

Clinicopathological Study Of Intradural Extramedullary Spinal Cord Tumors

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Abstract

Background: Intradural extramedullary tumors of the spine are common in middle age group and most of them are benign in nature, most of them being nerve sheath tumors and meningiomas. **Objective:** The aim of this study is to analyze the clinical presentation, imageology, resectability, to know the incidence of different types of tumors in intradural extramedullary compartment and to study the surgical outcome.

Materials and Methods: This is a prospective study of 30 cases of intradural extramedullary tumors were treated in the department of Neurosurgery period from October 2014 to December 2016. The clinical presentation, imageology, resectability, histopathology, surgical outcome were studied. All cases were treated surgically, outcome and complications were evaluated. Outcome was evaluated by using Nurick-grading scheme.

Findings: A total of 30 cases of intradural extramedullary tumors were included in this study. Most of them were in 30-40 years age group (36.66%). The tumor location was noted be thoracic in 18 (60%) patients, lumbar in 5 (16.66%) and cervical in 7 (23.33%) patients. In 80% of cases the tumors were located posteriorly and 20% were located posterolaterally. All the patients underwent surgery Total excision was achieved in 28 cases. Near total excision was done in 2 cases. Nerve sheath tumor was the common histopathological type (15 patients) followed by Meningiomas (9 patients). Follow up was available for all patients at 6months. Immediate improvement seen in 18 patients (60%) and gradual improvement over a period of six months seen in 11 patients (36.66%) and no improvement seen in 1 patient (3.33%).

Conclusions: Nerve sheath tumors and Meningiomas are the most common intradural extramedullary spinal lesions and complete excision is possible in all most all cases. Prognosis is usually good, in spite of poor neurological status at the time of presentation.

Key words: Meningiomas, Magnetic resonance imaging, Nerve sheath tumor Outcome.

I. Introduction

According to anatomical locations spinal tumors were classified as extradural and Intradural. Intradural tumours could be intramedullary or extramedullary. Meningiomas and nerve sheath tumors are the most common Intradural extramedullary tumours. Nerve sheath tumours are categorized as either Schwannomas or neurofibromas. Nerve sheath tumors account for about 25 percent of intradural spinal cord tumors in adults. The fourth to sixth decades of life represent the peak incidence of occurrence. Men and women are equally affected. The majority of nerve sheath tumors arise from a dorsal nerve root. Ventral root tumors are more commonly neurofibromas. Meningiomas occur with about the same frequency as nerve sheath tumors in adults. They usually arise from the arachnoids cap cells embedded in the dura near the root sleeve. This accounts for their predominant lateral location. Meningiomas arise in any age group, but the majority occurs between the fifth and seventh decades of life, with 75 to 85 percent occurring in women, and about 80 percent of these are thoracic in location. About 40 percent of spinal canal ependymomas arise within the filum terminale. Non-neoplastic lesions may also present as extra medullary masses. Intraspinal aneurysms are exceedingly rare.

II. Materials & Methods

This is a prospective study of 30 cases of intradural extramedullary tumors were treated in the department of Neurosurgery, government General Hospital, Guntur from October 2014 to December 2016. Inclusion and exclusion criteria depicted in Table1. The clinical presentation, imageology, resectability, histopathology, surgical outcome were studied. All the patients were thoroughly evaluated to know the symptoms and signs with particulars stress on motor and sensor deficits. The patients were investigated with plain spinal radiography to note the changes in spines and their joints. All the patients are evaluated with MRI for delineation of the lesion and to know the relations with cord and to know intrinsic cord changes due to tumor

compression. All cases are treated surgically by posterior or postero lateral approaches outcome and complications were evaluated. **Follow up:** All the patients were follow-up periodically and the results are analyzed. Ambulatory status was classified on admission by using Nurick-grading scheme. Nurick's Grade includes: Grade 1- Normal walk, Grade 2- Slight difficulty in walking, Grade 3- Disability limiting normal walk, Grade 4 -Required assistance in walk, Grade 5-Bed ridden.

III. Results:

Study population: During October 2014 to December 2016, 56 spinal tumors were treated at department of neurosurgery, government general hospital, Guntur. Out of which 30 cases were intradural extramedullary tumors i.e. 53.57%. **Demography:** The youngest patient in this series was 1 year old male child and the oldest patient was 60 years old male. Most of them were in 30-40 years age group i.e., 11 patients (36.66%). Out of 30 cases 12(40%) were Males, 18 (60%) were female patients. Slight female predominance is seen in occurrence of intradural extramedullary tumors. Meningiomas are more common in females (100%) in this series. Neurofibroma shown male predominance (73.33%) in the present series. **Clinical parameters:** The duration of symptoms varies from 2 months to 5 years with a mean of 2 years 2 months (Table 2). Most of the patients in the present case series presented with weakness of limbs. Ambulatory status was classified on admission by using Nurick-grading scheme. Eleven patients were ambulatory on admission and exhibits nurick grade 1 and 2 status. Eleven patients were in Grade 1 and in Grade 2. The mean duration of gait difficulty was 6 months. Eight patients were in grade 3, 7 patients in grade 4 and 4 patients were bed ridden. i.e., with grade 5 (Table 3). **Imageology:** All patients were investigated with plain X-ray AP and lateral view of the appropriate region and by MRI study. **Tumor Location:** The tumor location was noted be thoracic in 18 (60%) patients, lumbar in 5 (16.66%) and cervical in 7 (23.33%) patients. In 80% of cases the tumors were located posteriorly and 20% were located posterolaterally.(Table4). **Surgery:** All the patients underwent surgery, 26 patients were operated through the posterior approach, laminectomy was performed and in 4 patients laminectomy was extended laterally to remove the tumor completely. Total excision was achieved was achieved in 28 cases. Near total excision was done in 2 cases. **Complications:** The postoperative period was smooth in all patients. No postoperative neurological deterioration was found. CSF leak occurred in 2 patients (6.66%) who were treated with repeated lumbar punctures and acetazolamide. One patients (3.33%) developed wound infection and one patient (3.33%) developed meningitis in postoperative period, who responded to the appropriate antibiotics. **Followup:** 30 cases were followed up. Mean follow up period was 11 months. No recurrence was noted. **Histopathology:** Nerve sheath tumor was the common histopathological type (15) followed by Meningiomas (9), out these 9 cases 5 were psammomatus Meningiomas, 4 were meningothelial Meningiomas.(Table 5). **Outcome:** Immediate improvement seen in 18 patients (60%) and gradual improvement over a period of six months seen in 11 patients (36.66%) and no improvement seen in 1 patients (3.33%) who presented very lately (2yrs) with flaccid paralysis and cord shown myelomalacial changes on MRI.(Table 6) .

IV. Discussion

This is a prospective study of 30 cases of intradural extramedullary tumors carried out at Government General Hospital, Guntur, from October 2014 to December 2016. All the cases were operated in Govt. General Hospital, Guntur by team of surgeons. An analysis of clinical features and surgical outcome is discussed.

Out of 56 cases of spinal cord tumors operated during the period, 30 tumors were located in the intradural extramedullary compartment, the incidence in our series being 53.57%. There were 15 cases of nerve sheath tumors (50%) and 9 cases of meningiomas (30%), 2 cases of Arachnoid cyst (6.66%), 3 cases of Granulomatous lesions (10%) 1 case of lipoma (3.33%). The incidence of nerve sheath tumor reported was 50% and that of meningioma 30% of all intradural extramedullary tumors. Majority of the nerve sheath tumors were present in 3rd decade and majority of meningioma were present in 2nd and 3rd decades with female preponderance.

Spinal Nerve Sheath Tumors : The benign nerve sheath tumors, neurinomas were the commonest intraspinal tumors in our series of 30 total cases with incidence of 15 (50%). In the literature the incidence of nerve sheath tumors reported as 25% in the series reported by Nittner et al, Levy et al, PC McCormick et al^{1,2,3}. Majority of the tumors occur in middle age group from 35-55 years in our series. Though no sex preponderance was noted by Levy et al found that males were affected 3 ½ times more commonly than females which are corresponding with our series.

Neurofibromas occur frequently in the thoracic region, the rest being almost equally distributed between the cervical and lumbosacral regions. In series 60% of tumors were located in thoracic region, 23.33% in cervical, 16.66% in lumbar region which is 7:2:2 ratios corresponding with Nittner's series. Majority of the tumors located posteriorly or posterolaterally to the spinal cord, ensuring a greater percentage of surgical success without complications. In our series 86.66% were located posteriorly, 13.33% posterolaterally. The presenting symptoms in our series presented with mean duration of 2 years and 2 months. Symptoms were back

pain 50%, tingling and numbness 63.33%, weakness of extremities 96.66%, bladder disturbances 40%, hyperreflexia and severe spasticity noted in 72% were documented on initial neurological examination. Radicular pain and sensory symptoms corresponding with series of Albanese et al⁴, Leczy et al. higher incidence of weakness and bladder disturbance in our series due to randomized distribution of population and availability of facilities and socio economical status of patient population.

Ambulatory status was classified on admission by using Nurick grading scheme. Majority of the patients (86.66%) were ambulatory on admission and 63.33% exhibited Nurick grade 1 to 3 status and 33.66% of patients were disabled with grade 4 and 5. One patient was bedridden. All the patients were investigated with radiography of spine. The radiological changes found were flattening of pedicle, loss of pedicle shadow and enlargement of intervertebral foramen were observed in 30% of cases. All the patients were investigated with MRI spine, and it was the investigation of choice in our series. **Surgical Outcome:** Surgery was indicated in all patients in our series and complete excision of the lesion was achieved in 93.33% of cases. Which corresponds with results of Levy et al², Albanese et al⁴ 95% and Lot G. George et al 98%⁵. The rate of nerve root preservation in our series was 98%, without any persisting deficits after sacrificing the nerve root in 2 cases. We have no mortality in our series. No postoperative neurological deterioration noted in our series.

Functional Outcome: In our series in the immediate post operative period on day 1 improvement in spasticity was seen 90% of cases, and 85% had complete pain relief on follow up. 80% of patients had normal sensation who had prior sensory loss, and 50% of patients who had grade II motor deficits preoperatively improved to normal, 10% of preoperative patients with grade III deficit improved to grade II on 6 months follow up. Bladder function improved in 90% of patients on follow up for 6 months, and 9% of patients with grade V preoperatively had improved to grade IV on 12 months follow up. One patient had urinary incontinence as no improvement post operatively. The functional outcome results in our series correspond with the series reported by Levy W J et al, Albanese V et al. A radical surgery is the preferred treatment in cases of spinal nerve sheath tumors because of its associated excellent functional improvement along with an intensive rehabilitative program gives the patients the best long term results.

Meningioma:

The mean age of the patients in our series in Meningioma cases was 36 yrs., compared with in one study of Mayo clinic 15 of their patients were younger than 50 years of age in total numbers of 40 patients. In our series all the patients were female that was 100%, which is corresponding to 87.5% of mayoclinic study of 40 patients⁶. The presenting symptoms in our series of Meningioma cases were pain in 8 (89%), sensory disturbance in 8 (89%), weakness in 9 (100%) bladder dysfunction in 4 (44%) were corresponding to Roux et al⁷ series with 72%, 61%, 80% and 37%. Gait abnormality was seen in all 9 (100%) of all patients in our series by O.N. Gottfried et al⁸. In our series majority of tumors (89%) were located in thoracic region, which is corresponding with 80%, 80%, 83% and in a series of mayo clinic, Roux et al⁷, Solero et al⁹ respectively.

In our series the sensory changes, gait abnormality, weakness was seen in majority of cases due to late presentation and large tumors in comparison to the Mayo clinic study. This attributed a random distribution of population due to availability of facilities, socio economic status of patients.

Spinal Meningiomas are predominately histological benign tumors of the meningotheial and psammomatous variety. Total resection is the primary objective of treatment. The key to successful Spinal Meningioma resection is judicious planning of the surgical corridor. Excision of Dural margin in contrast to cauterization is associated with a lower recurrence rate. In our series all patients underwent posterior laminectomy, in cases in which tumors were located anteriorly the laminectomy was extended laterally toward the articular process to provide sufficient exposure and avoid pressure on spinal cord. Operating microscope was used. The goal of surgery was to minimize displacement of the spinal cord by undertaking an appropriately wide exposure, making the tumor and its dural attachment accessible. After Dural opening a plane was developed. The tumors were then internally debulked, the tumors was removed from its dural attachment. In our series Dura was cauterized than resection. Dural graft was not used in our series. We have achieved total excision in 94% of cases in comparison with other series of 93% Roux et al and 99% in O.N. Gottfried et al.

Overall functional outcome was excellent in our series and no deterioration seen. The results compared with king et al¹⁰ 95% and 1% and O.N. Gottfried et al⁸ with 92% and 0% respectively. In our series preoperative ambulatory patients were 63.33%, non ambulatory 36.66% and in other Erie King et al¹⁰ 74%, Samii¹¹ 74% and postoperatively in our series 96.66% became ambulatory in 2 months period which is corresponding with 97% in king et al¹⁰, 96% in O.N. Gottfried et al⁸, 94% in Roux et al⁷ series.

Bladder dysfunction was 44% preoperatively in our series exhibited 96.66% normal function after surgery in a period of 1 month corresponds with 95 % of king et al¹⁰. Morality was nil in our series where cause of death is unrelated to surgery and primary disease. Our series result was corresponding with 0% morality of roux et al and O.N. Gottfried et al series.

In present series histopathology showed 44% meningotheial and 56% psammomatous Meningiomas.

Recurrences of spinal Meningiomas were most series the rate ranged from 1.3 to 6.4%. Recurrence was found 3.7% in roux et al, 4% in O.N.Gottfried, 1.3% king et al series in 2 years follow up period.

In conclusion, surgery is the treatment in cases of spinal Meningiomas because of its associated excellent functional improvement and low recurrence rate. Radio surgery should be considered for the exceptional case involving recurrent and symptomatic spinal Meningiomas. An intensive rehabilitation program will give excellent results, along with early diagnosis and surgical removal of compression on spinal cord.

V. Conclusions

Nerve sheath tumors and Meningiomas are the most common in intradural extra medullary spinal lesions. and complete excision is possible in all most all cases. Prognosis is usually good, in spite of poor neurological status at the time of presentation.

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Table 1: Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
1. Age groups from 1 year to 60 years. 2. Cases include Cervical, Dorsal, and Lumbar region. 3. Elective and emergency cases. 4. Cases undergone Histopathological examination.	1. Extremely ill health and not fit for surgery cases were excluded. 2. Recurrent cases. 3. Patients who are not giving consent were excluded. 4. Age above 60 years.

Table 2: Clinical presentation

Symptoms	Total	Nerve Sheath Tumors	Meningioma	Others
Neck Pain / Radicular Pain	15	5	8	2
Paraesthesia	19	7	8	4
Weakness Of Limbs	29	15	9	5
Bladder & Bowel Symptoms	12	5	4	3

Table 3: Tumors with Nurick grading

Nurick Grade	Total	Nerve Sheath Tumors	Meningioma	Others
Grade - 1	7	4	-	3
Grade - 2	4	3	-	1
Grade - 3	8	4	2	2
Grade - 4	7	3	4	-
Grade - 5	4	1	3	-

Table 4: Tumor location

Tumor Location	Total	Nerve Sheath Tumors	Meningioma	Others
Cervical	7 (23.33%)	5 (33.33%)	1 (11%)	1
Thoracic	18 (60%)	8 (53.33%)	8 (89%)	2
Lumbar	5 (16.66%)	2 (13.33%)	0 (0%)	3

Table 5: Histopathology:

Tumor	N=30	%
Nerve Sheath Tumors	15	50%
Meningioma	9	30%
Lipoma	1	3.33%
Granulomatous Lesions (TB)	3	10%
Arachnoid Cyst	2	6.66%

5. Outcome

Nurick Grade	At Presentation		After Surgery	
	No.Of Cases	Percentage	No.Of Cases	Percentage
Normal walk	7	23.33%	10	33.33%
Slight difficulty in walking	4	13.33%	8	26.66%
Disability limiting normal walk	8	26.66 %	7	23.33%
Required assistance in walk	7	23.33%	4	13.33%
Bed ridden	4	13.33%	1	3.33%

Image 1 showing T1, T2 WI of cervical spine sagittal sections showing C2-D1 intradural extramedullary neurofibroma.

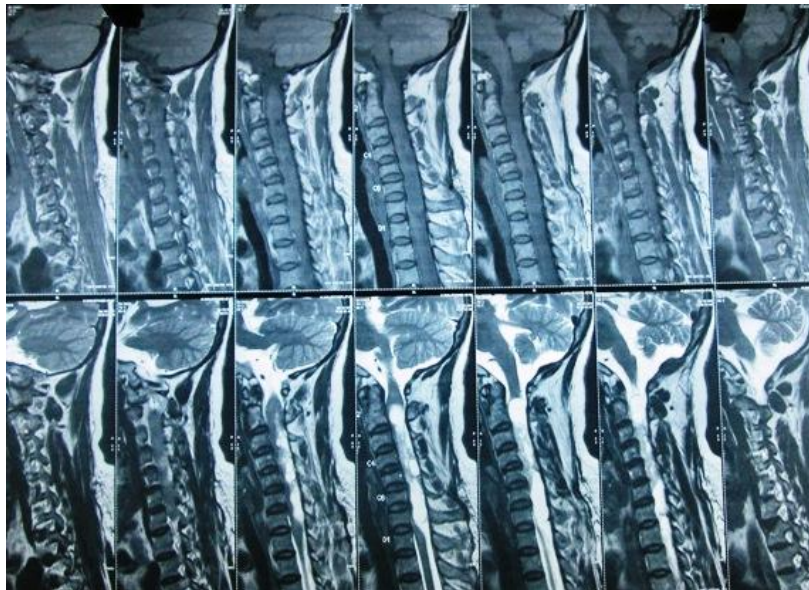
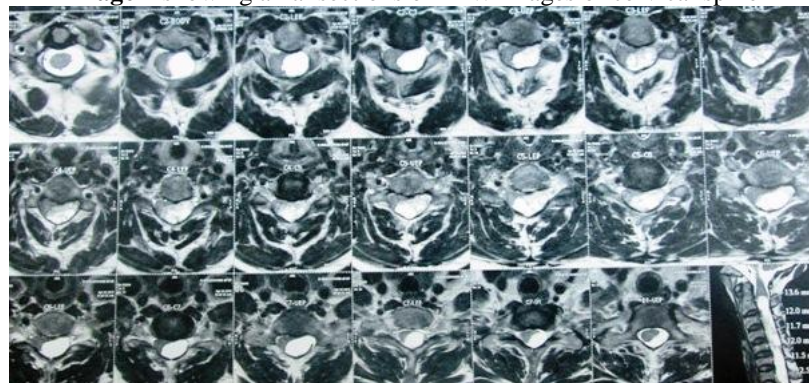


Image 2 showing axial sections of T2W images of cervical spine



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