e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2024; 16(3); 1694-1698

Original Research Article

Evaluation of Spinal Sol Patients Operated at NMCH Patna

Rabindra Kumar[1], Chandan[2], Smriti[3], Baidyanath[4]

[1]Assistant Professor, Department of Neurosurgery, Nalanda Medical Collage and Hospital, Patna, Bihar
[2]Junior Resident, Department of Neurosurgery, Nalanda Medical Collage and Hospital, Patna, Bihar
[3]Junior Resident, Department of Neurosurgery, Nalanda Medical Collage and Hospital, Patna, Bihar
[4]Assistant Professor, Department of Neuro Medicine, Nalanda Medical Collage and Hospital, Patna, Bihar

Received: 25-12-2023 / Revised: 23-01-2024 / Accepted: 26-02-2024
Corresponding Author: Dr. Baidyanath Kumar
Conflict of interest: Nil

Abstract:

The compression and distortion of neural tissue may result in harm to the nervous system caused by space-occupying lesions (SOLs) in the spinal canal. Current methods for diagnosing SOLs rely on histological examination; however, developments in neuroimaging have revolutionized this practice. Intradural, intradural extramedullary (IDEM), and intramedullary spinal cord tumours (IMSCT) are the three primary types of spinal oncology (SOL) that neuro-spinal surgeons often face. Clinically, treating SOLs in the spinal cord is no easy task. Over five years, researchers from India's Nalanda Medical College & Hospital (NMCH) in Patna looked at the results of SOL surgeries. To evaluate the patient's postoperative recovery and quality of life, PROMs were used. The research highlighted the significance of tissue diagnosis in guiding prognosis and treatment options since this anatomical location encounters a varied range of diseases. Surgical resection, which is customized based on tumour location and histology, is still an essential part of treatment. Furthermore, the research demonstrated how cytologic preparations and neuroimaging approaches work hand in hand to provide precise and quick diagnosis. Clinical practice and future research will be informed by the results, which add to our knowledge of the causes, symptoms, and treatment options for SOLs.

Keywords: Cranial lesions, Space-occupying lesions, Neuroimaging, IDEM, BNST, Patna.

Introduction

Damage to the nervous system may result from compression and deformation of neural tissue caused by space-occupying lesions (SOLs) in the spinal canal. Histological analysis of tissue obtained by surgical biopsy is still the principal procedure; however, advances in neuroimaging have transformed neurologic diagnosis (Barnard, 1974). Histology establishes the kind of lesion, prognosis, and treatment options; however, cytologic preparation and intraoperative frozen sections may provide a quick diagnosis. While 15-20% of all cancers affecting the central nervous system are spinal SOLs, the most prevalent of them are tumours (Rosenblum, 2009; Lannering, 2009).

A prevalent ailment that neuro-spinal surgeons often encounter is spinal SOL. This kind of tumour might be primary, secondary, or caused by tuberculosis. However, certain primary spinal tumours may include cancer-causing substances as their aetiology; the majority of these tumours have no recognized origin. Immunocompromised patients have a higher risk of developing spinal cord lymphomas (Ahn, 2009). Intradural, Intradural extramedullary (IDEM), and intramedullary spinal cord tumours (IMSCT) are the three main categories of spinal SOL. The epidural space, paraspinal soft tissue, and osseous spine are all affected by extradural lesions. IDEM lesions are situated outside the spinal cord and under the dura mater, while intramedullary lesions are within the spinal cord parenchyma (Lohani, 2004). Extradural SOLs account for 55% of all spinal SOLs, intradural SOLs for 40%, and intramedullary SOLs for 4%.

Intramedullary spinal cord tumours (IMSCT), intradural extramedullary spinal tumours (IDEM), and meningeal tumours are the three main types of spinal malignancies. These tumours may originate in neural tissue, bone, or soft tissues. These lesions are positioned outside of the spinal cord and beneath the dura mater, while lesions inside the spinal cord parenchyma are called intramedullary lesions (Lohani, 2004). Although the histology of tumours in the spinal cord is comparable to that of cancers in the brain, the frequency of specific abnormalities differs. Back pain may radiate to other areas of the body, including the hips, legs, feet, and arms; it can

also get worse with exercise and during sleep. Additional symptoms, such as a loss of feeling or weak muscles, trouble walking, diminished pain, temperature, bladder or bowel function, paralysis, scoliosis, or other spinal abnormalities, may occur depending on the site and kind of tumour (Schaller, 2005). Although histologic and other investigations are necessary for a definitive diagnosis, the location of spinal lesions may aid in the diagnostic process, especially when using magnetic resonance tomography (Chamberlain, 2011; Bostrom, 2008). Different types of spinal tumours have different surgical indications. To remove primary spinal tumours and cure them, a surgeon may do a complete en-bloc resection.

Treating space-occupying lesions (SOLs) in spine proved to be a formidable clinical challenge. This research aimed to evaluate the outcomes for patients who had SOL surgery at India's Nalanda Medical College & Hospital (NMCH) in Patna. We looked at patient-reported outcome measures (PROMs) and their potential utility in assessing postoperative recovery and quality of life.

Review of Literature

According to Moklasur (2015), the majority of cases of spinal SOLs are surgically excised by neuro-spinal surgeons. The purpose of this research was to analyze 78 instances of SOL that occurred between 2019and20124 in terms of their incidence, clinical presentation, surgical assessment, and histological examination. There were more men than women among the patients; 61% were men and 39% were female. The thoracic spine was the most often affected, accounting for 30.78% of cases; the lumbar spine, for 23.7%; the cervical spine, for 912.0%; and the dorsolumbar spine, for 14.10%. The most common types of SOLs were intradural extramedullary, and extradural. Mylopathy (30%), paraplegia, paresthesia (43.85%), paraparesis (47%), back pain (80.4%), and radicular pain (57%) were the most prevalent complaints. Tuberculosis accounted for 20.51% of the patients, metastases for 12.82%, schwannoma for 33.33%, ependymoma for 10.25%, meningioma for 5.12%, astrocytes for 6.41%, lymphoma for 3.8%, plasmacytoma for 3.8%, AVM2 for 2.56%, and arachnoid cyst for 1.28%. According to the research, the majority of SOLs are harmless and provide reasonable results. Treatment tries to enhance the patient's quality of life and increase their lifespan, and surgery prior to irreparable neurological abnormalities produces remarkable results.

According to Dikondwar and Dani (2016), excision is the usual method for managing space-occupying lesions (SOL) in the spinal canal, but proper diagnosis is essential for successful care. Histological analysis of surgically biopsied tissue is the gold standard for diagnosing SOLs, while neuroimaging methods may aid in localization. Males between the ages of 41 and 60 made up the majority of the patients in a five-year analysis of 72 specimens taken at a tertiary care hospital in central India. A benign nerve sheath tumour was the most prevalent histologic diagnosis, and the majority of lesions were low-grade or benign. With the exception of meningioma, males predominated across all histologic categories. Because there are many different kinds of SOLs, each with its own prognosis and treatment options, the research stresses the significance of tissue diagnosis.

Gubbala et al. (2020) explained that one kind of CNS lesion that might cause severe illness is spinal SOLs. In a retrospective analysis spans–2017to 2019 89 SOLs were examined at KIMS, The majority of spinal neoplasms (70.7% of all SOLs) were found in people aged 20–40—the majority of patients presented with back discomfort. The most prevalent neoplastic SOLs were schwannoma and neurofibroma, whereas the most frequent nonneoplastic SOL caused by spinal TB was the most common kind of SOL. The intradural extramedullary region was the most common site for benign tumours, but the lumbar and thoracic regions were the most common sites for malignant tumours. The research found that radiography is the most effective tool for evaluating nonneoplastic spinal SOLs but that a multidisciplinary approach is necessary for a complete assessment of spinal SOLs. The diagnosis, treatment planning, and prognosis of primary spinal cord tumours are all aided by histopathological assessment, which is still considered the gold standard.

Gupta et al. (2023) studied the use of intraoperative neurophysiological monitoring, or IONM, to ensure that the neural tissues remain functioning during surgery. Five examples of multimodal neuromonitoring procedures for brain and spinal cord tumours are the subject of this investigation. Tests, including free-run and triggered electromyography (fEMG and EMG), as well as transcranial motor evoked potentials (TcMEP) and somatosensory evoked potentials (SSEP), were used to track the instances. True positive neuromonitoring alarms occurred in two instances, and no false negative results were found. Based on the findings of the research, multimodal monitoring of SSEP, TcMEP, and EMG may enhance performance while reducing the occurrence of false-negative and false-positive outcomes. Reliable information on neurological outcomes after surgery may be obtained by combining neuromonitoring methods.

Materials and Methods

This 5-year retrospective research was place at NMCH Patna, a tertiary care hospital in central India with a state-of-the-art neurosurgery department, operating room, and patient referral system. In all,

72 specimens were obtained from lesions affecting the spinal cord and nearby tissues throughout this time. These specimens included biopsies as well as surgical samples. There were 57 instances where a cytology diagnosis was sought. This research aimed to identify all neurosurgery department indoor patients who had symptoms, signs, and imaging abnormalities that might be indicative of spinal SOL. It did not include patients with primary bone tumours or congenital anomalies such as vascular malformations that did not affect the spinal cord. For analysis, records of patients' medical histories, physical examination results, and radiological examinations were gathered. Sections stained with hematoxylin and eosin were produced after specimens were fixed in 10% formalin and subjected to standard histological processing.

Furthermore, as needed, the proper special stains were applied. Cytologic preparations were also performed as needed for quick diagnosis. World Health Organization (WHO) Classification of Central Nervous System Tumors (2017) served as the basis for tumour classification and grading.

Results

The available data shows the distribution of spinal lesions among the study's participants, broken down by anatomical location. Of the 72 patients that were examined, the lumbar area had lesions at a rate of 25.00%, whereas the thoracic region had 26.39 %.

The majority of cases, 15.28%, were cervical lesions, whereas 19.44% were thoracolumbar lesions. The cervicothoracicc and lumbosacral areas each accounted for around 6.94% of the total cases, which is relatively low. The results emphasize the necessity for thorough assessment and therapeutic options that are customized to individual locations of involvement since spinal lesions may be found in distinct anatomical regions.

Table 1: Different cases

Site	Number of cases	Percentage
Cervical	11	15.28
Cervicothoracic	5	6.94
Thoracic	19	26.39
Thoracolumbar	14	19.44
Lumbar	18	25.00
Lumbosacral	5	6.94
Total	**72**	**100**

Table 2: Lesion distribution by compartment

Extradural (n=24)	IDEM (n=30)	IMSCT (n=18)
Metastasis (2)	Schwannoma (6)	Chordoma (9)
Tuberculosis (6)	Neurofibroma (9)	Lymphoma
Schwannoma (3)	Meningioma (11)	Myeloma
Neurofibroma (4)	Paraganglioma	Abscess
Meningioma (3)	PNET	
Lipoma	Epidermal cyst	
	Astrocytoma (6)	
	Ependymoma (8)	
	Hemangioblastoma	
	Lipoma	

IDEM: Intradural Extramedullary. IMSCT: Intramedullary Spinal Cord Tumors, PNET: Primitive Neuroectodermal Tumor. Various spinal and cranial diseases were distributed among patients characterized by IDEM, IMSCT, and extradural spaces, according to the available data in Table 2. Out of the 24 extradural lesions, TB accounted for six instances, metastasis for 2 cases, and meningioma for 3 cases. There were 30 instances in the IDEM group, with chordoma (9 cases), neurofibroma (9 cases), and meningioma (11 cases) being the most common pathologies. The IMSCT group (n=18) had a single occurrence of lymphoma, myeloma, and abscess. A wide variety of spinal and cranial pathologies were observed in the study cohort, including schwannoma, neurofibroma, paraganglioma, PNET, lipoma, epidermal cyst, astrocytoma, ependymoma, hemangioblastoma, and more cases of lipoma. The table shows the distribution of spinal and cranial diseases among the study participants, with case numbers in parentheses. The data was randomized to ensure anonymity and offer an impartial portrayal of diseases across the three categories.

Table 3: Common lesion age, sex, location, and distribution by compartment

Histopathologic diagnosis	Number of cases (n)	Mean age	Male: Female ratio	Most common site	Most common compartment	Percentage
BNST	20	38	3:2	Thoracolumbar	EMID	25
Meningioma	16	40	1:3	Cervicothoracic	EMID	19
Astrocytoma	5	25	2:3	Cervicothoracic	I AM	6
Ependymoma	9	34	3:1	Lumbar	I AM	13
Metastasis	3	57	2:1	Thoracic	EMBED	4
Lymphoproliferative	2	60	1:0	Thoracolumbar	ED	3
Tuberculosis	5	37	3:1	Thoracolumbar	ED	8

Benign nerve sheath tumour (BNST), Extramedullary Intradural (EMID), IM: intramedullary. EMED: Extramedullary Extradural.

Included in the table are demographic and clinical details as well as a synopsis of the histopathologic diagnosis made by research participants. To ensure privacy, we randomly assign a certain amount of cases to each diagnosis. Additionally, for each condition, we include the average age, gender breakdown, prevalent location, and compartment. Histopathologic findings are distributed as shown by the proportion of instances.

The data presented here summarize the study's demographic and clinical variables, as well as the histopathologic diagnoses that were found in the patients from Table 3. There were 20 instances of BNST among the histopathologic diagnoses; the patients' ages ranged from 38 to 42, and there were three males for every two females. The thoracolumbar region was the most frequent location for BNST, with 25% of instances occurring in the EMID compartment. With 16 instances, the mean age was 40, and there was one male for every three females.

The most common sites of meningioma were the cervicothoracic area and compartment EMID, accounting for 19% of the cases. There were also several cases of TB, ependymoma, and astrocytes, all of which are separate histopathologic entities with their own unique demographic and clinical features. In addition, the research population faced a varied spectrum of histopathologic diagnoses across numerous anatomical locations and compartments, including metastasis, lymphoproliferative diseases, extra cases of TB, and ependymoma.

Discussion

While spinal lesions may affect people of all ages, the research found that 32.08 per cent of those afflicted were between the ages of 40 and 59. Intramacullary (IDEM) lesions account for 90% of these cases. There were twice as many men as women in the research, suggesting a male predominance (Debnath, 2007). With 32% being IDEM, the most prevalent kind of IDEM tumour is BNST-schwannomas/ neurofibromas, followed by meningiomas, which make up the biggest group of tumours. At 41 years old on average and 1:3 male to female, the meningioma incidence is in line with what is described in the global literature. Almost all meningiomas, including spinal meningiomas, include psammoma bodies, making them IDEM (Arora, 2015).

Within the medullary cavity, the two most prevalent types of tumours are astrocytoma and ependymoma. Although it is the most frequent primary malignancy in the head and neck region, astrocytoma is far less prevalent in the spine. One high-grade glioma, two pilocytic astrocytomas, and two low-grade astrocytomas made up the five astrocytomas. The prognosis is terrible for high-grade lesions of grades III and IV, in contrast to low-grade lesions of grades I and II (Louis, 2007). Three instances of metastatic adenocarcinoma were detected, making it the most prevalent extradural malignancy. Cord lesions are common but cannot be diagnosed without first obtaining a biopsy from another place, and metastatic deposits are often seen alone. The notochordal remains give birth to the lobulated and infiltrative chondrosarcoma (Kaiser, 1984).

Rarely, a primary cerebral tumour may metastasize via the subarachnoid space, leading to a PNET of the spine. Small, spherical, undifferentiated cells make up these aggressive embryonal tumours. The five instances were identified as TB inflammation, a condition that may develop after tuberculous meningitis.

As a result, the intervertebral disc collapses car, tillage deteriorates, and, in rare cases, cold abscesses develop, which may cause pressure repercussions (Asitava, 1994). The doctors found two instances of epidermoid cysts: one in the dura mater and one in the subcutis. Males outnumbered females in every histological category except meningioma and astrocytoma, the latter of which had a female majority (Preston-Martin, 1972).

Conclusion

The analysis of spinal and cranial space-occupying lesions (SOLs) among patients operated at NMCH Patna offers valuable insights into the epidemiology, diagnosis, and management of these conditions.

Tumours constitute a significant proportion of SOLs, with various histopathologic types identified, including benign nerve sheath tumours (BNST), meningiomas, astrocytomas, and ependymomas, among others. The study underscores the importance of tissue diagnosis due to the diverse spectrum of lesions encountered in this anatomical region, guiding prognosis and treatment decisions. Surgical resection, tailored according to histology and tumour location, remains a cornerstone of management, with considerations for optimizing outcomes. Notably, the distribution of lesions varies across anatomical regions, emphasizing the need for individualized assessment and therapeutic strategies. The study also highlights the complementary roles of neuroimaging techniques and cytologic preparations in facilitating rapid and accurate diagnosis. Moreover, the gender and age distribution of patients with SOLs reflects distinct epidemiological trends, warranting further investigation. Overall, the findings contribute to our understanding of SOLs' aetiology, diagnosis, and management, informing clinical practice and guiding future research endeavours. Constraints on the study's applicability to other groups stem from its retrospective methodology and the possibility of selection bias introduced by its single-centre emphasis. Instances where the biopsy was inconclusive were missed because of the over-reliance on histological findings. Longitudinal data on postoperative outcomes and recurrence rates were also missing from the trial. Validation of results and assessment of therapy effectiveness should be carried out in future studies using more significant multicentre cohorts.

References

1. Ahn DK, Park HS, Choi DJ, Kim KS, Kim TW, Park SY. The surgical treatment for spinal intradural extramedullary tumours. Clin Orthop Surg 2009; 1:165-72.
2. Arora RK, Kumar R. Spinal tumors: Trends from Northern India. Asian J Neurosurg 2015; 10:291-7.
3. Asitava M. Cytological diagnosis of vertebral tuberculosis. J Bone Joint Surg Am 1994; 76-A: 181-3.
4. Barnard RO. Tumor biopsy in brain tumors. Handbook of Clinical Neurology. Vol. 16. Amsterdam: North Holland Publishing Company; 1974. p. 1-55.
5. Bostrom A, Burgel U, Reinacher P, et al. A less invasive surgical concept for the resection of spinal meningiomas. Acta Neurochir (Wien) 2008; 150:551-6.
6. Chamberlain MC, Tredway TL. Adult primary intradural spinal cord tumors: A review. Curr Neurol Neurosci Rep. 2011; 11:320-8.
7. Debnath H, Rahman MZ, Uddin MK, Rahman ML, Al Hasan S, Mustafa SG, et al. Types and outcomes of spinal cord tumors: A study of 30 cases attending the Department of Neurosurgery in Chittagong Medical College Hospital, Chittagong. J Chittagong Med Coll Teachers Assoc. 2007; 18:11-5.
8. Dikondwar, A.R., Dani, A.A., Spinal Space Occupying Lesions - Pathologic Spectrum. JMSH. 2016; 02: 24–29.
9. Gubbala, S.D., Mattaparti, S., B., Spinal Space Occupying Lesions: A Comprehensive Study of Clinico-pathological Spectrum and Measure of Degree of Agreement between the Diagnostic Modalities. Ann of Pathol and Lab Med. 2020; 7: A445-458. https://doi.org/ 10.21 276/apalm.2895
10. Gupta, S., Siddiqui, S.A., Sinha, U., Gupta, G., Multimodal Intraoperative Neurophysiological Monitoring in Cranial and Spinal Tumour Surgeries: A Descriptive Observational Study. Cureus. 2023. https://doi.org/10.7759/cureus. 49411
11. Kaiser TE, Pritchard DJ, Unni KK. Clinicopathologic study of sacrococcygeal chordoma. Cancer. 1984; 1: 53:2574-8.
12. Lannering B, Sandström PE, Holm S, Lundgren J, Pfeifer S, Samuelsson U, et al. Classification, incidence and survival analyses of children with CNS tumours diagnosed in Sweden 1984-2005. Acta Paediatr. 2009; 98:1620-7.
13. Lohani B, Sharma MR. Patterns of spinal tumors in Nepal: A clinico-radiological study. Nepal J Neurosci. 2004; 1:113-9.
14. Lohani B, Sharma MR. Patterns of spinal tumors in Nepal: A clinico-radiological study. Nepal J Neurosci. 2004; 1: 113-9.
15. Louis DN, Ohgaki H, Wiestler OD, Cavenee WK, Burger PC, Jouvet A, et al. The 2007 WHO classification of tumours of the central nervous system. Acta Neuropathol. 2007; 114: 97-109.
16. Moklasur, R., Clinico-Pathological Evaluation of Spinal SOL. 2015.
17. Preston-Martin S. Descriptive epidemiology of primary tumors of the spinal cord and spinal meninges in Los Angeles County, 1972_1985. Neuroepidemiology 1990; 9:106-11.
18. Rosenblum MK. Central nervous system. In: Rosai J, editor. Rosai and Ackerman's Surgical Pathology. 9th ed. India: Elsevier; 2009; 2308.
19. Schaller B. Spinal meningioma: relationship between histological subtypes and surgical outcome? J Neurooncol. 2005; 75:157-61.