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The Clinicopathological Spectrum of Lesions of Spinal Meninges.

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ABSTRACT

Introduction: The spinal meningeal lesions are a distinct and interesting group of lesions with a wide spectrum of clinical and histological presentation. The aim of our study was to analyse the clinic-radiological spectrum of spinal meningeal lesions with histopathological correlation. **Methods**: Our study comprised of 88 cases of spinal meningeal lesions over a consecutive 10 years period in tertiary care hospital. Descriptive cross-sectional study of cases including detailed clinical data of age, sex, duration of disease, type of lesion, and radiological findings of the patients was obtained. The analysis of all the cases was done by examining Hematoxylin and Eosin stained slides with use of special stains and immunohistochemistry, if needed. **Results**: Male predominance was seen in spinal meningeal lesions with M: F ratio of 1.2:1 with 3rd and 4th decade age group was most commonly affected. These lesions were common in thoracic region followed by lumbar region .Neoplastic lesions of spinal meninges were more frequently encountered than non-neoplastic lesions. Meningioma (37.50 %) was the most common spinal meningeal tumor followed by lipoma (18.18 %). Psammomatous meningioma (45.45 %) was the most commonly observed histological type of meningioma. Epidermoid and dermoid cysts (23.92 %) were the most common cystic (non-neoplastic) meningeal lesions. **Conclusion**: Considering the rarity of spinal meningeal lesions, a multidisciplinary approach with the combination of clinical, radiological, and histopathological features forms the basis of its diagnostic approach.

Keywords: Lesions, Neoplastic, Non– neoplastic , Spinal region

INTRODUCTION

Owing to the complexitity and enormous diversity of the anatomic structures in the spinal region there is a heterogenous array of pathological lesions encountered. The spinal meningeal lesions are a distinct and interesting group of lesions with a wide spectrum of clinical and histological presentation .Spinal lesions are broadly categorized as lesions of spinal meninges, lesions of spinal nerve roots and lesions of spinal cord. These are further sub classified into congenital malformations, inflammatory disorders, degenerative and reactive processes, cystic lesions, vascular malformations, benign and malignant neoplasms. They can present in any age and gender prevalence is equal except in case of meningiomas, which are more common in women. They usually present with backache, weakness in extremities, walking difficulty and bladder and bowel symptoms. These lesions can involve any spinal level but more commonly affect thoracic region. Among the intradural extramedullary tumors of spinal meningiomas are frequently encountered group. There are several non-neoplastic lesions like meningeal cyst and inflammatory lesions which are rare and can mimic radiologically and clinically as spinal cord neoplasm. The aim of our study was to analyse the clinical and radiological spectrum of spinal meningeal lesions with histopathological correlation. The present communication feels that a detailed clinicopathological study of spinal meningeal lesions will be of a worthy record.

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MATERIALS AND METHODS

Our study comprised of a total 241 surgical resection specimens operated for lesions of spinal cord and its coverings in all age groups studied over a consecutive period of 10 years in a tertiary care hospital. The exclusion criteria were the primary bone tumors involving the vertebrae and paraspinal soft tissue. Descriptive cross-sectional study of cases with detailed clinical data of age, sex, duration of

disease, type of lesion, clinical and radiological findings of the patients was obtained. All cases were analyzed by fixing in 10% buffered neutral formalin for 24 hours. If the resected tissue was received as multiple fragmented bits, total submission was done. . If the lesion was removed in toto and exceeded 4-5 cms, sections from the representative areas were taken and paraffin blocks prepared. The paraffin embedded blocks were cut into 4-5 micron sections and stained with routine Haematoxylin and Eosin stain (H&E) along with use of special stains and immunohistochemistry if required.

RESULTS

Male predominance was seen in spinal meningeal lesions with M: F ratio of 1.2:1 and 3rd and 4th decade age group was most commonly affected [Table 1]. These lesions were common in thoracic region followed by lumbar region [Table 2].

Neoplastic lesions of spinal meninges were more frequently encountered than non-neoplastic lesions. Epidermoid and dermoid cysts 21 (23.92 %) were the most common cystic (non-neoplastic) meningeal lesions. Meningioma (37.50 %) was the most common spinal meningeal tumor followed by lipoma (18.18 %) [Table 3]. Psammomatous meningioma (45.45 %) was the most commonly observed histological type of meningioma. Transitional (24.24 %) was the next common type [Table 4].

Table 1: Showing age and sex distribution of lesions of spinal meninges.

Lesions Of Meninges	Age In Years								Sex		
	00-10	11-20.	21-30	31-40	41-50	51-60	61-70	71-80	Male	Female	Total
Meningioma	1	1	3	15	6	2	3	2	16	17	33
Lipoma	5	7	3	0	1	0	0	0	9	7	16
Lymphoma	0	1	3	0	1	1	0	0	5	1	6
Metastasis	0	0	1	0	0	1	1	0	1	2	3
Epidermoid Cyst	4	6	2	1	1	0	0	0	9	5	14
Dermoid Cyst	1	0	3	2	0	1	0	0	6	1	7

Table 2: Showing level and location of lesions of spinal meninges.

Lesions Of Meninges	Spinal Level					Location		
	Cerv	Cerv-Thor	Thor	Thor-Lumbar	Lumbo-Sacral	Extra Dural	Extra Medullary	Intra Medullary
Meningioma	3	1	21	1	7	8	24	1
Lipoma	1	3	0	0	12	8	8	0
Lymphoma	1	0	5	0	0	4	2	0
Metastasis	0	1	2	0	0	2	1	0
Epidermoid Cyst	1	0	5	2	6	7	5	2
Dermoid Cyst	0	0	0	1	6	5	2	0

Table 3: Showing lesions of spinal meninges.

	Number Of Cases	Percentage
A. Neoplastic		
Benign- (49)		
Meningioma	33	37.50 %
Lipoma	16	18.18 %
Malignant (10)		
Malignant Melanoma	01	1.13 %
Lymphoma	06	6.81 %
Metastasis	03	3.40 %
B.Non-Neoplastic		
Cystic- (28)		
Epidermoid Cyst	14	15.90 %
Dermoid Cyst	07	8.02 %
Neurenteric Cyst	03	3.40 %
Tarlov Cyst	02	2.27 %
Arachnoid Cyst	01	1.13 %
Ependymal Cyst	01	1.13 %
Inflammatory	01	1.13 %
Total	88	100 %

Table 4: Showing histological types of meningioma.

Types Of Meningioma	Number Of Cases	Percentage
Psammomatous	15	45.45 %
Transitional	8	24.24 %
Meningothelial	3	9.09 %
Fibroblastic	2	6.07 %
Microcystic	3	9.09 %
Clear Cell	1	3.03 %
Atypical	1	3.03 %
Total	33	100 %

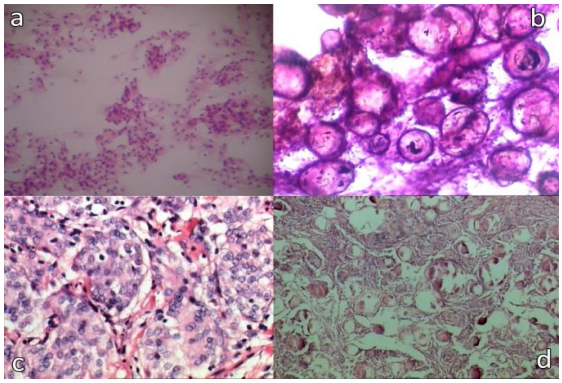

Figure 1a: Meningothelial meningioma- squash smear showing meningothelial cells having round or oval nuclei with stippled chromatin and typical whorl formation. (H&E, X100). b: Meningothelial meningioma-lobules of meningothelial cells with round nuclei, delicate chromatin and light pink cytoplasm (H&E, X400) c: Psammomatous meningioma- squash smear showing numerous psammoma bodies. (H&E, X400). d: Psammomatous meningioma-numerous calcify psammoma bodies and meningothelial component (H&E, X 40)

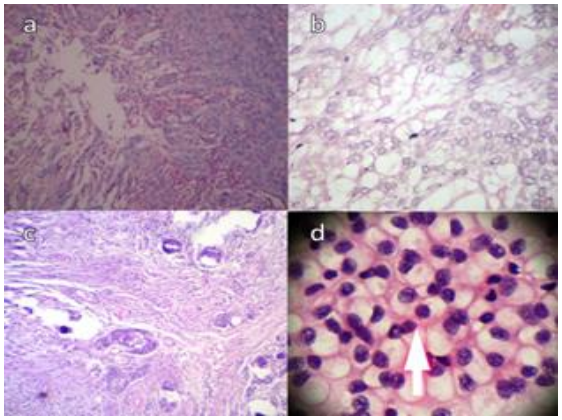

Figure 2a: Transitional meningioma-shows transition from meningothelial to fibrous patterns (H&E, X100). 2b: Microcystic meningioma- showing characteristic intercellular microcystic spaces (H&E, X100). 2c: Fibroblastic meningioma- spindle shaped cells forming intersecting fascicles and psammoma bodies. (H&E, X40). 2d: Clear cell meningioma- sheets of polygonal cells with clear cytoplasm. (H&E, X400)

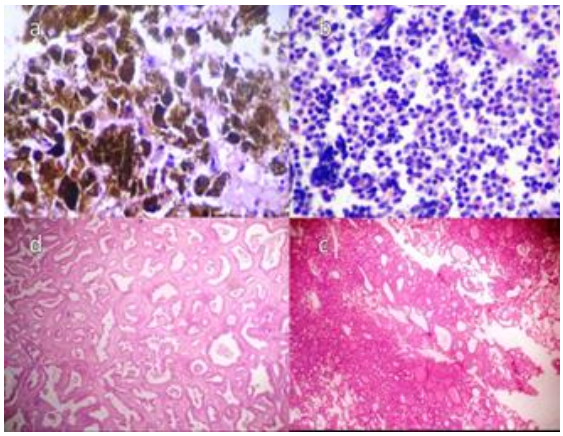

Figure 3a: Malignant melanoma- sheets of large pleomorphic cells with bizarre nuclei with abundant melanin in cytoplasm. 3b: Lymphoma- monotonous population of malignant lymphoid Cells. (H&E, X100). 3c: Metastatic Adenocarcinoma showing glandular pattern, papillae formation and infiltrating into stroma. (H&E, X 40). 3d: Metastatic follicular thyroid carcinoma- showing micro and macrofollicles filled with colloid. (H&E, X 40)

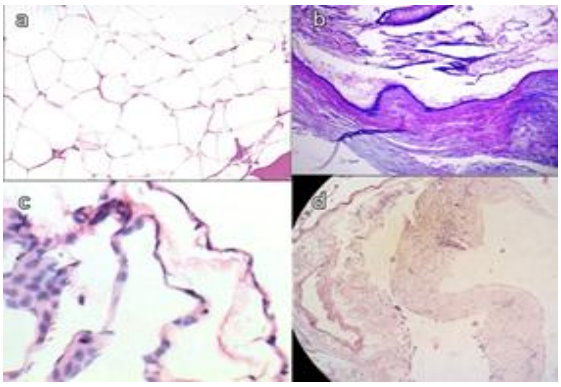

Figure 4a: Lipoma-sheets of benign adipocytes separated by thin fibrovascular septae. (H&E, X400). 4b: Epidermoid cyst- cyst comprised of fibrous wall lined by keratinizing squamous epithelium. (H&E, X40). 4c: Arachnoid cyst- delicate connective tissue with covering of meningothelial cells. (H&E, X 400). 4d: Tarlov cyst-space formation between perineurium and endoneurium. (H&E, X 40)

DISCUSSION

88 cases of spinal meningeal lesions were found, of these 59 were neoplastic and 29 non-neoplastic. In neoplastic lesions 49 (55.68 %) were benign and 10 (11.34 %) malignant. In benign lesions 33 cases (37.50 %) were of meningioma and 16 (18.18 %) of lipoma.

Meningioma was the commonest tumor amongst lesions of spinal meninges. 33 cases of meningioma constituted 18.85 % of spinal tumors. Engelhard et al,[1] Hufana et al,[2] Mwang'ombe et al and Solero et al,[3,4] also noted incidence of meningioma in between 15 % to 25 % of the spinal tumors.

Spinal meningiomas were found in the age group of 31 to 50 years which correlated with the studies of Ruberti et al and Traul et al,[5,6] who noted their predominance in 3rd and 4th decades. Meningiomas showed equal ratio of males and females (1.06:1). The documented studies of Chamberlain et al,[7] Parsa et al,[8] Traul et al,[6] Engelhard et al 1and Ruberti et al,[5] showed meningiomas predominantly in females.

Thoracic segment (63.63 %) of spinal cord was most common site for meningiomas. Various authors Ciurea et al,[9] Chamberlain et al,[7] Parsa et al,[8] and Traul et al,[6] had similar observations suggesting thoracic segment as the commonest site in 51 % to 80 % of cases.

Of the 33 meningioma cases 24 (72.72 %) were intradural extramedullary in location. Ciurea et al,[9] Chamberlain et al,[7] and Parsa et al,[8] also reported

the incidence of intradural extramedullary location in 90% of cases.

Histological examination of meningioma displayed psammomatous meningioma (15) [Figure 1 c and d], transitional meningioma (8) [Figure 2a], 3 each meningothelial [Figure 1 a and b] and microcystic meningiomas [Figure 2b], fibroblastic (2) [Figure 2c] and 1 case each of clear cell [Figure 2d] and atypical meningioma. Similar findings were observed by Schaller et al,[10] and Traul et al.[6]

A rare case of clear cell meningioma located in lumbar region was found. Chao et al,[11] also reported one case of clear cell meningioma.

Immunohistochemical examination was performed in 2 cases of meningiomas. They showed positivity for vimentin and epithelial membrane antigen. Vimentin showed cytoplasmic staining pattern and EMA stains cytoplasm and plasma membrane.[12]

16 cases of lipoma [Figure 4a] were encountered constituting 9.14 % of the spinal tumors. According to Kane et al,[13] incidence of spinal lipoma ranges from 1 % to 11 %. Lipomas were seen in children and young population. 75 % of lipomas occurred in first two decades and males were affected slightly more than females. 75 % of lipomas were seen in lumbosacral region and equally distributed in intradural and as well as extradural compartment. Traul et al,[6] Singh et al,[14] and Ruberti et al,[5] observed younger age, lumbosacral region predominance and equal gender incidence for lipomas.

Out of 10 malignant lesions of meninges, 6 were lymphomas [Figure 3b], 3 cases of metastasis [Figure 3 c and d] and 1 case of malignant melanoma [Figure 3a]. Lymphomas were seen in 6 cases forming 3.42 % of all spinal tumors. Engelhard et al,[1] found incidence of lymphoma as 4.2 % which correlated with our study. They were found in 3rd to 6th decades, males affected more than females in 5:1 ratio. 66 % were located in thoracic segment and extradural compartment. Paul et al[15] Kapoor et al,[16] and Lim et al,[17] also observed male preponderance, occurrence in 4th to 5th decade and thoracic level for lymphoma cases. Immunohistochemical examination showed positivity for CD-45 (LCA) which ruled out other small round cell tumors. LCA showed membrane staining pattern.[12]

Metastatic tumors were rare as compared to primary spinal tumors and accounted for 1.71 % of all spinal tumors. This correlated with the study of Traul et al,[6] who noted their incidence as 5 % and Perrin et al,[18] who observed them as rare lesions. They were seen in 3rd to 7th decades and M: F ratio was 1: 2. Metastatic tumors were located in thoracic region. Klimo et al,[19] and Sciubba et al,[20] also documented thoracic site for metastasis in 70 % of cases. In 2 cases metastasis were found in extradural compartment. Botterel et al,[21] and Perrin et al,[18] observed metastasis in extradural location in 90 % of cases. Histological study showed 2 cases of thyroid carcinoma [Figure 3d] and 1 case of Adenocarcinoma [Figure 3c].

A rare case of malignant melanoma was seen in 44 year male, in lumbosacral region and intradural in location. Kounin et al,[22] also documented melanoma as extremely rare case. Immunohistochemical examination showed positivity for HMB-45 by cytoplasmic staining pattern and Ki-67 index was 10 %. Ki-67 showed nuclear immunoreactivity. The malignant melanoma should be distinguished from benign melanocytoma. The distinguishing feature was Ki-67 index which was < 2 % in melanocytoma and > 8 % in melanoma.[9]

Of the 29 non-neoplastic lesions of meninges 28 were cystic and 1 inflammatory. In cystic lesions 75 % were epidermoid [Figure 4b] and dermoid cysts. The incidence was 0.9 % of all CNS tumors which correlated with the study of Traul et al,[6] who documented their incidence as 1 %. These cysts were seen in first 3 decades of life with M: F ratio of 2.5:1. Lumbosacral region and extradural location was observed for these cysts. The documented studies of Traul et al,[6] Filho et al,[23] and Guidetti et al,[24] also observed their occurrence in first two decades of life and lumbosacral region for epidermoid and dermoid cysts.

Other cystic lesions were 3 cases of neurenteric cysts (3.40 %), 2 tarlov cysts (2.27 %) [Figure 4d] and 1 case each of arachnoid cyst [Figure 4c] and ependymal cyst (1.13 %). Neurenteric cysts accounted for 1.71 % of spinal tumors. Similar was the observation of Fortuna et al,[25] who documented incidence of neurenteric cysts in 0.7 % to 1.3 % of spinal tumors. 1 case of ependymal cyst was found and accounted for 0.57 % of spinal tumors. It was in thoracic region and intramedullary compartment. Fortuna et al,[26] also reported ependymal cysts in 0.4 % of all primary spinal tumors. Iwahashi et al,[27] observed ependymal cysts with predilection for thoracic compartment. Overall spinal cysts were rare and had been reported as case reports only.

CONCLUSION

Considering the rarity of spinal meningeal lesions,a multidisciplinary approach with the combination of clinical, radiological, and histopathological features forms the basis of its diagnostic approach .

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REFERENCES

1. Engelhard HH, Villano JL, Porter KR, Stewart AK, Barua M, Barker FG et al. Clinical presentation, histology, and treatment in 430 patients with primary tumors of the spinal cord, spinal meninges, or cauda equina. J Neurosurg Spine 2010; 13:67–77.
2. Hufana V, Tan JS, Tan KK. Microsurgical treatment for spinal tumours. Singapore Med J 2005; 46(2): 74-77.
3. Mwang'ombe MJ, Ouma MB. Spinal cord compression due to tumours at Kenyatta national hospital, Nairobi. East African Medical Journal July 2000; 77(7): 374-376.
4. Solero CL, Fornari M, Giombini S, Lasio G, Oliveri G, Cimino C et al. Spinal meningiomas: review of 174 opened cases.Neurosurgery 1989; 25:153–60.
5. Ruberti R.F. Intraspinal tumour in the eastern African. AJNS1994; 13(1):1-4.
6. Traul DE, Shaffrey ME, Schiff D. Spinal-cord neoplasms—intradural neoplasms. Lancet oncol 2007; 8: 35–45.
7. Chamberlain MC, Tredway TL. Adult primary intradural spinal cord tumors: A review. Curr Neurol Neurosci Rep 2011; 11:320–328.
8. Parsa AT, Lee J, Parney IF, Weinstein P, McCormick PC and Ames C. Spinal cord and intradural-extraparenchymal spinal tumors. Current best care practices and strategies. Journal of Neuro-Oncology 2004; 69: 291–318.
9. Ciurea AV, Tascu Al, Palade CL. Microsurgical approach in a thoracic meningioma in Elderly. Case report. Romanian Neurosurgery (2010) XVII 1: 81 – 87.
10. Schaller B. Relationship between Histological Subtypes and Surgical Outcome Journal of neuro-oncology; 75 (2):157-161.
11. Cho CB, Kim JK, Cho KS, Kim DS. Clear cell meningioma of cauda equina without dural attachment. Korean Neurosurg Soc 2003; 34:584-585.
12. Louis DN, Ohgaki H, Wiestler OD, Cavenee KW. WHO classification of tumours of the central nervous system. 4th ed; IARC: 2007.
13. Kane PJ, Mandy W, Singh A. Spinal intradural tumors: part II Br J Neurosurg 1999; 13:558-563.
14. Singh A, Gupta V, Singh H, Chand K. Nondysraphic intradural spinal lipoma..J Pediatr Neurosci 2009 Jan-Jun; 4(1): 55–56.
15. Paul TR, Sundaram C, Reddy A. Hodgkin's lymphoma presenting as extradural spinal cord compression. JAPI Oct 2003; 51:960-962.
16. Kapoor R, Kumar V, Sharma SC. Primary extradural non-Hodgkin's lymphoma. JK Science 2006; 8:45-8.
17. Lim CC, Chong BK. Spinal epidural non-Hodgkin's lymphoma: case reports of three patients presenting with spinal cord compression. Singapore Med J 1996; 37:497-500.
18. Parrin RG, Livingston KE, Aarabi B. Intradural extramedullary spinal metastasis. J Neurosurg 1982; 56: 835-37.
19. Klimo P, Schmidt M. Surgical management of spinal metastases. The oncologist 2004; 9:188-196.
20. Sciubba DM, Petteys RJ, Dekutoski MB, Fisher CG, Fehlings MG, Ondra SL et al. Diagnosis and management of metastatic spine disease. J Neurosurg Spine 2010; 13:94–108.
21. Botterell EH, Eitzgerald GN. Spinal compression produced by extradural malignant tumors. Can Med Assoc J 1959; 80: 791-96.
22. Kounin GK, Romansky KV, Traykov LD, Shotekov PM, Stoilova DZ. Primary spinal melanoma with bilateral papilledema. Clin Neurol Neurosurg 2005; 107: 525-527.
23. Filho FO, Duarte F. Intraspinal dermoid and epider¬moid tumors. Arq Neuropsiquiatr 1971; 29:26-48.
24. Guidetti B, Gagliardi FM. Epidermoid and dermoid cysts. Clinical evaluation and late surgical results. J neurosurg 1977; 47:12-18.
25. Fortuna A, Mercuri S. Intradural spinal cysts. Acta Neurochir (Wien) 1983; 68:289–314.
26. Fortuna A, Palma L, Mercuri S. Spinal neuroepithelial cyst: Report of two cases and review of literature. Act Neurochir 1978; 45:177-185.
27. Iwahashi H, Kawai S, Watabe Y, Chitoku S, Akita N, Fuji T, et Al. Spinal intramedullary ependymal cyst: a case report. Surg Neurol 1999; 52: 357-361.

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