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Histopathological study of primary spinal Cord tumors

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Abstract
Primary spinal cord tumors account for 10-15% of all primary Central Nervous System tumors. Spinal cord tumors can be classified according to their anatomical locations. Lesions outside the dura are termed extradural and lesions within dura are called intradural. Intradural are further classified into two categories, whether they involve substance of the spinal cord (intramedullary) or are outside the spinal cord but within the dura (extramedullary). Ependymomas are the most common glial tumor in adults, whereas astrocytomas are the most common intramedullary tumor in children. This study was undertaken from June, 2017 to June, 2019 and the total cases encountered were 91 with males constituting 40 cases (44%) and females constituting 51 cases (56%). Most common symptom was motor weakness followed by pain, sensory loss and bladder dysfunction. The tumors includes Meningiomas 29 Cases (32%), Ependymoma 24 cases(26%), Neurofibromas 17 cases(19%), Schwannomas 09 cases(10%), Astrocytoma 06 cases(7%) and others. All differential diagnosis of spinal tumors are kept in mind as correct diagnosis helps in the treatment and prognosis.

Keywords: Spinal cord, tumors, ependymomas, schwannomas, astrocytoma

Introduction
Primary spinal cord tumors constitute 10-15% of all primary Central Nervous System tumors [1, 2]. Spinal cord tumors can be classified according to their anatomical location: Intramedullary tumors arise within the spinal cord itself. Most primary intra medullary tumors are either Ependymomas or Astrocytomas. WHO grade Ⅰ and Ⅱ are considered as benign and grade Ⅲ and Ⅳ are malignant. Ependymomas are the most common glial tumors in adults, whereas Astrocytomas are the most common intramedullary tumor in children [2, 4]. Intradural-extramedullary tumors arising within the dura but outside the actual spine. The most common tumors in this group are meningiomas and nerve sheath tumors [3] of these meningiomas are most common followed by neurofibroma. Other lesions include hemangioblastoma, paraganglioma and cystic lesions. Extradural tumors account for less than 25% of primary spinal tumors and mainly include meningiomas and metastatic lesions.
Primary spinal tumors commonly present with following symptoms:

- Muscle weakness
- Back or Neck pain
- Bladder dysfunction
- Sensory disturbance

Spinal tumors can be treated with medications, surgery, radiation or combination of treatments. Advances are being made through integration of systemic basic laboratory and clinical research. It is hoped that these advances will eventually culminate in safer and more effective treatment for spinal tumors.

Aims and Objectives
1. To study the incidence of primary spinal tumors at Tertiary Care Hospital.
2. To study the morphological features of spinal tumors.
3. To study the relative incidence of various spinal tumors.
4. To study age and sex wise distribution.

Materials and Methods

The study included all the resected specimens and biopsies of spinal cord tumors received at our department over a period of 2 years. Relevant clinical data and imaging details were also reviewed. Cases arising from spinal cord were included, cases secondarily extending to spinal cord from vertebrae and cases with insufficient data were excluded. All the specimens were fixed in 10% formalin. Bony parts were decalcified in HNO3. Thorough gross examination for its size, shape and consistency was done. Several representative areas of tissue were taken from received surgical specimens and subjected to routine paraffin embedding. Hematoxylin & Eosin staining was done in all cases and examined under microscope.

Results and Observations

In our study, total cases encountered were 91 with males constituting 40 cases(44%) and females constituting 51 cases(56%). Tumors presented in our study includes Meningiomas 29 cases(6.5%) and others(6.5%) which includes 2 cases of capillary Hemangioblastoma, 2 cases of Paraganglioma, 1 case of Lipoma and 1 case of Cavernous hemangioma.

Table 1: Tumors presented in our study with sex wise distribution

Tumor type	Males	Females	Total cases
Meningioma	9	20	29(32%)
Ependymoma	11	13	24(26%)
Neurofibroma	6	11	17(19%)
Schwannoma	4	5	9(10%)
Astrocytoma	4	2	6(6.5%)
Others	6	0	6(6.5%)
Total	40	51	91(100%)

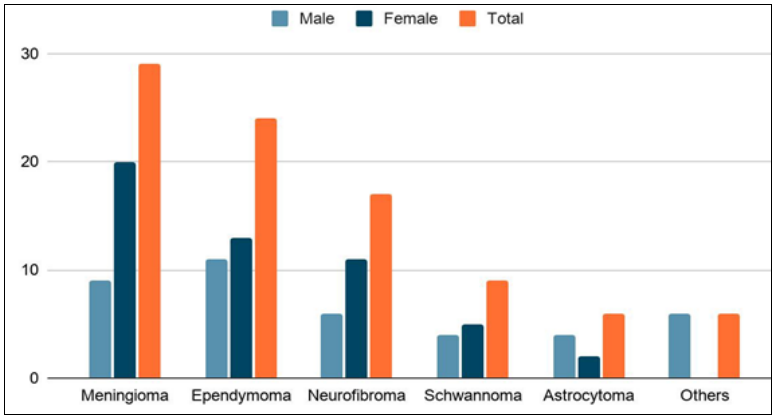

Fig 1: Tumour distribution

Table 2: Age wise distribution most tumors are encountered in 21-30 years of age (Table 2)

Age (Years)	Numbers Of Cases
0-10	8
11-20	10
21-30	22
31-40	15
41-50	11
51-60	10
>60	15
Total	91

Based on location in relation to spinal cord they are divided into intramedullary tumors constitute 28 cases(31%), intradural extramedullary constitute 44 cases(48%) and extradural constitute 19 cases(21%)(Table 3).

Table 3: Location wise distribution

Symptoms	Number Of Cases
Motor weakness	54(59%)
Pain	28(31%)
Bladder dysfuntion	5(6%)
Sensory disturbance	4(4%)
Total	91(100%)

Table 4: Site wise distribution

Location	Number of Cases
Interedullay	2(31%)
Intradural Extra Dullary	44(48%)
Extradural	19(21%)
Total	91(100%)

Table 5: Most common symptom was motor weakness followed by pain, bladder dysfunction and sensory disturbance

Site	Number Of Cases
Cervical	20(22%)
Thoracic	44(48%)
Lumbo-Sacral	27(30%)
Total	91(100%)

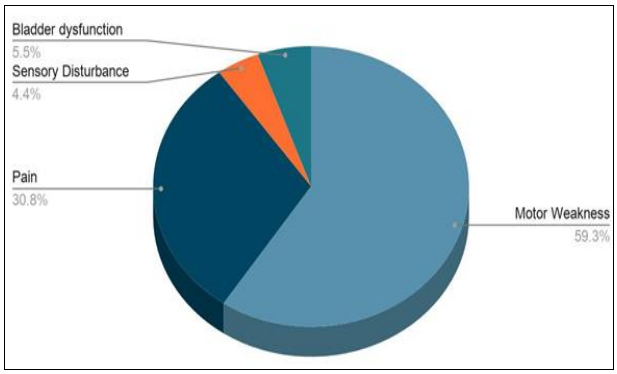

Fig 2: Symptoms wise distribution

Discussion

Primary spinal cord tumors are one of the rarest categories of tumors, representing about 4-16% of all tumors arising from the central nervous system [1, 2] Tumors of glial origin(eg. astrocytoma, ependymoma) are usually intradural intramedullary in location, whereas nerve sheath tumors(eg. neurofibroma, schwannoma) are typically intradural extramedullary lesions. Meningiomas can be either

extradural or intradural extramedullary lesions. In our study total spinal tumors were 91 cases with males constituting 40 cases and females constituting 51 cases. According to the Engelhard *et al.* [4] the most common tumor types were meningiomas (24.4%) and ependymoma (23.7%) which correlated with our study. Pain, weakness and sensory disturbance have been found to be the most frequent presenting symptoms and signs in adult and pediatric patients with intraspinal tumors [4, 5]. In our study the most common symptom was motor weakness followed by pain which correlates with Krishna Reddy CH *et al.* [1].

Intramedullary tumors mainly include ependymomas followed by astrocytomas [2, 6]. Astrocytomas are the most common intramedullary tumor in children. The most common site is thoracic followed by cervical cord. In our study they are second common intramedullary tumors which correlated with study done by Ferreira *et al.* Table 6 demonstrates various grades of Astrocytomas encountered in present study.

Table 6: Grades of Astrocytoma

Grade	Cases
Grade I	2
Grade II	3
Grade III	1
Total	6

Meningiomas are benign tumors arising from arachnoid cells and mostly located in the intracranial compartment. Spinal meningiomas are rare and accounts about 1.2% of all meningiomas and 25% of all spinal cord tumors [10, 11]. The common site was thoracic with 75% of cases which correlated with study done by Sandalcioglu *et al*., Setzer *et al*. Mean age of presentation is 31 years and 65 years. Many studies showed peak incidence at 5th to 7th decades which correlated with our study. Table 7 demonstrates various types of Meningiomas encountered in present study.

Ependymomas are the most common glial tumor in adults. It tends to manifest in younger ages with a median age of 34 years. In our study 24 cases were reported of ependymomas and all of them were found to be intramedullary. The two most common ependymoma subtypes are cellular and myxopapillary. Cellular ependymomas usually occur in the cervical cord, whereas myxopapillary ependymomas occur almost exclusively in the conus medullaris and filum terminale. Table 8 demonstrates various types of ependymomas encountered in present study.

Table 7: Types of Meningioma

Type	Cases
Meningothlial	14
Pssmmomtoud	10
Fibroblastic	2
Transitional	1
Intraosseous	1
Atypical	1
Total	29

Nerve sheath tumors constitute about 25% of tumors arising in intradural extramedullary space. Benign spinal nerve sheath tumors often occur on dorsal nerve roots sporadically or in neurofibromatosis type 1 and type 2. [7, 8] In our study we reported 17 cases of neurofibroma, of these 70% were intradural and 30% were extradural. Mean age of female and another in a 48 year male.

One case of cavernous hemangioma was seen in a 2 year male and a case of lipoma was found in a 26 year male with neurofibromatosis type1 may have multiple spinal cord neurofibromas that often increase in number with age.

Table 8: Types of Ependymomas presentation is 31 years. Patients

Type	Cases
Myxopapillary (Grade I)	6
Tanycytic (Grade II)	6
Cellular(Grade II)	10
Anaplastic(Grade III)	2
Total	24

Spinal schwannomas account for about 25% intradural tumors in adults. [9] We reported 9 cases of schwannoma. There was no difference among males and females in our study which corresponds to many studies. The mean age of presentation was 32 years. In our study all schwannomas were intradural extramedullary.

We reported 2 cases of capillary hemangioblastoma. One case was encountered in a 35 year male and another case was encountered in a 41 year male. We reported 2 cases of Paraganglioma, one in a 31 year

Conclusion

A histopathological study of spinal tumors was undertaken at tertiary care hospital to know the occurence of different types of spinal tumors. A total 91 cases were studied from June 2017 to June 2019. The findings are as follow:

- The most common primary spinal cord tumor was meningioma followed by ependymoma, neurofibroma, schwannoma, astrocytoma and others.
- Spinal tumors are more common in females than male with a ratio of 1.275:1.
- Muscle weakness was the most common mode of presentation.
- Spinal tumors are more commonly located in intradural than in extradural location.
- Within spinal cord tumors are more commonly located in the thoracic region followed by the lumbo sacral region.

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