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Original Research

Spectrum of Spinal Cord Tumours in a Tertiary Care Centre with Emphasis on Rare Tumours

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ABSTRACT

Introduction- A spinal cord tumour is an atypical mass of tissue located inside or surrounding the spinal cord and/or spinal column. They are designated based on vertebral levels and their specific location within the spine - Extradural and Intradural (Extramedullary and Intramedullary). The aim of present study is to assess the spectrum of spinal cord tumours in a tertiary care centre with emphasis on rare tumours.

Material and methods- The present hospital based observational study was conducted at Department of Neurosurgery, NRS medical college, Kolkata for a period of 2 years from January 2023 to December 2024, sample size taken was of 60 subjects. Relevant clinical data, including age, gender, and clinical symptoms, were noted. Every neuropathological sample of a spinal cord cancer that was received was preserved and regularly stained using haematoxylin and eosin. Rare tumors underwent IHC testing. Results were analyzed using SPSS version 25.0.

Results- Most of the patients were in the age group of 41-50 years (16.7%). Mean age of patients was 40.34±3.5 years. Number of male patients was 40 (66.7%) and female patients was 20 (33.3%). The most common tumor was meningioma 17 (28.3%), followed by schwannoma 13 (21.6%), metastasis 5 (8.3%), plasma cell neoplasm 4 (6.6%), lymphomas 4 (6.6%), ependymoma 3 (5%), astrocytoma 3 (5%), chondroma 2 (3.3%) , glioblastoma 2 (3.3%), aneurysmal bone cyst 2 (3.3%), solitary fibrous tumor 2 (3.3%), giant cell tumor 1 (1.6%), neuroendocrine 1 (1.6%) and melanoma 1 (1.6%). Spinal tumors in relation to their location showed that 11 (18.3%) were intradural intramedullary, 39 (65%) were intradural extramedullary and 10 (16.7%).

Conclusion – According to the findings of the study, the most prevalent tumours are schwannoma and meningiomas, and the intradural extramedullary region is the most affected place.

Keywords- Extradural, H&E, Intradural, Extramedullary, Intramedullary, Spinal Cord Tumor

INTRODUCTION

Because the anatomical structures in the spinal region are varied and unpredictable, they frequently serve as a great test for neuropathologists and neuroclinicians alike, revealing a wide range of pathological abnormalities. Rare spinal lesions often affect the spinal tissues of the epidural space, including the spinal cord, spinal meninges, and spinal nerve roots. Although it can affect any level of the spine, it often affects the thoracic region [1,2]. Four to sixteen percent of all cancers in the central nervous system (CNS) are spinal cord tumours [2]. Congenital malformations, degenerative illnesses, inflammatory disorders, cystic lesions, vascular malformations, and neoplasms are the categories into which spinal lesions can be divided [1]. Primary tumours, which come from bone, meningeal, or spinal cord cells, are the first of two main categories of spinal tumours. The second category consists of metastatic lesions that start in other cells and spread to the spinal cord and adjacent tissues [3, 4]. The spinal Space Occupying Lesions (SOLs) are classified as extradural or intradural lesions based on their anatomical position. Extradural lesions arise from the bony spine, intervertebral discs, and surrounding soft tissues and happen outside the spinal dura. The dura is where intradural lesions form. Extramedullary and intramedullary are two more classifications for intradural spinal tumours [5, 6].

Inside the spinal cord, intramedullary spinal cord tumours develop. They come from ependymal or glial cells. Around 5% of occurrences occur frequently. The most prevalent are ependymomas and astrocytes. Children frequently have astrocytes, which first

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appear in the thoracic region and then the cervical spine [7].

Rare congenital tumours called intramedullary lipomas are most frequently found in the cervicothoracic spine. The dura is home to intradural-extramedullary spinal tumours, which are located outside the spinal cord. Two-thirds of all primary intraspinal neoplasms are spinal intradural extramedullary (IDEM) tumours. These are rare lesions [8]. The most prevalent are meningiomas, which arise in the brain and spinal cord's meninges. [9].

Compared to adults, children are more likely to have spinal cord tumours [10]. Patients with primary spinal tumours typically experience the following symptoms: paraesthesia, paraplegia, gait disturbance, sexual dysfunction, neck or back discomfort, radiating pain, sensory disturbance, and pain along the spinal axis [11]. Spinal tumours are a major cause of morbidity and mortality, despite their rarity [12]. To diagnosis spinal tumours, a pathological investigation, radiographic characteristics, and clinical history are necessary [3]. These tumours are managed with medications, surgery, radiation, or a mix of these approaches [13].

The aim of present study is to assess the spectrum of spinal cord tumours in a tertiary care centre with emphasis on rare tumours.

MATERIAL AND METHODS

The present hospital based observational study was conducted at Department of Neurosurgery, NRS medical college, Kolkata for a period of 2 years from January 2023 to December 2024. Ethical clearance for conducting the research was taken from institutional ethics committee of college. Patients were asked to sign an informed consent form after explain them about the study.

Assuming that there were any CNS tumours, the prevalence was 6.49% in one study [14]. The 95% confidence level and 5% absolute precision were the additional factors taken into account while calculating the sample size. For 100,000, a finite population correction was made based on the prior hospital records. According to our hospital records 60 were needed. Convenient sampling was used to include all of the patients' eligible specimens until the required sample size was reached. Patients were selected on the basis of inclusion and exclusion criteria

Inclusion criteria: All the study specimen, belonging to patients of any age and both genders, diagnosed with spinal tumours, during study period were included in the study.

Exclusion criteria: Primary vertebral body tumours and paraspinal soft tissue lesions were excluded. Non-neoplastic conditions of the CNS were excluded.

Methodology - Relevant clinical data, including age, gender, and clinical symptoms, were noted. Every neuropathological sample of a spinal cord cancer that was received was preserved and regularly stained using haematoxylin and eosin (H & E). IHC was performed using antibodies such as Epithelial Membrane Antigen (EMA), Vimentin, S-100, Cytokeratin (Pan CK), MIB-1, Neurofilament, G-FAP, and R132H-IDH1 based on the specific diagnostic requirements of each case.

For quantitative variables, descriptive analysis was done using mean and standard deviation; for categorical variables, it was done using frequency and proportion. P-values less than 0.05 were regarded as statistically significant. Statistical analysis was conducted using SPSS version 25.0.

RESULTS

Most of the patients were in the age group of 41-50 years (16.7%). Mean age of patients was 40.34±3.5 years. Number of male patients was 40 (66.7%) and female patients was 20 (33.3%) as shown in table 1.

Table 1: Demographic data of patients

Demographic data	N (%)	
Age	0-10	3 (5)
	11-20	5 (8.3)
	21-30	21 (35)
	31-40	7 (11.6)
	41-50	10 (16.7)
	51-60	8 (13.3)
	61-70	4 (6.7)
	71-80	1 (1.7)
	81-90	1 (1.7)
Gender	Male	40 (66.7)
	Female	20 (33.3)

The most common tumor was meningioma 17 (28.3%), followed by schwannoma 13 (21.6%), metastasis 5 (8.3%), plasma cell neoplasm 4 (6.6%), lymphomas 4 (6.6%), ependymoma 3 (5%), astrocytoma 3 (5%), chondroma 2 (3.3%) , glioblastoma 2 (3.3%), aneurysmal bone cyst 2 (3.3%), solitary fibrous tumor 2 (3.3%), giant cell tumor 1 (1.6%), neuroendocrine 1 (1.6%) and melanoma 1 (1.6%) as shown in graph 1.

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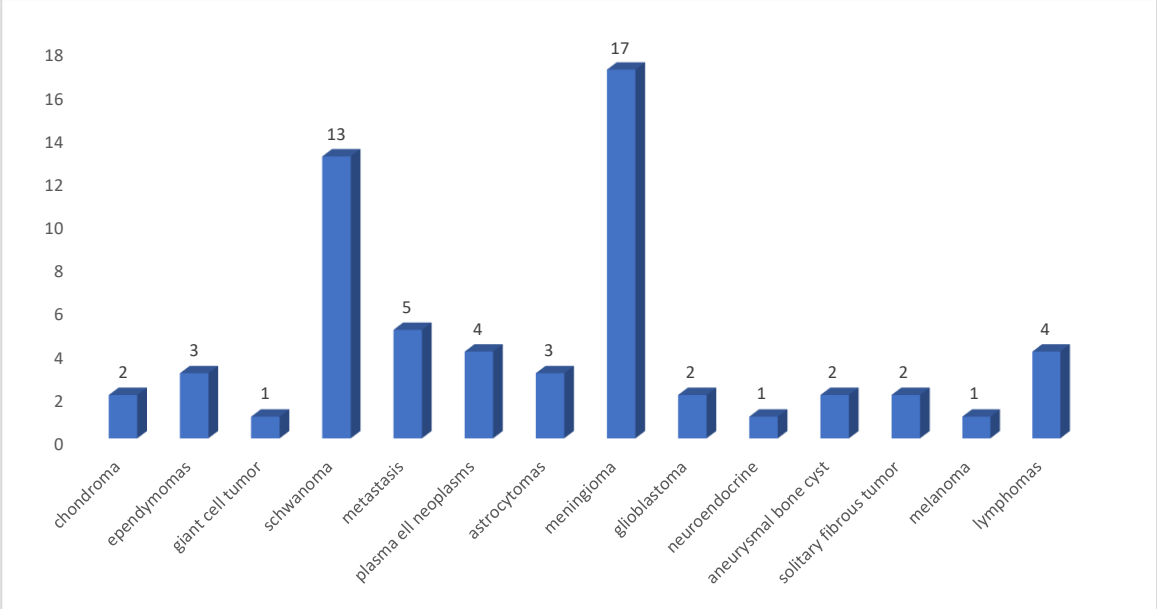
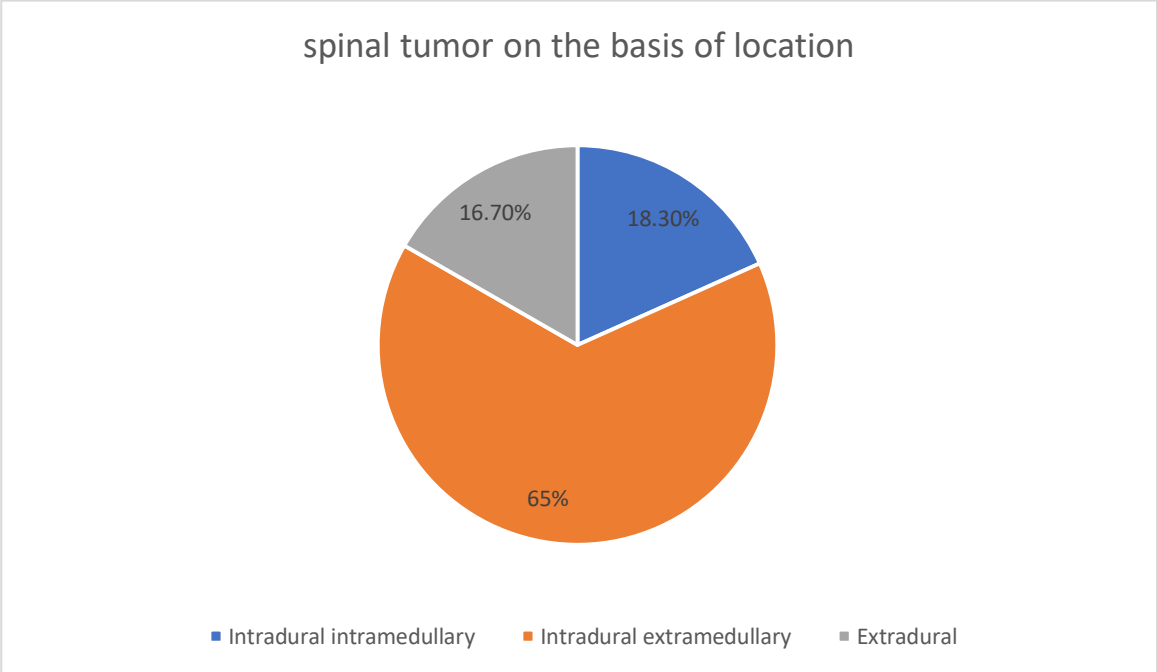


Graph: 1 Spectrum of tumors present in patients

Distribution of spinal tumors in relation to their location showed that 11 (18.3%) were intradural intramedullary, 39 (65%) were intradural extramedullary and 10 (16.7%) were extradural as shown in table 2, graph 2.

Table 2: Distribution of spinal tumors in relation to their location

Location of tumor	N (%)
Intradural intramedullary	11 (18.3)
Intradural extramedullary	39 (65)
Extradural	10 (16.7)



Graph: 2 Distribution of spinal tumors in relation to their location

Compartmental distribution of tumors on the basis of location was divided into intradural intramedullary, intradural extramedullary and extradural as shown in table 3.

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Table 3: Compartmental distribution of spinal cord tumors

Type of tumor	Intradural intramedullary	Intradural extramedullary	Extradural	Total
Chondroma	0	2 (100)	0	2
Ependymomas	1 (33.3)	1 (33.3)	1 (33.3)	3
Giant cell tumor	0	1 (100)	0	1
Schwanoma	3	8	2	13
Aneurysmal bone cyst	0	2 (100)	0	2
Meningioma	4	10	3	17
Neuroendocrine	0	1 (100)	0	1
Astrocytoma	0	2 (66.7)	1 (33.3)	3
Glioblastoma	1 (50)	1 (50)	0	2
Plasma cell neoplasm	0	3 (75)	1 (25)	4
Solitary fibrous tumour	0	1 (50)	1 (50)	2
Lymphoma	1 (25)	3 (75)	0	4
Metastasis	1 (20)	3 (60)	1 (20)	5
Melanoma	0	1 (100)	0	1
Total	11	39	10	60

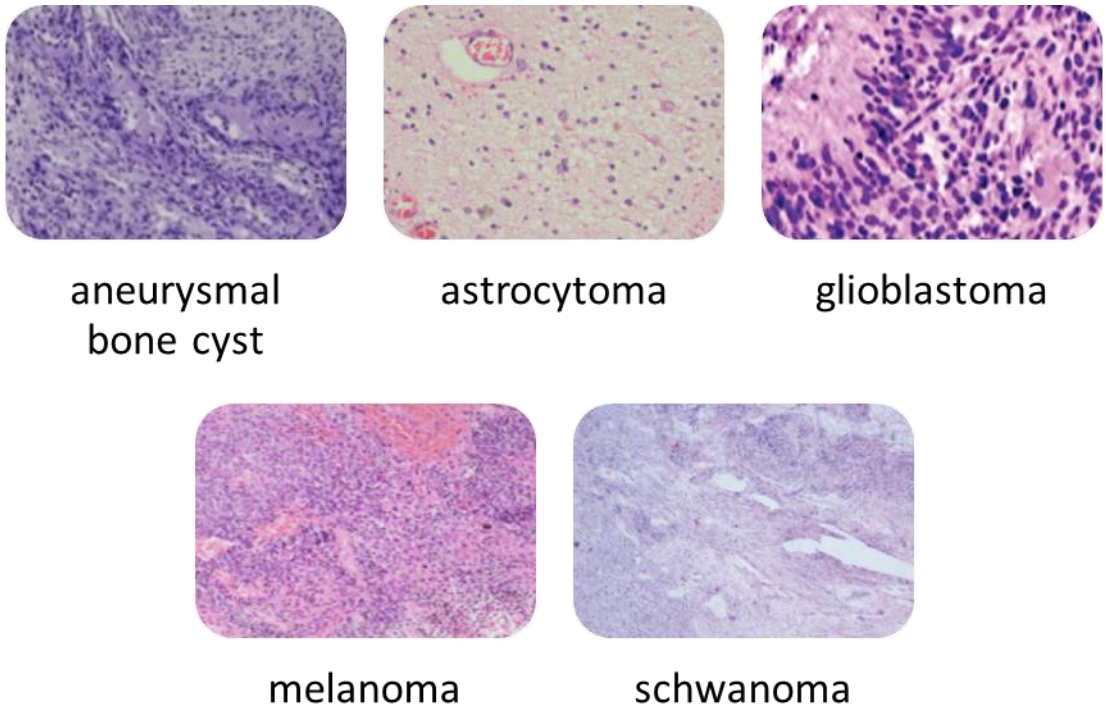

Figure 1- Some tumors seen in our study.

DISCUSSION

The diversity of anatomical features in the spinal area enhances the clinical utility of the histopathological report [15]. This study assessed several spinal tumours for age, gender and location. This study observed the highest incidence of spinal tumours in the age group of 41-50 years, but Hirako K et al reported that benign spinal tumours are more prevalent in individuals aged 50-59 years, and malignant spinal tumours are more common in those aged 40-49 years [3].

Most prior investigations indicated a male majority [16,17], similar to current study (66.7%), which was in contrast with the findings of Drashti P et al. and Santos Júnior EC et al. [18,19]

In our study distribution of spinal tumors in relation to their location showed that 11 (18.3%) were intradural intramedullary, 39 (65%) were intradural extramedullary and 10 (16.7%) were extradural a similar pattern is seen in other studies [16,18] while in Santos J. et al., [19] intradural intramedullary location was most common site.

In present study the most common tumor was meningioma 17 (28.3%), followed by schwannoma 13 (21.6%), metastasis 5 (8.3%), plasma cell neoplasm 4 (6.6%), lymphomas 4 (6.6%), ependymoma 3 (5%), astrocytoma 3 (5%), chondroma 2 (3.3%) , glioblastoma 2 (3.3%), aneurysmal bone cyst 2 (3.3%), solitary fibrous tumor 2 (3.3%), giant cell tumor 1 (1.6%), neuroendocrine 1 (1.6%) and melanoma 1 (1.6%). Upon examination of

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Haematoxylin and Eosin (H&E) slides from individuals with schwannoma, the tumours exhibited high cellularity, spindle-shaped cells arranged in a palisading pattern, with tumour cells interspersed by copious oedematous fluid. The cases of meningioma showed whorls pattern and psammoma body. The present study which was comparable with other studies [3,16,18,19] where meningioma was more common

Some of the rare tumors found in our study were – 1.) glioblastoma (Tumour was intradural extramedullary. It was immunopositivity for Olig 2, p53 and 3K27M. MIB1 was 60-70%.), 2.) aneurysmal bone cyst (On H & E, the cystic areas of varying diameters are delineated by fibrous septa that encompass fibroblasts and myofibroblasts. Regions of spindled stroma were observed.), 3.) solitary fibrous tumor (Immuno-positive for Vimentin, CD-99, CD-34 (patchy), and STAT-6; negative for S-100. The MIB was between 30% and 35%. Histological characteristics, including homogeneous spindle cells organised in interlacing fascicles alongside interspersed collagen and a thick reticulin fibre network, together with the immunohistochemical profile, led to the diagnosis of a Solitary Fibrous Tumour), 4.) melanoma (Diffuse positivity for S-100 and SOX 10, with patchy positivity for HMB 45. The MIB index ranged from 10% to 12%. These lesions typically manifest as diffuse melanomatosis. Isolated lesions are uncommon.), 5.) giant cell tumor (The specimen had several osteoclast large cells and spindle cells organised in fascicles, accompanied by a vascular stroma featuring regions of haemorrhage and necrosis, along with pronounced mitotic activity.), and 6.) neuroendocrine tumors (focal positive for NF1, diffuse positivity for chromogranin A & synaptophysin; CK negative. MIB1 index was 18-20%.).[20]

Small sample size was the limitation of the study which hampers the generalisability of the results.

CONCLUSION

Tissue diagnosis is crucial due to the diverse range of pathological lesions in this region, each with distinct prognoses and treatment protocols. The tumor's location was vital for comprehending the nature and progression of the disease. Schwannomas and meningiomas were the predominant tumours identified in this study with the intradural extramedullary site being the most involved location.

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