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RETROSPECTIVE STUDY OF SPINAL TUMORS – DEMOGRAPHY, HISTOPATHOLOGY, IMMEDIATE SURGICAL OUTCOME IN SOUTH INDIANS

Neurosurgery

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ABSTRACT

Primary spinal tumors are mostly benign neoplasia of the spinal cord, meninges and vertebral column. They are classified into extradural, intradural and extramedullary and intramedullary tumors.

Extramedullary tumors contribute 17.6%, intradural extramedullary tumors 58.8%, and intramedullary tumors 23.5% in our study. Mean age is 43.2 years at the time of diagnosis. Male-female ratio 1:1.9 in our study.

Extramedullary tumors and intradural extramedullary tumors gave excellent results irrespective of their location. Intramedullary tumors at high cervical region had guarded prognosis. Complete resection of intramedullary tumors in other locations gave excellent results.

KEYWORDS

Extradural, Intradural Extramedullary (idem), Intramedullary

INTRODUCTION

Spinal tumors are group of neoplasia producing gradual crippling in humans and even death in few cases if not diagnosed early and treated. But if diagnosed early and treated early, these are conditions which give gratifying results to neurosurgeons.

Majority of spinal tumors are benign, unlike cranial tumors. These tumors are classified into three broad groups:

1. Extradural tumors
2. Intradural extramedullary tumors
3. Intra-medullary tumors.

Some tumors have both extradural and intradural component – Dumbbell tumors. For convenience, we included dumbbell tumors into intradural extramedullary tumors.

Common extradural tumors include:

1. Tumors of vertebrae.

Metastatic tumors.

Common intradural-extramedullary tumors are:

1. Meningiomas
2. Nerve sheath tumors

Common intra-medullary tumors are:

1. Ependymomas
2. Astrocytomas

Pathophysiology of spinal tumors:

1. Space occupying lesions in the spinal canal cause compression of the neural elements results in neurological deficits.

a. Rapidly growing lesions cause severe loss of function as there is no time for the spinal cord to adjust itself.

b. Slow growing lesions produce no symptoms in initial stage. Latter-on they produce compressive myelopathy.

c. The presence of a tumor interferes with the normal movements of the cord, which occur during movements of the spinal column. Such impairment contributes to cord damage. In long standing tumors, there may be gliosis in the spinal cord due to ischemia and recovery may be incomplete despite complete removal of the tumor.

Clinically patients harbouring spinal tumors present with
Pain
Motor deficit
Sensory deficit
Bladder/bowel dysfunction
Respiratory Difficulty in the cases of CVJ location of tumor

Material and Methods:

34 patients with various spinal tumors, who were operated within the period of 2017 Jan-2018 Dec were included in the study. This retrospective study was conducted on patients admitted to Govt. Omandurar Multisuperspeciality Hospital, Chennai. Patients from South India, particularly from allover Tamilnadu, South Andrapradesh, and South Karnataka are feeding population in our hospital. Our hospital is Tamilnadu referral centre in Tamilnadu.

Inclusion Criteria:

All spinal SOLs, at any age.

Exclusion Criteria:

All spinal vascular malformations.
Extradural Pott's lesions with cold abcess.

All patients were thoroughly examined clinically by qualified neurosurgeons. Plain MRI is standard imaging modality in all patients. Contrast MRI, plain CT scan and Xray were employed appropriately. Surgery in through standard posterior midline approach in all cases, except in few. Histopathological examination was done by senior Pathologist, who is experienced in neuropathology.

Results

Out of 34 patients
Extradural tumors- 6 (17.6%)
Intradural- Extramedullary tumors- 20 (58.8%)
Intradural tumors- 8 (23.5%)

Extradural Tumors

Extradural tumors are most commonly arising from vertebral column, primary bone lesions and secondaries from elsewhere, particularly prostate, lung and breast etc. In our study, we had the following distribution of extradural tumors:
Vertebral hemangioma -1 case.
Glomangioma -1 case.
Tuberculous granuloma -1 case.
Secondary from prostate – 1 case.
Plasmocytoma – 1 case.
Neurofibroma – 1 case.

Intradural-extramedullary Tumors

Among intradural-extramedullary tumors, the single most common histopathology is: Schwannoma

Other IDEM are:
Schwannomas – 14 cases
Meningiomas – 2 cases
Filum ependymomas – 2 cases

We have also encountered 2 cases of spinal intradural arachnoid cysts, which are relatively rare.

Among intramedullary tumors, the most common histopatholgy is : Myxopapillary ependymomas of lumbosacral region, which is found in 3 cases.
Other HPE findings in intradural tumors:
Granulomatous lesions (probably tuberculosis) -2 cases.
Epidermoid cyst – 1 case.
Intramedullary Schwannoma – 1 case.

Ependymoma – 2 cases
Grade II Astrocytoma – 1 case and
Intramedullary meningioma – 1 case

Surgical performance
Total Excision : Total excision of tumor achieved in 15 cases of intradural- extramedullary SOLs (75%) , and four cases of extradural SOLs (66.7%) and 6 cases of intramedullary SOLs (75%).

Subtotal Excision is achieved in 2 cases of extradural tumors (33.3%), 2 cases of intradural extramedullary tumors (10%) and one case of Intramedullary SOLs (12.5%) .

Partial Excision achieved 1 case of intramedullary SOLs (12.5%) and 3 cases of IDEM 3 (15%).

Immediate Post-op recovery: All the extradural tumor patients showed improvement in McCormickk scale atleast to one score above preoperative neurological status, with adequate decompression (100%) within one week. Patients harbouring IDEM, also showed similar improvement (90%), except filum ependymomas (myxopapillary ependymomas), who, after adequate decompression and partial excision, remain static in their neurological status. Patients with intramedullary SOLs showed varied response to surgery depending on the (1) location of tumor, (2) extend of resection.

Higher cervical location of intramedullary SOL is associated with poor outcome, irrespective of tumor histopathology (3 out of 8 cases 37.5%). Complete resection is associated with better outcome. But astrocytomas, due to infiltrative nature preclude complete excision, hence had poor prognosis in our study.

Discussion:
Spinal tumors are mostly benign tumors with potential devastating consequences, if not treated early.

Primary spinal cord tumors account for 4 to 10% of all central nervous system tumors [1]. The frequency of spinal neoplasia is 1/10 of cranial neoplasia.

In Western population, the primary spinal tumors occur more frequently in females. Asian studies show slight male preponderance[2,3]. Studies in northern India by Rajnish Kumar et al [4] also showed male preponderance of spinal neoplasia. But in our study, we had female preponderance in all three kinds of spinal neoplasia. We had 1:1.9 male:female ratio.

The mean age of presentation of patients with extra-dural tumors was 38.9 years, for intradural extra medullary tumors was 49.8 years and four intramedullary tumors 41.8 years. Intra-dural extra medullary spinal tumors preferably occurs 40-80 years age group in our study. Extra-dural and intramedullary tumors does not appear to have age predilection in our study.

The most common extradural tumors are primary skeletal tumors arising from vertebrae as a group. Secondaries and neurofibroma each one case had been encountered.

The most common intradural extra medullary tumor is schwannoma in our series. It is the most common spinal neoplasia also (41.18%) in our series. The incidence of spinal meningioma is 5.88% in our series. Spinal nerve sheath tumor:meningioma =7:1 ratio, is in striking contast to other studies. European studies show 1:1 ratio and Asian studies show 3:1 ratio. These differences may be due to small sample population. Two cases of intradural extramedullary meningiomas occurred in female patients only.

Most common intramedullary tumors in our series are ependymomas and Intramedullary granulomatous lesions (25% each).

Table 1 Incidence of primary spinal cord tumors by series

References	Country	No. of cases	Date	NSCTs (%)	Meningioma (%)
Schellinger et al. [5]	USA	3,226	1998–2002	24.4	28.9
Preston-Martin [6]	USA	462	1972–1985	22.3	42.9
Engelhard et al. [7]	USA	430	2000	22.6	24.2
Klekamp and Samii [8]	Germany	1,081	1978–2003	26.9	16.7
Helseth et al. [9]	Norway	415	1955–1986	10.8	46.7
Kaye et al. [10]	Australia	266	1986–1988	32.3	29.7
Ardehali [11]	Iran	108	1962–1986	40.7	33.3
Lalitha and Dastur [12]	India	326	Before 1980	39.9	25.5
Shuangsh and Panyatha [13]	Thailand	120	1956–1973	65.8	14.2
Cheang et al. [14]	Taiwan	92	1988–1995	52.2	15.2
Wen-Qing et al. [15]	China	2,245	Before 1982	49.4	14.7
Suh et al. [16]	Korea	141	1997–1998	39.7	25.5
Kenich Hirano et alss. Our study	Japan South India	678 34	2000–2009 2017-2019	60.6 41.2	11.7 5.9
NSCTs nerve sheath cell tumors					

Table 2 Vertebral level distribution of each type of tumor (%)

Tumor type	Cervical	Cervicothoracic	Thoracic	Thoracolumbar	Lumbar	Lumbosacral	Sacral
Schwannoma	14.7	2.9	14.7	-	44.6	11.8	-
Meningioma	2.9	-	2.9	–	2.9	–	–
Ependymoma	2.9	-	-	2.9	-	-	–
Hemangioma	-	–	2.9	-	-	–	–
Neurofibroma	2.9	-	-	-	-	-	-
Filum Ependymoma	-	-	-	-	-	5.9	-

Table 3 Modified McCormick scale

Grade Modified McCormick scale	
I	Intact neurologically, normal ambulation, minimal dysesthesia
II	Mild motor or sensory deficit, functional independence
III	Moderate deficit, limitation of function, independent with external aid
IV	Severe motor or sensory deficit, limited function, dependent
V	Paraplegia or quadriplegia, even with flickering movement

Table 4 Age distribution of tumors

Age	Extradural	Idem	Intramedullary
Less Than 12	1		
12 to 19		1	3
20 to 39	2	5	1
40 to 59	2	7	1
60 to 79	1	7	3
Mean Age	38.9 Years	49.8 Years	41.8 Years

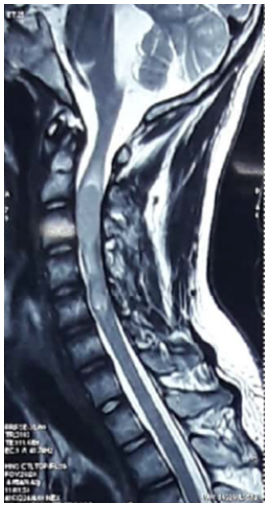
Table 5 Master Chart

S.No	Name	Age	Sex	Diagnosis	Excision	HPE	McCormick score -preop	McCormick score-1 wk postop
1	Pt. 1	56	M	L3 L4 IDEM	COMPLETE	SCHWANNOMA	II	I
2	Pt . 2	55	F	D9D10 IDEM SOL	COMPLETE	SCHWANNOMA	II	I
3	Pt 3	18	M	C2 – C5 IDEM SOL	COMPLETE	SCHWANNOMA	III	II
4	Pt. 4	43	M	C5C6 IDEM	COMPLETE	SCHWANNOMA	II	I
5	Pt. 5	31	F	L2L3 IDEM SOL	COMPLETE	SCHWANNOMA	I	I
6	Pt. 6	34	M	C7T1 IDEM SOL	COMPLETE	SCHWANNOMA	II	I
7	Pt. 7	64	F	D7 D8 IDEM SOL WITH PARAPARESIS	COMPLETE	SCHWANNOMA	II	II
8	Pt. 8	40	F	IDEM C3 – C4	COMPLETE	SCHWANNOMA	II	I
9	Pt. 9	65	F	D3 IDEM	COMPLETE	SCHWANNOMA	II	II
10	Pt. 10	46	F	C3C4 IDEM SOL	COMPLETE	SCHWANNOMA	I	II
11	Pt. 11	70	M	D4D5 IDEM SOL	COMPLETE	SCHWANNOMA	II	II
12	Pt. 12	60	F	L3L4 IDEM	COMPLETE	SCHWANNOMA	I	I
13	Pt. 13	44	F	RECURRENT D5-D12 IDEM	SUBTOTAL	SCHWANNOMA	III	II
14	Pt. 14	63	F	L3 IDEM	TOTAL EXCISION	SCHWANNOMA	I	I
15	Pt. 15	76	F	D10 IDEM	TOTAL EXCISION	TRANSITIONAL MENINGIOMA GR I	I	I
16	Pt. 16	48	F	D5D6 IDEM WITH PARAPARESIS	COMPLETE	MENINGIOMA	IV	II
17	Pt. 17	22	F	D10-L3 CYSTIC SOL	PARTIAL EXCISION	ARACHNOID CYST	I	I
18	Pt. 18	32	M	C7 – D1 CYSTIC SOL	SUBTOTAL EXCISION	ARACHNOID CYST	II	I
19	Pt. 19	26	F	C7 – D2 EXTRADURAL SOL	COMPLETE	TUBERCULOUS GRANULOMA	III	II
20	Pt. 20	68	M	D10 SECONDARIES WITH PARAPARESIS	SUBTOTAL	ADENOCARCINOMA (PROSTATE)	III	I
21	Pt. 21	55	M	D12 VERTEBRAL BODY SOL	COMPLETE	PLASMOCYTOMA	III	II
22	Pt. 22	26	F	L1 L2 EXTRADURAL SOL	COMPLETE	GLOMANGIOMA	I	I
23	Pt. 23	55	F	D7 VERTEBRAL HEMANGIOMA EXTENDING INTO SPINAL CANAL	SUBTOTAL	HEMANGIOMA	III	II
24	Pt. 24	10	F	C1-C2 EXTRADURAL SOL	TOTAL EXCISION	SCHWANNOMA	III	I
25	Pt. 25	46	F	L2L3 INTRADURAL SOL	COMPLETE	MYXOPAPILLARY EPENDYMOMA GR I	III	II
26	Pt. 26	14	F	D12-L1 INTRAMEDULLARY SOL	TOTAL EXCISION	GRANULOMATOUS LESION	III	II
27	Pt. 27	35	F	D12-L2 INTRAMEDULLARY SOL	SUBTOTAL EXCISION	EPIDERMOID CYST	III	II
28	Pt. 28	18	M	C2 – C5 INTRAMEDULLARY SOL	TOTAL EXCISION	SCHWANNOMA	IV	III
29	Pt. 29	65	F	L3-S1 INTRADURAL SOL	PARTIAL EXCISION	MYXOPAPILLARY EPENDYMOMA GR I	III	II
30	Pt. 30	20	F	RECURRENT C4-C7 SOL +LUMBOSACRAL DIFFUSE SOL (? MULTIPLE PRIMARIES)	PARTIAL EXCISION	MYXOPAPILLARY EPENDYMOMA GR I	III	III
31	Pt. 31	55	F	C2-C5 INTRAMEDULLARY SOL	TOTAL EXCISION	MENINGIOMA	EXPIRED	
32	Pt. 32	65	M	C3-C6 INTRAMEDULLARY SOL	TOTAL EXCISION	EPENDYMOMA GR I	EXPIRED	
33	Pt. 33	17	M	D10- L3 INTRADURAL SOL	PARTIAL EXCISION	ASTROCYTOMA GR II	III	III
34	Pt. 34	69	F	D12-L1 INTRAMEDULLARY SOL	TOTAL EXCISION	GRANULOMATOUS LESION	III	I

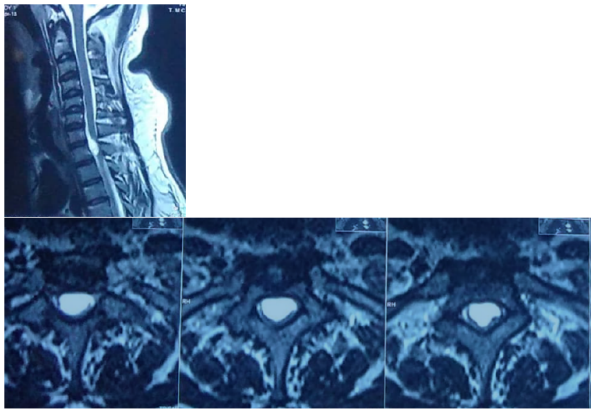
We able to completely resect extradural SOLs in four cases (66.67%). Subtotal resection was done in one case of vertebral haemangioma and in one case of secondary spine (33.33%). We did complete resection in 15 cases out of 20, in the intradural extra medullary tumor group (75%). We able to completely resect 13 cases of schwannoma. In one case of recurrent schwannoma we able to do only subtotal resection. Complete resection was possible in two cases of spinal meningiomas. In the cases of intradural arachnoid cysts, we open the cysts and excise the walls as much as possible. One case of cervico-dorsal arachnoid cyst recurred within three months. In two cases of Intradural myxopapillary ependymomas, we were able to do only partial resection (10%), since the tumor tissue is entangled between nerve fibres, and resection will be associated with extreme mobidity.

Total resection was possible in 75% of cases of intramedullary tumors. In one case of astrocytoma, we were able to do only partial resection (12.5%). We achieved subtotal resection in one case of intramedullary epidermoid cyst (12.5%). Since the cyst wall is adherent with neural elements, we were not able to excise the cyst wall. Marsupialization of the cyst wall was done. There was no recurrence after one year follow-up. Interestingly, we had one case of intramedullary meningioma at C2-C5 region. We did complete excision of the tumor following C1 to C6 laminectomy and occipito-cervica fusion in a 55-year-old female patient. Post operatively, the patient developed respiratory difficulties due to phrenic nerve palsy. In spite of excellent ventilatory care, the patient expired due to respiratory complications and chest infection. One 18-year-old patient with the type 2 neurofibromatosis who was

operated for CP schwannoma in our institution presented with decreasing level of consciousness and respiratory difficulties. He had C2 to C5 intramedullary SOL in MRI. We did complete excision of tumor after C2 to C6 laminectomy. We were able to wean him from ventilator after prolonged effort. His neurological function recovered partially from McCormickk grade IV to grade III.



Picture 1: Intramedullary Schwannoma (NF II)



Picture 2: Intradural Arachnoid cyst

Two cases of intramedullary granulomatous lesions were excised completely. They recovered well in the immediate post-operative period .

Regarding motor improvement, we noticed preoperative good neurological status (McCormickk score I and II) have very good outcome in immediate postoperative period. Extend of resection is important prognostic indicator for neurological recovery and morbidity. Patients with complete resection of tumors made good recovery, even in intramedullary tumors. Patients with high cervical/ cervico-medullary intramedullary lesions had poor prognosis, even with complete resection.

We employed post-operative RT in all cases of malignant tumors like myxopapillary ependymomas, ependymomas, astrocytoma and secondaries. Chemotherapy was adviced for plasmacytoma and spinal secondaries as necessary.

Conclusion

- Male: female ratio of primary spinal tumors in south-indians is 1:1.9 with female preponderance, unlike other Asians.
- Mean age of primary spinal tumors in our study falls at 43.2 years. Intramedullary tumors occur about 10 year older patients than intradural-extramedullary tumors.
- Extradural tumors give excellent immediate neurological recovery with adequate decompression/excision, irrespective of their location.
- Intradural-extramedullary lesions give excellent results, irrespective of their location, depending on the extend of resection.
- Intramedullary tumors have poor prognosis, if they are located in higher cervical region and with incomplete resection.
- Limitation of the study is: small number of patients studied and short duration of study.

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