

## ORIGINAL ARTICLE

# Surgical Excision of Intradural Extra Medullary Spinal Tumors; Review of Outcome and Complications

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## ABSTRACT

**Objectives:** Intradural extra medullary (IDEM) tumors of the spinal cord are most common benign lesions. Surgical decompression and resection, though challenging, benefits the patient significantly.

**Methods:** The authors performed a retrospective review of forty three patients with IDEM lesions, who presented to the Department of Neurosurgery Shaikh Zayed Hospital Lahore from June 2006 to March 2014. All patients were clinically evaluated for preoperative neurological status and investigated with MRI without and with contrast. Postoperative complications were assessed along with the neurological status till the patients last follow up. Other complications including CSF leakage, requiring lumbar drainage and infections were also noted.

**Results:** There were forty three patients with a mean age of 40 years. Complete resection was achieved in 38 (88.3%) patients and subtotal resection in 5 (11.6%) patients. Majority of the patients (41 out of 43) showed improvement (95%). Thirty eight patients were ambulatory post resection.

**Conclusion:** IDEM lesions pose significant challenge for surgical resection. However if complete resection is achieved, the results, as evident by the functional recovery, are gratifying.

**Key words:** Spine, Tumor, Intradural, Extramedullary, Resection Outcome

## INTRODUCTION

Intradural extramedullary (IDEM) spinal tumors accounts for two third of all primary spinal neoplasm. However these lesion are uncommon, with a reported incidence of 3-10 per 100,000 people.<sup>1,2,3,4</sup> In adult population the most common IDEM tumors arise from the nerve sheath (30%) and from the meninges (25%). The clinical presentation of IDEM tumors is determined by the location of tumors. In most patients radicular pain is the predominant presenting symptom. Sometimes motor deficit are present, when the lesion is diagnosed later in the clinical course. In a recent study, Raco and colleagues<sup>5</sup> reported that pain was the most common presenting symptom in approximately 72% of the patients. This symptom was followed in frequency by motor disturbances in 55% and sensory loss in 39% of the patients. Other authors have also reported similar results.<sup>2,4,6,7</sup> Majority of lesion are benign (WHO grade 1 and 2) and patients usually benefit from careful surgical decompression and resection. Despite advances in operative techniques and neuroimaging, the morbidity associated with resection of IDEM tumors continues to be significant. While intraoperative spinal cord monitoring by electromyography, motor evoked potentials and somatosensory evoked potentials has allowed surgeons to predict postoperative

morbidity, it has done little to prevent postoperative complications associated with resection of IDEM tumors. Careful spinal cord manipulation is of paramount importance during operation. This study will review the outcome and complications associated with surgical excision of the tumors at our department.

## CLINICAL MATERIALS AND METHODS

There were 43 patients with the diagnosis of IDEM spinal tumors presented to the Department of Neurosurgery, Shaikh Zayed Hospital Lahore. The mean age at presentation was forty years. The most frequent presenting symptom were backache, radicular pain, motor weakness, sensory weakness. Forty patients (93%) presented with difficulty in walking, 20 patients (47%) were non ambulatory, 15 patients (35%) can walk with support, 10 patients (23%) can walk without any support and 4 patients (9%) were paraplegic. The ambulatory status were recorded and patients were classified in 4 grades.

GRADE 1: Walking without support

GRADE 2: Walking with support

GRADE 3: Unable to walk but can move legs

GRADE 4: Paraplegic

All the patients in the study had preoperative evaluation including history of presenting illness, physical examination and radiological studies

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including preoperative MRI showing tumor site and respective spinal cord level of lesion. The MRI axial views were assessed for location of tumor with respect to the spinal cord as anterior, lateral and posterior.

**Radiological Findings**

On MRI meningiomas appear solid well circumscribed lesion attached to the dura. The tumor is iso to hypo intense on T<sub>1</sub> weighted MR images and slightly hyper intense on T<sub>2</sub> weighted flair images. Meningiomas homogeneously enhance

with contrast. A schwannoma appears as a solid tumor associated with displacement of spinal cord conus medullaris or filum terminale. They appear iso intense on T<sub>1</sub> weighted and hyper intense T<sub>2</sub> weighted flair image. Contrast enhancement varies from intense to faint, especially if a cystic component is present. Neurofibroma appear as fusiform or rounded tumor that are typically isointense on T<sub>1</sub> images and hyperintense on T<sub>2</sub> flair images and intense enhancement is seen after contrast.

**Table 1:** Gender and tumor type distribution of idem lesions

	Schwanoma	Neurofibroma	Meningioma	Arachnoid cyst	Dermoid	Ependymoma
Male	14	8	3	1	1	1
Female	2	2	10	0	0	1
Total	16 (37%)	10 (23%)	13 (30%)	1 (2%)	1 (2%)	2 (4%)

**Table 2:** Graphical representation of gender and tumor type distribution



**CLINICAL MANAGEMENT**

In all the patients’ surgical resection of the tumor was performed through posterior approach after laminectomy of the concerned level. The goal of surgery in all cases was to achieve a gross total resection with minimal intraoperative spinal cord manipulation. After making incision in dura a plane was develop between the arachnoid membrane and tumor surface under high magnification microscope (Moller-Wedel). The tumor was internally de-bulked using suction, bipolar and microsurgical instruments. After internal debulking tumor is rolled away from the spinal cord towards its dural attachment. Dura with the residual tumor was either resected or coagulated using bipolar cauterization. Meticulous hemostasis is maintained throughout the procedure. Primary closure of the dural covering was achieved in every patient without any implantation of graft except in one

patient with arachnoid cyst that required fascia lata graft. There were 13 patients with meningiomas (30%), 16 patients with schwannomas (37%), 10 patients with neurofibromas (23%), 1 patient with dermoid (2%), 1 arachnoid cyst (2%), 2 patients with ependymomas (4%) (Table 1). Two patients had a cerebrospinal fluid leak (4%), that required lumbar drain placement for one week. One (2%) patient developed superficial wound infection that required debridement and Intravenous antibiotics.

**RESULTS**

There was significant functional improvement in 40 (93%) patients, one (2%) patient was made worse and two (4%) patients didn’t show any improvement. Even patients with severe preoperative neurological deficits experienced good neurological recovery after careful neurosurgical intervention and rehabilitation.

Fourteen (33%) patients who were unable to walk but could move their legs, did started walking with support soon after surgery, 2 (4%) of the paraplegic patients also showed improvement in their leg movement (Table 3) However one (1%) non ambulatory patient was rendered paraplegic after surgery. Twenty eight (65%) out of 43, who had bowel dysfunction preoperatively exhibited normal function after surgery. Out of 29 patient with bladder dysfunction preoperatively, 20 (70%) regained normal bladder control while 5 (17%) patients still had some urinary urgency and 4 (14%) patients remained catheterized.

**Table 2:** Distribution of tumors based on spinal level

Spinal level	No. of Patients
Cervical	5 (12%)
Thoracic	23 (53%)
Lumbar	15 (35%)

**Table 3:** Comparison of Pre and Postoperative Ambulatory Status

Grading	Pre op. patients	Post op. patients
1	10	34
2	15	2
3	14	4
4	4	3

## DISCUSSION

Surgical excision can lead to local tumor control if complete removal is feasible and is still the best treatment for the patients with IDEM tumors. Surgical resection and decompression relieves symptom of radicular pain and possibly neurological deficits. Although there is a risk of unintentional enhancement of neurological deficit, functional status is a major concern when treating patients and the goal is always to preserve, and if possible to improve the patient condition. Thus for IDEM tumors maximal safe tumor resection should be the primary treatment objective. The surgical treatment outcome of benign spinal tumor is excellent with good improvement of neurological function. The risk of recurrence is very low, except in the scenario of subtotal resection of tumor. Ventral location of spinal tumors increases the risk of major surgery related complications. Slinko<sup>8</sup> and colleagues have demonstrated that the more proximal the location of tumor, and more ventral the position to the spinal cord, the worse will be the surgical outcome and greater likelihood of having a

postoperative neurological deficit. Conversely Ahan and colleagues<sup>2</sup> found no association between the ventral tumor location and poor outcome. In our series anteriorly located spinal cord tumor trended towards development of neurological deficits as in one patient. The neurological deficit was enhanced. The finding of higher complication rate for anteriorly located upper thoracic spine tumors may be related to the difficult anatomy of the spine which has higher cord to canal ratio, as well as tumor vascular supply to that region of the spinal cord. This finding highlights the importance of additional precautionary measures to mitigate the risk of major complications when resecting anteriorly located upper thoracic IDEM spinal cord tumors. In our series a posterior approach was used regardless of the location of tumor relative to spinal tumor cord. Slinko and colleagues<sup>8</sup> suggested than an extreme lateral and anterior approach was necessary for resection of ventrally located tumors. However Ahan<sup>2</sup> and colleagues reported no difference in resecting ventrally located IDEM tumors via a posterior approach. We experienced no difficulty in resection ventrally located tumors via posterior lateral approach. However in patients presenting with severe spinal stenosis due to the ventral location of IDEM tumor, anterior approach resection may help.

Numerous studies have shown a positive association between gross total resection and associated favorable outcomes<sup>3,4,7,8</sup>. Slinko<sup>8</sup> and colleagues reported complete resection in 74% of their cases, with subtotal resection accounting 21% and partial resection of about 5% respectively. They noted a lower recurrence rate in patients who underwent a gross total resection. Gottfried<sup>9</sup> and colleagues achieved complete resection in 12% of their cases. They reported that patients who underwent gross total resection were more likely to remain disease free as compare to patients who underwent partial or subtotal resections. Thus the most important treatment variable, influencing long term outcome and recurrence rate in patients with IDEM tumors, is the gross total resection, making the outcome favorable if complete resection of the tumor is achieved<sup>4,7</sup>. In our series, gross total resection was planned in every patient but was achieved in 37 (85%) out of 43 patients, with subtotal resection in 4 (9%) out of 43 patients and a partial resection in 3 (6%) out of 43 patients respectively. The functional improvement was significant in patients

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with gross total resection, as compare to subtotal and partial resection. The recurrence rate of these tumors could not ascertained in these patients, because most of patients were lost in long term follow up. Mehta<sup>10</sup> and colleagues has found recurrence in 11% of the cases. In another study, Gottfried and colleagues<sup>9</sup> reported a recurrence rate of 4%.

### CONCLUSION

A great majority of IDEM spinal tumors are benign and can be excised completely with careful surgical technique. Anteriorly located and upper thoracic spinal tumor were found to have the highest complications and postoperative neurological deficits .Recurrence of these tumors is rare ,if gross total resection is achieved and disability can be minimize if treated early.

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