AN ANALYTICAL STUDY ON THE SURGICAL OUTCOME OF INTRADURAL EXTRAMEDULLARY SPINAL NEOPLASMS

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ABSTRACT Background: Spinal cord neoplasms constitute one of the major aspects of neurosurgical practice. Of the different types based on location, intradural extramedullary neoplasms are the commonest. Most are benign, including nerve sheath tumours and meningiomas.

Methods: A series of 41 cases of intradural extramedullary spinal tumours located at different levels, surgically excised at our centre over a period of 2 years from 2018 are evaluated. Demographic distribution, clinical presentations, radiological aspects, pathological classifications and postoperative clinical status of the patients are being analysed along with the correlation of functional outcome with histopathology.

Results: Age and sex distribution of IDEM tumours were such that there was an almost equal number of males and females, while most belonged to the group of 20-50 years. Lesions were common at the dorsal level followed by the lumbar region. Cervicothoracic junction tumours were rare. Benign nerve sheath tumours viz. schwannoma and neurofibroma were the commonest types followed by meningioma and myxopapillary ependymoma. The mean symptom duration till radiological diagnosis is 8 months. Commonly seen symptoms were backache, limb weakness and radicular pain. Sphincter disturbances were less common. According to modified Frankel grading, the majority of the patients belonged to grades D and E both preoperatively and after surgery. On a visual analogue scale for pain, mean values dramatically decreased over a period of 1 year after surgery. Complications were relatively rare. Mild worsening of neurological functional status was noted in 5 patients. No instances of surgical site infection noted. Neurological worsening was seen only in cases of anteriorly located meningiomas and malignant peripheral nerve sheath tumours.

KEYWORDS Intradural extramedullary spinal neoplasm, Laminectomy, Neurofibroma, meningioma

Introduction

Spinal cord neoplasms constitute one of the major aspects of neurosurgical practice. About 4% of all CNS neoplasms are primary spinal cord tumours. According to the site of occurrence, they can be extradural, intradural extramedullary and intramedullary.

Intradural extramedullary tumours, aka IDEMs, form the major fraction. Mostly benign neoplasms, surgical removal is curative primarily, but recurrences at the same or other levels occur. Nerve sheath tumours and meningiomas are the common IDEM tumours.

The investigation of choice is MRI. Thorough neurological evaluation is mandatory to assess the possible output.

Here, a series of 41 cases of spinal IDEM tumours operated at Government Medical College, Kozhikode, over a span of 2 years is being enlisted. Clinical, radiological and pathological aspects
are discussed.

Materials and methods

This is a retrospective analysis was conducted at Government Medical College, Kozhikode. Forty-one cases of intradural extramedullary neoplasms were operated on in 2018 and 2019. Preoperative evaluation and postoperative follow-up were considered with emphasis on certain aspects.

The posterior approach was used for all lesions. Laminectomy at corresponding levels with microscopic surgical excision was performed on all lesions. Nerve monitoring techniques used. Lesions were mostly excised en-toto and sent for histopathological reporting. Dural closure was done with absorbable sutures. Suction drains were used in all cases. No instrumentation was used in any of the cases for stabilization. Preoperative and postoperative antibiotics were used. In cases showing worsening neurological status in the immediate postoperative period, a short course of steroids was administered.

Demographic data were analysed for the distribution based on age and gender. Clinical records of duration and nature of symptoms were studied, followed by radiological evaluation of axial and sagittal spinal images. Also, patients’ neurologic status before and after surgery was noted on follow-up. This was based on modified Frankel scores. Visual analogue scale-based pain assessment was also made along a scale ranging from 1-10. Finally, Pearson’s Chi-squared test was done for statistical analysis.

Results

Age distribution was studied after dividing the whole population into 3 groups. The groups were as follows: <20 years, 20-50 years and >50 years. The majority of the patients belonged to the second group, followed by the third. Only one patient was younger than 20 years.

There were 20 males and 21 females. Sex distribution was approximately even across two genders. Radiological imaging showed that the commonest site of IDEM tumours was the dorsal level. 15 of the patients had lesions at different levels of the dorsal spine. This was closely followed by the lumbosacral region. 8 cases were cervical, while 5 were along the thoracolumbar junction. One of the patients was noted to have a lesion at the cervicothoracic junction.

Benign nerve sheath tumours, namely schwannoma and neurofibroma, were the commonest pathological variety. A total of 10 neurofibromas and 15 schwannomas were listed. Six cases were reported as meningiomas, all of grade 1, while 5 cases of myxopapillary ependymomas were noted, all in the lumbosacral region. 2 cases of malignant nerve sheath tumours were seen. Rare diagnoses were capillary hemangioma, primitive neuroectodermal tumour and epithelioid granuloma.

The mean duration from onset of symptoms to radiological diagnosis was 8 months.

The symptoms ranged from backache and radicular pain to neurological deficits, including limb weakness, sphincter abnormalities and paraesthesia. Symptoms were not mutually exclusive. The commonest symptom was pain at the level of the lesion. A large number also reported weakness of limbs. Pain radiating to corresponding limbs was also noted. Sphincter abnormalities causing urinary retention were seen in 6 patients.
The neurological status of patients was evaluated based on both motor and sensory aspects. A modified Frankel scoring system was used. No patients presented with grade A or B pre-operatively, while one was graded as grade B following surgical excision.

A visual analogue scale of 1-10 was used to enquire about pain perception at 3 stages, viz. at presentation, immediately after surgery, and a year later. Mean values were as follows.

![Figure 7](image_url)

**Figure 7** Distribution based on visual analog score of pain.

Finally, a few complications were also reported. Worsening of neurological status post-surgery in 5 patients and CSF leak in one of the patients were noted.

Importantly, the worsening of neurological function with respect to the weakness of limbs was observed postoperatively in 3 cases of meningiomas and 2 cases of malignant peripheral nerve sheath tumours. All these lesions were located in the anterior aspect of the cord at different levels.

**Discussion**

Demographic analysis suggests that the majority of the patients with IDEM tumours belong to the working population, aged between 20-50 years. This is significant concerning the preoperative neurological status, symptoms as well as a functional outcome after surgery.

Secondly, sex distribution shows no significant difference between males and females, with 51% males and the remaining females. This was comparable to rates reported by Seppala et al. [6], Fernandes et al. [7], Song et al. [2], and Nittner [5], where the incidence was equal in males and females.

Analysing the spinal levels of tumours radiologically, our series had 36% of dorsal tumours followed by 29% of lumbosacral lesions. 20% of neoplasms were in the subaxial cervical spine. Junctional lesions were very few. Nittner et al. [5] reported more than 50% of IDEM tumours in the thoracic region, with 22% cervical and 22% incidence at the lumbosacral level.

Arora and Kumar [8], Sharadendu Narayan [10], Song et al. [2], Kankane et al. [9], and Ahn et al. [1] reported the incidence of different pathologies in spinal intradural tumours as benign nerve sheath tumours, viz. schwannoma and neurofibroma being the most common, followed by meningioma and thirdly myxopapillary ependymomas involving the filum terminale. Our study makes a similar observation. Two cases of malignant nerve sheath tumours were also noted.

The mean duration of symptoms from onset to radiological diagnosis has been about 8 months. The commonest suggestive clinical feature is backache corresponding to the level of the lesion. Radiation of pain to limbs is seen in only 12 patients, with 6 presenting as dumbbell lesions. Weakness of different grades was noted in 20 patients. Engelhard et al. [12], in a series
### Table 1 Distribution based on histopathology.

<table>
<thead>
<tr>
<th>Tissue Type</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neurofibromas</td>
<td>10</td>
</tr>
<tr>
<td>Schwannomas</td>
<td>15</td>
</tr>
<tr>
<td>Meningioma</td>
<td>6</td>
</tr>
<tr>
<td>Myxopapillary ependymoma</td>
<td>5</td>
</tr>
<tr>
<td>MPNST</td>
<td>2</td>
</tr>
<tr>
<td>Capillary hemangioa</td>
<td>1</td>
</tr>
<tr>
<td>PNET</td>
<td>1</td>
</tr>
<tr>
<td>Epithelioid granuloma</td>
<td>1</td>
</tr>
</tbody>
</table>

### Table 2 Distribution based on symptoms.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backache</td>
<td>28</td>
</tr>
<tr>
<td>Weakness of limbs</td>
<td>20</td>
</tr>
<tr>
<td>Radicular pain</td>
<td>12</td>
</tr>
<tr>
<td>Sphincter disturbances</td>
<td>6</td>
</tr>
<tr>
<td>Paraesthesia</td>
<td>9</td>
</tr>
</tbody>
</table>

### Table 3 Distribution based on Preoperative and Postoperative Frenkel Grades.

<table>
<thead>
<tr>
<th>Frankel Grade</th>
<th>Preoperative</th>
<th>Postoperative</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>B</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>C</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>D</td>
<td>18</td>
<td>21</td>
</tr>
<tr>
<td>E</td>
<td>21</td>
<td>16</td>
</tr>
</tbody>
</table>

### Table 4 Complications following laminectomy and excision for intradural extramedullary spinal neoplasms.

<table>
<thead>
<tr>
<th>Complication</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSF leak</td>
<td>1</td>
</tr>
<tr>
<td>Worsening of neurological status</td>
<td>5</td>
</tr>
<tr>
<td>Surgical site infection</td>
<td>0</td>
</tr>
</tbody>
</table>

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of 430 cases of spinal tumours, reported pain as the commonest symptom followed by neurological deficits. Similar results were reported by Spirig et al. [11]. Sphincter weakness is a rare form of presentation probably because diagnosis is made at a relatively earlier stage following persistent pain and associated deficits.

Neurological deficits in the form of weakness reported by the patient and sensory signs elicited on examination were graded according to the modified Frankel scoring system. Being mostly slow-growing lesions, intradural extramedullary lesions seldom present with complete motor weakness or sensory loss. Frankel grade A patients were not noted in the series. Postoperatively a case of malignant nerve sheath tumour was graded as Grade B. Most cases were categorized as grades D, and E. Postoperative worsening of neurological status by one grade was noted in 4 cases of benign tumours, of which 3 were meningiomas. No statistical significance was derived, stating certainty about the increased probability of worsening weakness after resection of meningiomas.

Frankel grade E denotes the absence of any neurological deficit, sensory or motor, while grade D stands for incomplete sensory loss with a fully preserved motor system. Analysing the functional outcome, grades D and E may be grouped since mild to moderate sensory loss barely affects the functionality of an individual. In this regard, our data shows that the total number of patients graded as grade D and E is not significantly different in the preoperative and postoperative periods. This emphasizes that meticulous surgical removal of intradural extramedullary lesions provide good functional outcomes. Also, pain that compromises the quality of life of an individual shows a significant decrease on the visual analogue scale over one year after surgery.

Complications were relatively rare. CSF leak was seen in a case of myxopapillary ependymoma following inadvertent dural tear during resection. The fistula healed spontaneously in a period of 5 days. No incidence of surgical site infection was reported.

Conclusions

Intradural extramedullary tumours are commonly benign, with benign nerve sheath tumours, meningiomas and myxopapillary ependymomas contributing significantly.

20-50 years is the age group commonly affected, while there is no sex predilection noted.

The commonest level of IDEMs is the dorsal level, followed by the lumbosacral segment.

Local pain is the commonest presenting feature. Weakness is also a significant feature.

Functional outcome considering pain and neurological status preoperative and postoperative, there is no significant loss of functionality after meticulous excision of IDEM tumours.

Complications are also uncommon.

References


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