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Original Article

Histopathological Spectrum of Spinal Space Occupying Lesions

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Abstract

Introduction: *Spinal space occupying lesions (SOLs) are rare with wide histopathological spectrum. These are categorized based on their location as extradural, intradural and intramedullary. Although the neuroimaging techniques give an idea about precise location and probable diagnosis, histopathology remains the gold standard for the accurate diagnosis of spinal space occupying lesions. The present study was carried out to study the histopathological spectrum, distribution and demographic features of various spinal space occupying lesions.*

Materials and Methods: *Total 106 cases of spinal space occupying lesions over a period of 3 years [January 2016- December 2018] were studied.*

Results: *The most affected age group was 41-60 years with male:female ratio of 1.5:1. Neoplasms formed the majority [83%] of the spinal space occupying lesions. The most common SOL in the intradural compartment was schwannoma and ependymoma in the intramedullary compartment, while tuberculosis was the most common cause of space occupying lesion in extradural compartment.*

Conclusion: *A location based approach to the spinal SOLs is helpful in establishing an appropriate differential diagnosis. Tissue diagnosis is imperative due to wide spectrum of pathological lesions in this area with differing prognosis and therapeutic protocols.*

Keywords: *spinal space occupying lesions, extradural, intradural, intramedullary, Histopathologic spectrum.*

Introduction

Although rare, spinal space occupying lesions [SOLs] are important cause of morbidity and mortality[1]. The complex anatomy of the spinal region poses a great challenge to neurosurgeons, radiologists and pathologists; displaying a wide spectrum of pathological lesions. Space occupying lesions may be neoplastic or non neoplastic. Spinal SOLs constitute the lesions encountered in the spine, epidural space, spinal meninges, spinal nerve roots and spinal cord[2].

Based on anatomical location, the spinal SOLs are classified as extradural, intradural extramedullary and intramedullary lesions. Extradural lesions occur outside the spinal dura and arise from the osseous spine, intervertebral discs and adjacent soft tissues. Intradural lesions arise within the dura but outside the spinal cord. Intramedullary lesions are located in the substance of the spinal cord [3,4].

Advances in the neuroimaging techniques have revolutionized the field of neurological diagnosis, but the definitive diagnosis requires histopathological examination. The present study aims to study the histopathological spectrum of the spinal lesions and to observe the relative frequency of different lesions and distribution of these lesions with respect to age, sex, compartment and spinal level involved.

Materials and Methods

This is a retrospective observational study conducted at Department of Pathology, in a tertiary health care centre over a period of 3 years [January 2016-December 2018]. Total 106 patients presenting as spinal SOLs in the Department of Neurosurgery were included in the study. Patients presenting with congenital anomalies and prolapsed intervertebral discs were excluded.

Relevant clinical data and imaging details were reviewed. Specimens were fixed in 10% formalin. Routine histopathological processing was done. Sections of 4-6µ thickness were cut and stained with H&E stain. Special stains like reticulin, PAS and AFB were done wherever necessary. Recent WHO classification of central nervous system tumors was used for classification and grading of the tumors. All the data was divided in different categories, analysed and summarized as percentage.

Results

Total 106 patients were analysed. Age of the patients ranged from 2 years to 82 years with the mean age of 42 years. The largest age group affected was 41-60 years. There was male preponderance with M:F ratio of 1.5:1. The most common complaint was back pain [65%], nerve root pain [50%], paraparesis [45%] and paresthesia [43%].

Thoracic region was the most frequently [38.6%] involved spinal level followed by cervical [20.7%] and thoracolumber [18.8%] region [Table 1]. Most of the lesions were intradural extramedullary [55.7%] followed by extradural [28.3%] and intramedullary lesions with 16% cases. Compartmental distribution of various spinal SOLs is given in table 2. Out of 106 cases, 88 [83%] were neoplatic and 18 [17%] were non neoplastic lesions. The frequency of various neoplastic and non neoplatic spinal lesions is enumerated in the table 3.

The most common histological diagnosis was benign nerve sheath tumor [35.8%]. Out of these 28.3% were schwannomas [FIG 1] and 7.5% were neurofibromas. These tumors were mostly intradural with thoracic region being the most common site of involvement. Three patients with neurofibromatosis 2 [NF2] had multiple schwannomas. Meningioma was the second most common tumor with 14.1% cases. Mean age of presentation was 50 years with M:F ratio of 1:7. Among the histological variants of meningioma, psammomatous meningioma [60%] was the most common [FIG 2] followed by meningotheliomatous meningioma and one case each of transitional and clear cell meningioma.

Ependymomas constituted 9.4% of the spinal lesions and was the most common tumor in the intramedullary compartment. Out of 10 cases, 7 were grade II ependymomas [FIG 3], 2 were myxopapillary [grade I] and 1 was anaplastic ependymomas [grade III]. Astrocytomas constituted 3.7% of the cases and were the second most common intramedullary tumor. Out of 4 cases, 2 were grade II diffuse fibrillary astrocytomas and 2 were pilocytic astrocytomas.

Metastasis was the most common neoplastic lesion in the extradural compartment constituting 3.7% cases. Primary malignancies associated were breast, prostate, follicular carcinoma thyroid and one case of unknown primary malignancy. Primary bone tumors included 2 cases of hemangioma, plasmacytoma and one case each of giant cell tumor and chondroblastoma.

Primitive neuroectodermal tumor [PNET] was the most common tumor in the pediatric age group [FIG 4]. Most common site of involvement was thoracic region with intradural location.

Among the non neoplastic lesions, tuberculosis was the most common [11.3%] followed by cystic lesions. Tuberculosis [FIG 5] was seen in extradural compartment with thoracic spine being most common site of involvement. Benign cystic lesions constituted 4.7% of cases, of which 3 were epidermoid cysts, 2 cases of archnoid cyst and one case of dermoid cyst.

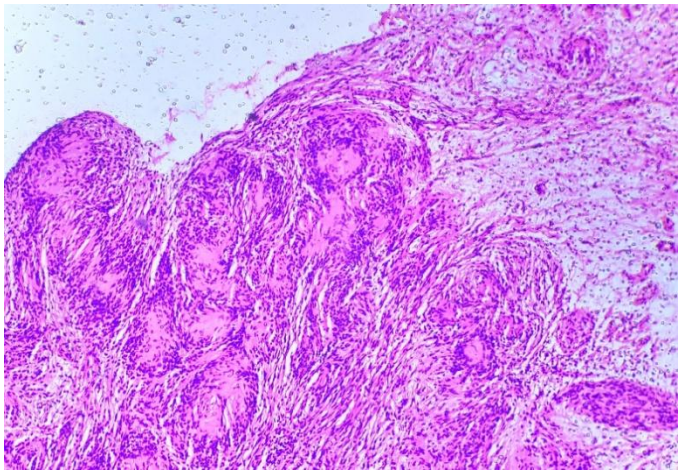

Fig 1: Schwannoma showing Antoni A areas with verocay bodies and hypocellular Antoni B areas. [H&E, 100X]

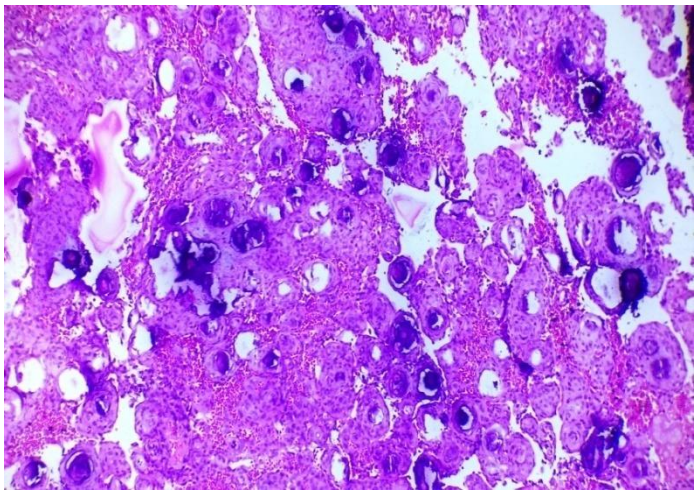

Fig 2: Psammomatous meningioma showing numerous psammoma bodies and meningothelial whorls. [H&E, 100X]

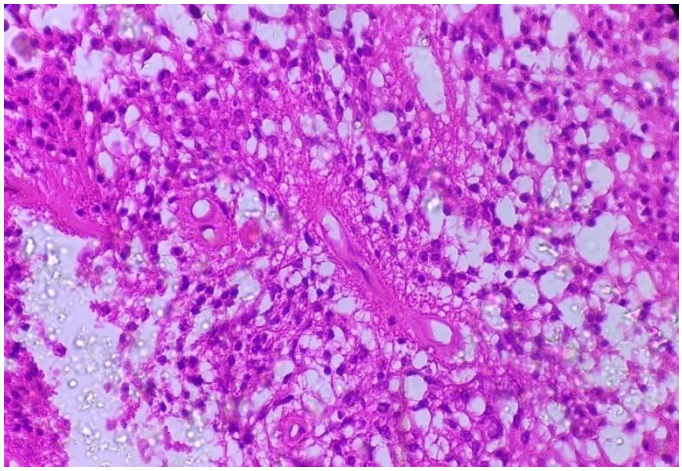

Fig 3: Ependymoma showing perivascular pseudorosettes against fibrillary background. [H&E, 400X]

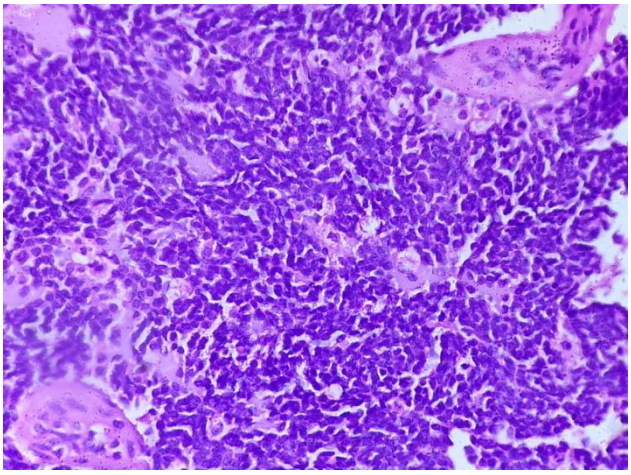

Fig 4: PNET showing highly cellular tumor composed of cells with high N/C ratio. [H&E, 400X]

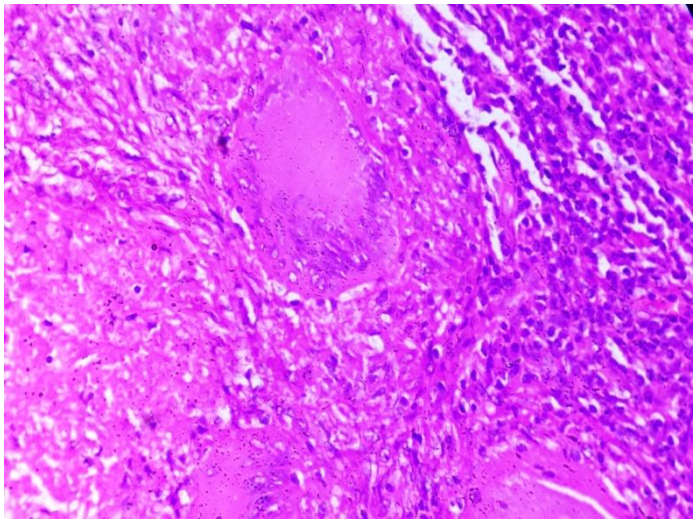

Fig 5: TB spine showing caseous necrosis, epithelioid cells and Langhans Giant cells. [H&E, 400X]

Table 1: Site wise Distribution of Spinal Sols

Site	No of cases	Percentage
Cervical	22	20.7%
Cervicothoracic	6	5.6%
Thoracic	41	38.6%
Thoracolumbar	20	18.8%
Lumbar	14	13.2%
Lumbosacral	2	1.8%
Sacral	1	0.9%
Total	106	100%

Table 2: Compartmental Distribution of Spinal SOLs

Extradural (n=30)	Intradural (n=59)	Intramedullary (n=17)
Metastasis(4)	Schwannoma (27)	Ependymoma (10)
Schwannoma (3)	Neurofibroma (6)	Astrocytoma (4)
Neurofibroma (2)	Meningioma (15)	Haemangioblastoma (1)
Hemangioma (2)	PNET (4)	Dermoid Cyst (1)
PNET (2)	Lipoma (3)	Epidermoid Cyst (1)
Lymphoma (1)	Epidermoid Cyst (2)	
Plasmacytoma (2)	Archnoid Cyst (2)	
Chondroblastoma (1)		
Giant cell tumor (1)		
Tuberculosis (12)		

Table 3: Histopathological Spectrum and Frequency of Spinal SOL$_S$.

	Spinal SOLs	No. of Cases	Percentage
A. Neoplastic (n=88)	Schwannoma	30	28.3%
	Neurofibroma	8	7.5%
	Meningioma	15	14.1%
	Ependymoma	10	9.4%
	Astrocytoma	4	3.7%
	Metastasis	4	3.7%
	PNET	6	5.6%
	Lipoma	3	2.8%
	Hemangioma	2	1.8%
	Plasmacytoma	2	1.8%
	Hemangioblastoma	1	0.9%
	Lymphoma	1	0.9%
	Chondroblastoma	1	0.9%
	Giant cell tumor	1	0.9%
B. Non- neoplastic (n=18)			
I. Infections (n=12)	Tuberculosis	12	11.3%
II. Cystic Lesions (n=6)			
	Epidermoid Cyst	3	2.8%
	Archnoid Cyst	2	1.8%
	Dermoid cyst	1	0.9%
Total		106	100%

Discussion

A spectrum of lesions affects spinal cord including developmental anomalies, inflammatory, infectious diseases, degenerative and neoplastic lesions[2]. Primary spinal cord tumors account for 4-10% of all CNS tumors and are classified based on their location as extradural, intradural and intramedullary [5]. Proper knowledge of clinical and demographic features of spinal lesions can streamline the process of diagnosis and management which ultimately improves the prognosis.

The present study was carried out to study the histopathological spectrum and demographic features of various spinal cord lesions. In the present study total 106 cases were analysed. The spinal lesions occurred over a wide age range with the mean age at surgery being 42 years. The most affected age group was 41-60 years with M:F ratio of 1.5:1, which is in concordance with other studies. Thoracic spine was the most common location for spinal space occupying lesions followed by cervical spine. Our findings correlate with other studies [6,7].

Intradural extramedullary lesions account for 60% of the spinal lesions. Schwannomas are the most common intradural tumor accounting for 25% of all intradural tumors in adults[4,8]. They are most commonly intradural in location within thoracic and lumbar spine. They are WHO grade I tumors and total resection is considered curative[9]. In present study, intradural tumors constituted 55.7% of the cases with schwannoma being the most common tumor which is in correlation with other studies [6,8,10]. Meningiomas are the second most common intradural tumor. They are most commonly seen in females in 5th to 7th decades of life. In our study, meningioma accounted for 14.1% with M:F ratio of 1:7 which is comparable to other studies [11]. Psammomatous meningioma has predilection for spinal dura; as is reflected by our study in which, it constituted for 60% of all meningiomas[12].

Extradural space occupying lesions account for 30% of spinal lesions. Extradural tumors can be subclassified as primary spinal tumors and secondary spinal tumors or metastatic disease. Extradural tumors arise from the bone but can also

develop in the soft tissue near the spine but outside spinal cord[4]. The most common extradural tumor is metastatic disease. The most common primary neoplasms leading to metastatic disease are breast lung and prostate. In the present study, metastasis was the most common neoplastic SOL in the extradural compartment. Our findings are in accordance with other studies[7,13]. Although hemangiomas are the most common benign tumor of the spine, we had only 2 cases of hemangioma. This may be because vertebral hemangiomas are rarely symptomatic in adults. Only 0.9-1.2% of all vertebral hemangiomas may be symptomatic[14].

Tuberculosis remains the major health problem in India. In spinal tuberculosis, the extradural mass formed by an abscess, sequestered bone and disc or granulation tissue, fills the epidural space and spreads around dural space, thus causing cord compression[15]. In the present study tuberculosis presented as most common extradural space occupying lesion. Most common location was thoracic spine which is in accordance with other studies[16].

Intramedullary spinal cord lesions are the rarest and account for 16- 25 % of all spinal lesions. Gliomas make upto 80% of all intramedullary tumors. Ependymomas are the most common intramedullary tumor in adults, whereas astrocytomas are the most common intramedullary tumor in children. Non glial neoplasms including hemangioblastoma, paraganglioma, PNET& lymphomas are much less common[1,4]. In the present study, intramedullary lesions constituted 16% of the cases with ependymoma being the most common intramedullary tumor in adults.

Although PNET is the second most common malignant neoplasm in childhood, the spinal cord as primary site for PNET is relatively rare. In the present study, PNET was the most common tumor in the pediatric population which is in correlation with Shirazi et al[17].

The treatment of spinal tumors is determined by the biology, location and extent of the lesion. It is important to recognize and differentiate non neoplastic and neoplastic lesions of the spinal cord as the differentiation is extremely crucial to the neurosurgeon. For these reasons, establishing the tissue diagnosis is of great importance.

Conclusion

Neoplastic lesions constitute majority of the spinal space occupying lesions. A location based approach to the spinal SOLs is helpful in establishing an appropriate differential diagnosis. Tissue diagnosis is imperative due to wide spectrum of pathological lesions in this area with differing prognosis and therapeutic protocols.

Conflicts of interest- Nil

Source of grants- None

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References

1. Samartzis D, Gills CC, Shih P, O'Toole JE, Fessler RG. Intramedullary spinal cord tumors: part 1-epidemiology, pathophysiology and diagnosis. Global Spine J. 5:425-435,2015.
2. Pant I & chaturvedi S. Spectrum of Histopathology in spinal lesions. Astrocyte 2:187-99,2016.
3. Grimm S & Chamberlain MC. Adult primary spinal cord tumors. Expert Rev Neurother. 9(10):1487-1495,2009.
4. Gebauer GP, Farjoodi P, Sciubba DM, Gokaslan ZL, Relay LH et al. Magnetic resonance imaging of spine tumors: classification, differential diagnosis and spectrum of disease. J Bone Joint Surg Am. 90:146-162,2008.
5. Koeller KK, Rosenblum RS, Morrison AL. Neoplasms of the spinal cord and filum terminale: radiologic-pathologic correlation. AFIP ARCHIVES 20(6):1721-1749,2000.
6. Hirano K, Imagama S, Sato K, Kato F, Yukawa Y, Yoshihara H, *et al.* Primary spinal cord tumors: Review of 678 surgically treated patients in Japan. A multicenter study. Eur Spine J. 21:2019-26,2012.

7. Arora RK, Kumar R. Spinal tumors: Trends from Northern India. Asian J Neurosurg 10:291-297,2015.
8. Govind M, Mittal R, Sharma A, Gandhi A. Intradural extramedullary spinal cord tumors: a retrospective study at tertiary referral hospital. Romanian neurosurg 1:106-112,2016.
9. Carra BJ & Sherman PM. Intradural spinal neoplasms: a case based review. J Am Osteopath Coll Radiol 2(3):13-21,2013.
10. Jeon JH, Hwang HS, Park Sh, Moon JG, Kim CH. Spinal schwannoma: analysis of 40 cases. J Korean Neurosug Society. 1;43(3);135-8,2008.
11. Sandalcioglu IE, Hunold A, Muller O, Basssiouni H, Stolke D, Asgari S. Spinal meningiomas: critical review of 131 surgically treated patiets. Eur Spine J. 1;17(8):1035-41,2008.
12. Perry A, Louis DN, Budka H, Deimling A, Sahm F, Rushing EJ et al. Meningioma. In: WHO Classification of tumors of the central nervous system.4th edn. Edited by Louis DN, Ohgaki H, Webster W, Cavenee K. IARC Lyon. 231-246,2016.
13. Chamberlain MC, Tredway TL. Adult primary intradural spinal cord tumors: a review. Curr Neurol Neurosci Rep. 11;320-328,2011.
14. Alfawareh M, Alotaibi T, Labeeb A, Audat Z. A symptomatic case of thoracic vertebral hemangioma causing lower limb spastic paresis. Am J Case Rep. 17:805-809,2016.
15. Shridhar K. Tuberculosis of the spine. In: Textbook of Neurosurgery, 2nd Edn. Rammurthi B, Tondon PN. Churchill Livingstone, 496-513,1996.
16. Jain AK, Singh S, Sinha S, Dhamni IK, Kumar S. Intraspinal tubercular granuloma-an analysis of 17 cases. Indian J Orthop. 37(3):1-4,2003.
17. Shirazi N, Gupta M, Bhat N, Kalra B, Kumar R, Saini M. Profile of primary pediatric brain and spinal cord tumors from north India. Indian J Med Pediatr Oncol. 38(1):10-14,2017.