

**SURGICAL OUTCOME OF CERVICAL AND FORAMEN MAGNUM INTRA DURAL AND INTRA MEDULLARY TUMOURS**

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**ABSTRACT: INTRODUCTION:** Spinal tumors account for only approximately 5-15% of the nervous system neoplasms. Technical advances in imaging and surgical procedures have brought about significant better clinical results in the last 2 decades. We also evaluated surgical and functional outcomes in patients having cervical intradural tumors including tumors at foramen magnum. **METHODS:** All patients who underwent surgical treatment for cervical intradural tumors from foramen magnum to C7, were evaluated preoperatively and six months after surgery by Nuricks scale (1972) and the modified Japanese Orthopaedic Association Scale (mJOA) (1991). **RESULTS:** A total 49 patients were studied, out of which 20 patients are with intra dural extra medullary & intra medullary tumors- from foramen magnum to C2, were treated surgically by far lateral approach and posterior approach by cervical laminectomy & excision. 29 patients with intra dural extra medullary & intra medullary tumors - from C3 to C7, were treated by posterior approach by cervical laminectomy & excision. The mean age of patients was 42.6±8.42 yrs (range 15-75 yrs) and male: female ratio was -26 (54%): 23 (46%). Total excision was achieved in 43 patients and subtotal excision in 6 cases. There were 2 post-operative deaths due to respiratory failure and these patients were having intra medullary tumors. Functional analysis was done for remaining 47 patients. The post-operative Nuricks scale scores were significantly decreased from 5.22±0.18 to 2.14±0.20 (p< 0.0001). The pre and postoperative mJOA scores were increased from 10.33±1.21 to 14.13±1.42 respectively P< 0.0001. **CONCLUSION:** Surgery for intradural tumors with goal of complete tumor removal is a safe and effective option. At the 8 month mean follow-up, majority of patients had complete or near complete relief of symptoms and return to full activity. IDEM patients showed statistically significant improvement on than intra medullary tumor patients on Nuricks and mJOA scales.

**KEYWORDS:** Surgical outcomes, intradural extra medullary tumors (IDEM), intradural intra medullary tumors (IDIM), foramen magnum, Nuricks scale, modified Japanese orthopaedic association Scale (mJOA).

**INTRODUCTION:** Spinal tumors account for only approximately 5-15% of the nervous system neoplasms.<sup>(1-3)</sup> Intradural spinal cord tumors constitute approximately two thirds of these tumors.<sup>(3-4)</sup> Few studies were published addressing the surgical outcomes based on tumor types and their locations.<sup>(4-7)</sup> Technical advances in imaging and surgical procedures have brought about significant better clinical results in the last 2 decades. However, a small percentage of patients still present poor postoperative outcome which are mainly related to the duration of disease, severity of neurological deficits and to some extent anatomic-surgical aspects. To this purpose, we evaluated surgical and

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functional outcomes in patients having cervical intradural tumors including tumors at foramen magnum.

**METHODS:** This study conducted in the department of neurosurgery, Nizams institute of medical sciences, Hyderabad who underwent surgical treatment for cervical intradural tumors from foramen magnum to C7 during the period 2006-2008. Patients with infection & infestations causing compressive myeloradiculopathy such as tuberculosis, neurocysticercosis etc are excluded from this study. Patients were also excluded if they have syringomyelia, spondylotic compressive myelopathy and multiple sclerosis with symptomology.

Patient's medical records, office notes and operative reports were reviewed for collecting pre, peri- and post-operative data. All patients were evaluated by complete neurological examination both preoperatively and six months after surgery. Particular attention was paid to information regarding the status of myelopathic symptoms as assessed by Nuricks scale (1972)<sup>(8)</sup> (Table-1) a six point scale (0-5) that addresses the 'difficulty in walking' and the modified Japanese Orthopaedic Association Scale (mJOA) (1991).<sup>(9)</sup> (Table-2) mJOA which assesses motor dysfunction of the upper extremities (6 items), motor dysfunction of the lower extremities (8 items), sensation (4 items), and sphincter dysfunction (4 items). The score for each section ranges from 0 to 5, 0 to 7, 0 to 3, and 0 to 3 respectively, giving a total score ranging from 0 to 18. The higher score denotes absence of any motor, sensory or sphincter dysfunction. Post-operative improvement was defined as a reduction in disease severity by  $\geq$  one Nurick grade.<sup>(10)</sup>

**SURGICAL TECHNIQUES:** Our study includes a total 49 which includes both intradural extra medullary & intra dural intra medullary tumors. Out of which 20 patients are with intra dural extra medullary & intra medullary tumors- from foramen magnum to C2, were treated surgically by far lateral approach and posterior approach by cervical laminectomy & excision (Group-A) and 29 patients with intra dural extra medullary & intra medullary tumors - from C3 to C7, were treated by posterior approach by cervical laminectomy & excision. (Group-B) The amount of tumor resection was evaluated intra operatively by direct visualization with microscope & post operatively by using MRI after 1month post operatively.

**STATISTICAL ANALYSIS:** The data was entered in excel spread sheet and then the statistical analysis was performed by using Graphpad Prism version-4, USA. The continuous data was presented as mean and standard deviation. The categorical data was presented as actual numbers and percentages. Paired t test was used to assess the difference between functional scores. A two tailed p value less than 0.05 was considered statistically significant.

**RESULTS:** The mean age of patients was  $42.6 \pm 8.42$  yrs (range 15-75 yrs) and male: female ratio was - 26 (54%): 23 (46%). The numbers of patients in different age groups were shown in table-2. Out of 20 patients, in group-A, 6 had intra medullary tumors of which Astrocytoma-4, Ependymoma-1 Haemangioblastoma-1 whereas 14 cases had Intra dural extramedullary tumors of which Neurofibroma-10, Meningioma-3, and Schwannoma-1. 12 patients in this group underwent surgical excision of tumor by Far lateral approach.

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In group-B, 11 were intra medullary tumors, ependymoma-5, astrocytoma-3, medulloblastoma-1, and neurofibroma-2. Intra dural extramedullary tumors were 18 of which neurofibroma-10, meningioma-4, and schwannoma-4. All were treated by posterior laminectomy & excision.

Total excision was achieved in 43 patients and subtotal excision in 6 cases. There were 2 post-operative deaths due to respiratory failure and these patients were having intra medullary tumors. Tumor resection using far lateral approach was performed highlighting the management of vertebral artery and its anatomic variations. The clinical profiles and functional outcomes were shown in table-4 & 5 respectively.

None of our patient was with preoperative Nurick grade 0. Post-operative improvement which was defined as a reduction in disease severity by  $\geq$  one Nurick grade in all patients who came for follow-up. Excluding two post-operative deaths, analysis was done for remaining 47 patients. Out of them, 43 (91.4%) indicated improvement to grade 1 disease, while 4 patients (8.5%) had clinical evidence of ataxia while maintaining employment abilities and none of the patients had unchanged or worsened disease. The post-operative scores were significantly decreased from  $5.22 \pm 0.18$  to  $2.14 \pm 0.20$  ( $p < 0.0001$ ).

On further analysis, 47/49 (96%) had improved in their total mJOA scores. The severity of functional disability was graded based on the preoperative mJOA score as mild if mJOA score  $>12$ , moderate if mJOA score between 9–12; and severe if mJOA score  $<9$ . Most of our patients were moderately disabled. 4 patients had severe disability. The pre and postoperative mJOA scores were  $10.33 \pm 1.21$  and  $14.13 \pm 1.42$  respectively  $P < 0.0001$ .

**DISCUSSION:** Surgery for intradural tumors is the best treatment option producing overall excellent results, with complete surgical excision being the modality of choice. Modern techniques enable good surgical outcomes with minimal morbidity and mortality. Good results can be achieved with least complications. In cases of intra dural tumors one should not wait till the onset of clinical deterioration but rather institute treatment as soon as possible. Majority of clinical improvement can be observed either immediately or within 6 months of the operative intervention.<sup>(1)</sup> After this initial period notable clinical change will be minimal. From a functional standpoint, it seems that individuals with grade 2 or 3 disease have the most benefit from surgery. The disagreement between the scores in some patients suggests that Nurick grade and mJOA scores assess separate domains of functionality.<sup>(8-9)</sup>

Surgical approach is mainly decided by the location of tumor. The tumors situated at foramen magnum and upper cervical tumors were approached by far lateral & posterior cervical laminectomy & excision. Those that are situated from C3 to cervico-thoracic junction were approached by posterior cervical laminectomy and excision. The most important factors that should be considered for better surgical outcome includes comprehensive understanding of the region anatomically, tailored exposure of the underlying lesion, bloodless surgical field.

15 % of patients had post-operative CSF leak, meningitis, wound infection. Others report similar outcomes among patients with similarities to our patient sample, with significant improvement in 62-88% of cases and clinical worsening in only a minority of patients (1-5%). Some of the patient outcomes and functional scores on discharge and follow-up may differ across studies because of different assessment tools being used by different surgeons.<sup>(1)</sup>

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Limitations of this study are its retrospective nature, Lack of patient follow up data beyond the 7.2 months mean follow up period, Lack of complete data on recurrences beyond the end of the study period, Intra operative monitoring of spinal cord function and post-operative assessment of instability of spine.

**CONCLUSION:** Surgery for intradural tumors with goal of complete tumor removal is a safe and effective option. At the 8 month mean follow-up, majority of patients had complete or near complete relief of symptoms and return to full activity. IDEM patients showed statistically significant improvement on than intra medullary tumor patients on Nuricks and mJOA scales.

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Score	Definition
0	Signs or symptoms of root involvement but without evidence of spinal cord disease
1	Signs of spinal cord disease but no difficulty in walking
2	Slight difficulty in walking which did not prevent full-time employment
3	Difficulty in walking which prevented full-time employment or the ability to do all housework, but which was not so severe as to require someone else's help to walk
4	Able to walk only with someone else's help or with the aid of a frame
5	Chair bound or bedridden

Table 1: Nuricks myelopathy grading<sup>[8]</sup>

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Score	Definition
	Motor dysfunction
	Upper extremities
0	Unable to move hands
1	Unable to eat with a spoon but able to move hands
2	Unable to button shirt but able to eat with a spoon
3	Able to button shirt with great difficulty
4	Able to button shirt with slight difficulty
5	No dysfunction
	Lower extremities
0	Complete loss of motor & sensory function
1	Sensory preservation without ability to move legs
2	Able to move legs but unable to walk
3	Able to walk on flat floor with a walking aid (cane or crutch)
4	Able to walk up- &/or downstairs w/aid of a handrail
5	Moderate-to-significant lack of stability but able to walk up- &/or downstairs without handrail
6	Mild lack of stability but able to walk unaided with smooth reciprocation
7	No dysfunction
	Sensory dysfunction
	Upper extremities
0	Complete loss of hand sensation
1	Severe sensory loss or pain
2	Mild sensory loss
3	No sensory loss
	Sphincter dysfunction
0	Unable to micturate voluntarily
1	Marked difficulty in micturition
2	Mild-to-moderate difficulty in micturition
3	Normal micturition

**Table 2: Modified Japanese Orthopaedic Association scoring system<sup>[1]</sup>**

Age range	Number	Percentage
11-30	16	32.65
31-50	19	38.77
51-70	9	18.36
Above 70	5	10.20
<b>Total</b>	<b>49</b>	<b>100</b>

**Table 3**

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Motor weakness	40	81.63%
Sensory hypoesthesia	39	79.59%
Paraesthesias	30	61.22%
Hyperreflexia& plantars extensors	35	71.43%
Posterior column involvement	21	42.86%
Atrophy of hands	14	28.57%
Sub occipital or neck pain	18	36.73%
Nystagmus	8	16.33%
Lower cranial nerve palsy	9	18.37%
Neck stiffness	2	4.08%

**Table 4: Profile of the clinical features in our patients**

Functional Scores	Pre-Operative	Post-Operative	P Value
All Patients (N=49)			
Nuricks	5.22±0.18	2.14±0.20	< 0.0001
mJOA	10.33±1.21	14.13±1.42	< 0.0001
IDEM Patients (N=20)			
Nuricks	4.12±0.18	2.12±1.1	< 0.0001
mJOA	10.14±1.35	15.45±1.56	< 0.0001
IM (N=27)			
Nuricks	3.54±1.68	2.85±1.16	0.08
mJOA	12.12±2.14	13.68±3.81	0.06

**Table 5: Profile of the functional scores in our patients**

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