients, 39 had intradural tumors and 11 had extradural spinal tumors. Amongst the 39 intradural tumors, 27 were extramedullary and 12 were intramedullary in location. Majority of the cases presented with sensorimotor symptoms and pain was the predominant clinical complaint. Sphincter involvement (bowel and bladder complaints) was noted in 15.4% of the patients with intradural and 36.4% patients with extradural lesions. The average duration of symptoms, prior to presentation and diagnosis, in this study was 9 months. A predilection towards the thoracic region (44%) was seen followed by the cervical cord. Nerve sheath tumors, meningiomas, ependymomas and astrocytomas formed 68% the tumors. Nerve sheath tumors and meningiomas were the histological type found in nearly 81.5% (22/27) of the intradural extramedullary tumors while ependymomas and astrocytomas were the pathological diagnosis in 66.6% (8/12) of the intramedullary tumors. Amongst the extradural lesions 36.3% (4/11 cases) were nerve sheath tumors while 3 cases were of metastasis (Table 2).

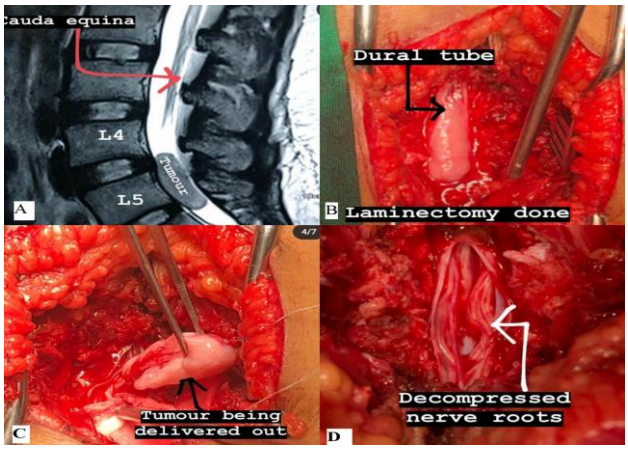

Figure 1: (A) MRI T2 weighted image of L4-L5 intradural extramedullary homogenous isointense tumor, (B) intraoperative image after laminectomy showing dural tube, (C) intraoperative image showing tumor being delivered out after doing durotomy, and (D) intraoperative image showing decompressed nerve roots.

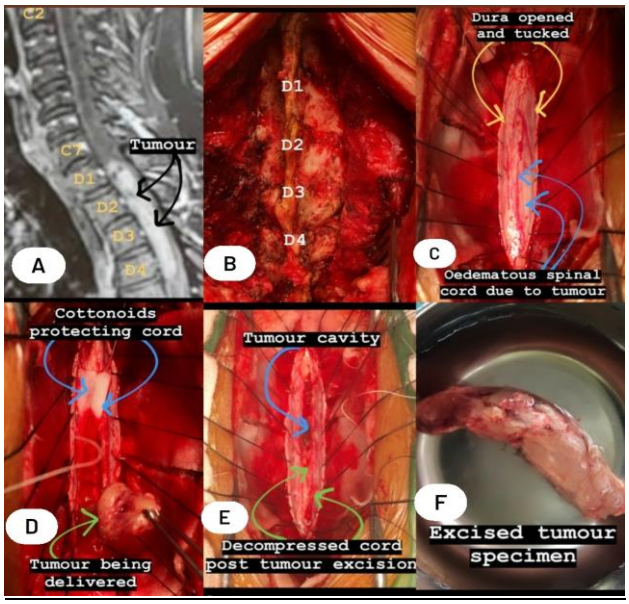

Figure 2: (A) MRI contrast image showing contrast enhancing intramedullary lesion at D1 to D4 vertebral level, (B) intraoperative image showing D1 to D4 spinous process and lamina, (C) intraoperative image after midline durotomy showing odematous spinal cord due to tumor, (D) intraoperative image showing tumor being delivered, (E) intraoperative image showing tumor cavity and decompressed cord post tumor excision, and (F) excised tumor specimen.

Single case each of hemangiopericytoma, multiple myeloma, tarlov's cyst and capillary hemangioma were seen in extradural region. On determining the sexual

predilection of individual tumors it was found that Meningioma was more frequently found in females (89%) compared to the males (11%). There was a male preponderance in the ratio of 2.4:1 amongst the nerve sheath tumors observed in this study. Most of the tumors occur in 2nd to 4th decade with gradual decline in extremes of age. In the intramedullary subgroup there was a predilection towards earlier presentation with 58.3% of the tumors occurring in the first 3 decades of life. The assessment of individual tumor occurrence in the series reveals that majority of the meningiomas and nerve sheath tumors were found in the 3rd-5th decade 5 out of 9 and 9 out of 18 cases respectively. The astrocytomas and the ependymomas on the other hand were evenly distributed in all the age groups. The metastatic tumors were seen mostly in the elderly age group with 3 of the cases being detected in patients above 45 years of age. The tumors were excised completely in 68% of the patients while subtotal resection was done in 18% and near total resection in 14% patients. There was significant drop in visual analogue scale (VAS) score and improvement in McCormicks score at 3 months of follow up (Table 3).

Table 1: Baseline characteristics of the patients.

Variables	Frequency	Percent
Age groups (years)		
0 to 10	1	2
11 to 20	6	12
21 to 30	12	24
31 to 40	11	22
41 to 50	9	18
51 to 60	6	12
60 to 70	5	10
Gender		
Female	21	42
Male	29	58
Tumor type		
Intradural extra medullary	27	54
Intramedullary	12	24
Extradural	11	22

Table 2: Description of various spinal cord tumors.

Variables	Intra dural extra medullary	Intramedullary	Extradural	Total
Site				
Cervicomedullary junction	0	0	0	0
Cervical	5	6	1	12
Cervicodorsal	2	2	0	4
Dorsal	13	0	9	22
Dorsolumbar	3	3	0	6
Lumbar	3	1	0	4
Lumbosacral	0	0	0	0
Sacral	1	0	1	2
Symptoms				
Pain	22	11	8	41
Motor	24	10	9	43
Sensory	27	12	11	50
Bowel and bladder	3	3	4	10
Histolpathology				
Nerve sheath tumor	13	0	4	17
Meningioma	9	0	0	9
Astrocytoma	0	4	0	4
Ependymoma	0	4	0	4
Epidermoid	2	2	0	4
Metastasis	0	0	3	3
Neuroenteric cyst	1	1	0	2
Capillary hemangioma	0	0	1	1

Continued.

Variables	Intra dural extra medullary	Intramedullary	Extradural	Total
Hemangiopericytoma	0	0	1	1
Multiple myeloma	0	0	1	1
Lipoma	1	0	0	1
Oligodendroglioma	0	1	0	1
Chordoma	1	0	0	1
Spindle cell tumor	0	1	0	1
Tarlov cyst	0	0	1	1
Surgery				
Total	23	3	8	34
Subtotal	2	5	2	9
Near total	2	4	1	7

Table 3: Comparing pre- and post-operative outcomes of patients.

Outcome assessment	Pre-operative	Immediate post-operative	3 months follow up	P value*
Mean VAS score	6.7	5.54	1.92	<0.01
Mean McCormicks scale	3.4	2.72	1.16	<0.01

*Comparing pre-operative and 3 month follow up

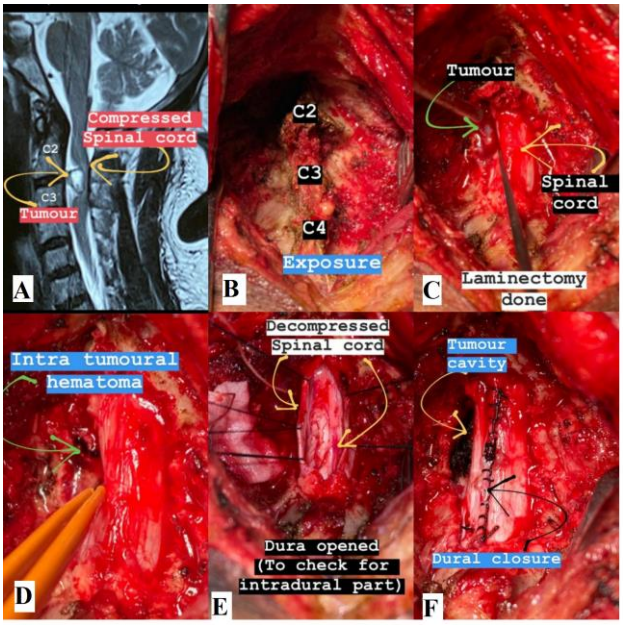

Figure 3: (A) MRI T2 weighted image showing hyperintense C2-C3 extradural lesion with compressed spinal cord, (B) intraoperative image showing C2 to C4 spinous process after paraspinal muscle dissection, (C) intraoperative image after laminectomy showing dural sac, (D) intraoperative image showing extradural lesion with intratumoral bleed, (E) intraoperative image with dura opened to check for intradural part and decompressed spinal cord, and (F) intraoperative image showing tumor cavity and tight duroplasty.

DISCUSSION

The present study describes the epidemiology, location and pattern of spinal cord tumors in Indian population. We observed that 22% tumors were found extradural while the remaining 78% were intradural tumors. Klekamp, King et al and Lee et al, the extradural component contributes 15% and the intradural components give rise to the remaining 85%.[4-6] In the intradural group intramedullary spinal cord tumors make up 35% and intradural extramedullary tumors account for 65% lesions. McCormick et al had found gender prevalence to be equal in intradural spinal tumors except in meningiomas, where there is a definite female preponderance (80%) and in ependymomas which is slightly more common amongst males.[7]

We observed that tumors were most commonly found in the 3rd to 5th decade of life with gradual decline in the incidence towards the extremes of age group. In addition, tumor had a predilection towards the thoracic region where it was observed in 22 cases. The cervical region also contributed 24% of the tumors and the cervicothoracic region was the culprit in 8%. The rest 12% were found in the thoracolumbar, 8% in lumbar and 4% sacral region. Stein and McCormick based on their studies have found that because of the large proportion of the thoracic part of the cord, the most common location of the tumors is the thoracic region, the cervical region the next most likely site and the lumbosacral region the least common site.[8] Studies have shown that 80% meningiomas occur in the thoracic region. Nerve root tumors occur proportionately throughout the spinal cord.[9] Astrocytomas occur most commonly (60%) in the cervical and cervico-thoracic region.[10] Ependymomas also occur throughout the cord but most series report cervical and cervico-thoracic region to be the predominant site and 40% of it is also found in the filum terminale.[8]

In the present study, the histological examination of the various tumors in this study revealed that nerve sheath tumors, meningiomas, ependymomas and astrocytomas are the commonest forms of the intradural tumors (68%).

Nerve sheath tumors usually arise from the dorsal roots. These tumors are relatively avascular, globoid and without calcification. Neuromas are most frequently found in the cervical level.[11] The dorsal root is intimately involved in the tumor and can rarely be preserved during surgical resection. Nerve sheath tumors and meningiomas were the histological type found in nearly 81.5% (22/27 cases) of the intradural extramedullary tumors. Schwannomas and meningiomas made up approximately 90% of the extramedullary tumors in the studies by Levy et al which corroborate the findings of our study.[12]

In the present study most of the patients presented to our tertiary care centre over a mean period of 9 months. The underlying reasons are not clear but, it is probably because pain is a common symptom and is often neglected until more serious discomfort ensues especially affecting their ability to work to earn a livelihood. Second, most of the patients are of low socioeconomic strata and many patients might have a difficult access to tertiary care hospital in rural areas. Because of these reasons, very few patients seek medical care form a specialist and usually are dependent on general practitioners. We observed that pain was present in 11 patients out of 12 cases of intramedullary tumors which were corresponding to findings in our study, 81.4% cases of intradural extramedullary tumors, 91.6% cases of intramedullary tumors and 72.7% cases of extradural tumors had pain. Local pain close to the site of the lesion on the spinal column is most common.[13] Radicular pain is less common. In extradural tumors 76% of the patients have weakness of the limbs at presentation. More than half the patients with spinal cord compression due to metastatic disease of the epidural region have sphincter involvement.[14]

The patients in this series were subjected to surgery as the first and in most case the only line of definitive treatment. The tumors were excised completely in 68% of the patients, while 18% cases subtotal excision could be done and remaining 14% patient's near total excision was achieved. Furthermore, we observe complete excision was possible in majority 85.2% of the intradural extramedullary tumors while in only 25% of the intramedullary tumors could gross complete excision be done. According to Ciapetta et al short-term outcome in the surgical treatment of intradural extramedullary neoplasms is generally excellent, with very gratifying improvement of neurological function, as the rule.[15] Stein and McCormick have found that 90% of all intradural spinal cord tumors are benign and potentially resectable.[16] The total removal of these tumors is not always possible, and aggravation of neurological signs after surgery is not rare. It has been said that 90% of the morbidity associated with intramedullary spinal tumor surgery occurs during the resection of the last 10% of tumor.[17]

There are a few limitations of this study. First, the clinical outcome of the patients reported in our study might not be generalizable to studies conducted at other surgical centres. Second, longer post-operative follow up periods are required to assess long term clinical outcomes.

CONCLUSION

Intradural extramedullary is the most common spinal cord tumor. The majority of the cases presented with sensorimotor symptoms and pain is the predominant clinical complaint. Spinal cord tumors are most commonly observed in the 2nd to 4th decade of life with gradual decline in the incidence towards the extremes of age group. Surgery is the definitive treatment and aim of the surgery is gross total resection. However, complete excision is not possible in most of the intramedullary cases.

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