

Research Article

Clinico-pathological study of intradural extramedullary spinal tumors

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ABSTRACT

Background: The intradural extramedullary tumours of the spine are one of the commonest tumours of the spine. Early diagnosis and surgical removal helps in best outcome. The objective of the study was to analyze the clinical presentation, imageology, resectability, to know the incidence of different types of tumours in intradural extramedullary compartment and to study the surgical outcome.

Methods: This was a prospective study of 32 cases of intradural extramedullary tumours. The clinical presentation, imageology, resectability, histopathology, surgical outcome were studied. The patients were investigated with plain spinal radiography and MRI. All cases were treated surgically by posterior or posterolateral approaches. Outcome and complications were evaluated. They were followed up regularly and the results were analyzed. Ambulatory status was classified on admission by using Nurick-grading scheme.

Results: The incidence of intradural extramedullary spinal tumours was 57.14%. Most of the tumours presented in the third decade (37.5%). Mean age of Presentation for meningioma was 36 years and for nerve sheath tumours was 39.5 years. The nerve sheath tumours contributed 35% followed by meningioma 28%. Nerve sheath tumours were found to be most commonly located in thoracic region (56%). Total excision of tumour was achieved in 87.7% cases.

Conclusions: Nerve Sheath tumours and Meningiomas were the most common in intradural extramedullary spinal lesions and complete excision was possible in almost all cases. Prognosis was usually good, in spite of poor neurological status at the time of presentation.

Keywords: Clinico-pathological study, Meningioma, Nerve sheath tumours

INTRODUCTION

Intradural extramedullary tumours of the spine are the commonest intradural tumours of the spine (67% in the Elseberg series).¹ They are common in middle age group and most of them are benign in nature, most of them being nerve sheath tumours and meningiomas. The early diagnosis and surgical removal and relieving pressure on the cord along with an intensive rehabilitation give excellent results with best outcome.

According to their anatomical location spinal tumours are classified as extradural and intradural. Intradural tumours could be intramedullary or extramedullary.

Primary extradural tumours: Relatively uncommon, accounting for 19% in the series of Elseberg.² Neurinomas, meningiomas and lipomas occur in the order of frequency. Rarely a secondary malignant tumour without involvement of bone can occur. Extradural cysts (congenital or acquired), non-specific granulomas and hydatid cysts, are the other extradural lesions.

Intramedullary tumours (14% in the series of Elseberg).² Most of the intramedullary tumours are malignant and belong to glioma group. Astrocytomas and ependymomas are the common lesions in the compartment.

Intramedullary tumours may become partly extramedullary when they break through the confines of the cord. Epidermoid, dermoid, angiomas, AV malformations and hemangioblastomas are such lesions.

Intradural extramedullary tumours: These are the most common intraspinal tumours. (67% in the series of Elseberg).² Neurinomas, Meningiomas are the most common lesions. Because of presence of filum terminale, intradural extramedullary ependymomas can occur in the cauda equine region.

While the diagnosis of cord compression may be obvious in a few cases, it is often delayed because of the variations in the presenting symptoms which may simulate other disease and the variability of the progress of the symptoms. Pesna et al found a median delay in diagnosis of 24 months (range 3 days to 24 years) amongst 57 patients, referred to them between 1978 and 1988.³ The symptoms and signs include those produced by the involvement of the nerve roots (posterior and anterior), the cord segments and the long tracts, viz., the motor, sensory, autonomic and other tracts. Some signs pertaining to the spinal column may also become apparent.

The aim of this study was to analyze the clinical presentation, imageology, resectability, to know the incidence of different types of tumours in intradural extramedullary compartment and to study the surgical outcome.

METHODS

This was a prospective study of 32 cases of intradural extramedullary tumours that were treated in the department of Neurosurgery, Osmania General Hospital from August 2004 to December 2006.

Clinical evaluation

The clinical presentation, imageology, resectability, histopathology, surgical outcome were studied.

All the patients were thoroughly evaluated to know the symptoms and signs with particular stress on motor and sensory deficits.

Imageological evaluation

The patients were investigated with plain spinal radiography to note the change in spines and their joints. All the patients were evaluated with MRI for better delineation of the lesion and to know its relations with

cord and to know intrinsic cord changes due to tumour compression.

Surgical treatment

All cases were treated surgically by posterior or posterolateral approaches. Outcome and complications were evaluated.

Follow up

All the patients were followed up regularly and the results were analysed.

Ambulatory status was classified on admission by using Nurick – grading scheme.⁴

Nurick Grade

1. Normal walk.
2. Slight difficulty in walking.
3. Disability limiting normal walk.
4. Required assistance in walk.
5. Bed ridden.

RESULTS

Table 1: Location of tumours compared with other studies.

Study	Location in percentage		
	Cervical	Thoracic	Lumbar
Lavvy et al 1982 ⁸	17	75	7
Solero et al 1989 ¹³	15	83	2
Roux et al 1996 ¹¹	18	80	2
King et al 1998 ¹⁴	14	84	2
Kleokamp J et al 1999 ¹⁵	27	67	6
N Gottfried et al 2003 ¹²	16	76	8
Present study	18	64	18

During the period of August 2004 to December 2006, 56 spinal tumours were treated at Department of Neurosurgery, Osmania General Hospital.

Out of which 32 cases were intradural extramedullary tumours i.e. the incidence was found out to be 57.14%.

Never sheath tumours and meningiomas were common intradural extramedullary tumours, constituting 35% and 28% from this series.

The youngest patient in this series was 1 year old girl and the oldest patient was 60 years old female.

Most of them were in 30-40 years age group i.e., 12 patients (37.5%).

Mean age for meningioma was 36 years and for nerve sheath tumour was 39.5 years. Slight female predominance was seen in the occurrence of intradural extramedullary tumours i.e. Males were 13 (40.6%) and females were 19 (59.4%). Meningiomas were more common in females (100%) whereas neurofibroma has shown male predominance (72.7%).

Table 2: Presenting symptoms compared with other studies.

Study	Pain	Weak-ness	Sensory	Sphincter Dysfunction
Lavvy et al 1982 ⁸	77*	66	74	40
Solero et al 1989 ¹³	53	92	61	50
Roux et al 1996 ¹¹	72	80	67	67
King et al 1998 ¹⁴	23	-	28	61
Kleokamp J et al 1999 ¹⁵	50	16	6	6
N Gottfried et al 2003 ¹²	68	64	84	48
Present study	89	100	89	44

All the cases were operated by a single surgeon to avoid the inter surgeon variability. An analysis of clinical features and surgical outcome is discussed.

Table 3: Comparison of symptoms with mayo clinic study.

Symptoms	Mayo Clinic study (%) ¹⁰	Present series
Sensory changes	32 (80%)	8 (89%)
Gait abnormality	27 (68%)	9 (100%)
Back Pain	18 (45%)	8 (89%)
Weakness	16 (40%)	9 (100%)
Bladder symptoms	16 (40%)	4 (44%)
Radicular pain	8 (20%)	3 (33%)

Out of 56 cases of spinal cord tumours operated during the period, 32 tumours were located in the intradural extramedullary compartment, the incidence being 53.14%. There were 11 cases of nerve sheath tumours (35%) and 9 cases of meningiomas (28%) and 2 cases of dermoid tumours (6%).

DISCUSSION

The incidence of nerve sheath tumour reported was 35% and that of meningioma 28% of all intradural extramedullary tumours. Majority of the nerve sheath

tumours were present in 3rd decade and majority of meningiomas were present in 2nd and 3rd decades with female's preponderance. Thoracic spine was common site of occurrence which is corresponding with the literature reported by McCormick and Ramamurthy et al.^{5,6}

Table 4: Comparison of ambulatory status with mayo clinic study.

Nurick grade	Definition	Mayo Clinic study ¹⁰	Present series (%)
1	Normal walk	13 (32%)	-
2	Slight difficulty in walking	20 (50%)	-
3	Disability limiting normal walk	3 (7.5%)	2 (22%)
4	Require assistance in walk	3 (7.5%)	4 (44%)
5	Bed ridden	1 (2.5%)	3 (33%)

Spinal nerve sheath tumours

The benign nerve sheath tumours, neurinomas were the commonest intraspinal tumour in our series of 32 total cases with incidence of 11 (35%). The incidence of nerve sheath tumours was reported as 25% in the series reported by Levy et al and McCormick et al.^{5,7} Majority of the tumours were seen in middle age group from 35-55 years in our series. Levy et al found that males were affected more commonly than females, which is corresponding with our series.⁸

Neurofibromas occur frequently in the thoracic region, the rest being almost equally distributed between the cervical and lumbosacral regions. In our series 64% of tumours were located in thoracic region, 18% in cervical, 18% in lumbar region which is 7:2:2 ratios. Majority of the tumours (80%) were located posteriorly or posterolaterally to the spinal cord, ensuring a greater percentage of surgical success without complications. The majority tumours (80%) were intradural and 10-15% extended through the dural root sleeve as dumbbell tumours occupied both intra and extradural compartments. The incidence in our series corresponds with that 75% and 10-15% of McCormick series report.⁵ The giant neurofibromas in our series were 18% as type 5 which corresponds with series reported by Ramamurthy et al who reported it to be 10.9%.⁶

The mean duration of presenting symptoms in our series was of 2 years and 2 months. Symptoms were back pain (45%), tingling and numbness (63%), weakness of limbs (72%), bladder disturbances (27%). Hyper reflexia and severe spasticity noted in 72% was documented on initial neurological examination. Radicular pain and sensory symptoms were corresponding with series of Levy et al.⁷ Higher incidence of weakness and bladder disturbance in

our series was due to randomized distribution of population and availability of facilities and socio

economical status of patient population.

Table 5: Functional outcome after surgery for spinal meningiomas.

Study	Outcome percentage			Ambulatory percentage	
	Improved	Stable	Deteriorated	Pre-operative	Post-operative
Lavvy et al 1982 ⁸	83	17	0	70	76
Solero et al 1989 ¹³	53	33	10	70	92
Roux et al 1996 ¹¹	83	13	2	67	94
King et al 1998 ¹⁴	95	1	4	74	97
Kleokamp J et al 1999 ¹⁵	-	-	-	74	94
N Gottfried et al 2003 ¹²	92	0	8	68	96
Present study	78	22	0	66	100

Ambulatory status was classified on admission by using Nurick grading scheme.⁴ Majority of the patients (91%) were ambulatory on admission and 72% exhibited Nurick grade 1 to 3 status and 27% of patients were disabled with grades 4 or 5. One patient was bed ridden. All the patients were investigated with radiography of spine. The radiological changes found were flattening of pedicle, loss of pedicle shadow and enlargement of inter vertebral foramen were observed in 30% of cases. All the patients were investigated with MRI spine, and it was 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 99% of cases. This corresponds with results of Levy et al and Lot G et al who in their study achieved complete excision of lesion in 98% of cases.^{7,9} The rate of nerve root preservation in our series was 98%, without any persisting deficits after sacrificing the nerve root in 2 cases. We had no mortality in our series. No postoperative neurological deterioration noted.

Functional outcome

In the immediate post-operative period on day 1 improvement in spasticity was seen in 90% of cases, and 85% had complete pain relief on follow up. 80% of patients had normal sensation that had prior sensory loss and 50% of patients who had grade II motor deficits pre operatively improved to normal, 10% of pre-operative 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% patients with grade V pre operatively had improved to grade IV in 12 months follow up. No case of postoperative deterioration was noted. The functional outcome result in the present series corresponds with the series reported by Levy et al.⁸

Meningioma

The mean age of the patients in meningioma cases was 36 years. In a study by Mayo Clinic they found that 37.5% of their patients belonged to less than 50 years of age.¹⁰ In the present study, all the patients of meningioma were female (100%), which is corresponding to 87.5% of Mayo Clinic study.¹⁰

The presenting symptoms of meningioma cases in the present study were pain in 89%, sensory disturbance (89%); weakness (100%), bladder dysfunction in 44% was corresponding to Roux et al series with 72%, 61%, 80% and 37% respectively. Gait normality was seen in all 9 (100%) of all patients in our series with 3(33%) were non-ambulatory which is corresponding with 32% in a series by O.N. Gottfried et al.^{11,12}

Majority of tumours (89%) were located in thoracic region, which is corresponding with 80% in a series of Mayo Clinic, and 83% in a study by Roux et al.^{10,11}

In the present study, the sensory changes, gait abnormality, weakness was seen in majority of cases due to late presentation and large tumours in comparison to the Mayo Clinic study.¹⁰ This can be attributed to a random distribution of population due to availability of facilities, socio economic status of patients.

Spinal meningiomas are predominantly histologically benign tumours of the meningotheial and psammomatous variety. Total resection is the primary objectives of treatment. The key to successful spinal meningioma resection is judicious planning of the surgical corridor. To access to the tumour bulk, but equally important, to the tumour margins were noted. Excision of dural margin in contrast to cauterization was associated with a lower recurrence rate. In our series all patients underwent posterior laminectomy, in case the tumours were located anteriorly the laminectomy was

extended laterally towards 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 tumour and its dural attachment accessible. After dural opening a plane was developed. The tumour was then internally debulked and was removed from its dural attachment. Dural graft was not used. We have achieved total excision in 95% of cases in comparison with other series of 93% by Roux et al and King et al with 99% and 99% in Gottfried et al.^{11,12,14}

Table 6: Histopathology of spinal tumours.

Study	Meningothelial	Psammomatous
Roux et al ¹¹	44%	20%
Present study	44%	56%

Overall functional outcome was excellent in our series and no deterioration seen. The results are comparable King et al study and ON Gottfried et al study.^{12,14} In our series pre-operative ambulatory patients were 66%, non-ambulatory 33% compared to King et al 74%.¹⁴ Postoperatively in our series 100% became ambulatory in 2 months period which is corresponding with 97% in King et al 96% in Gottfried et al 94% in Roux et al series.^{11,12,14}

Bladder dysfunction was 44% pre operatively in our series exhibited normal function after surgery in a period of 1 month, which corresponds with 95% cases in King et al study.¹⁴

Mortality was nil in our series. Our series result was corresponding with 0% mortality of Roux et al and O.N. Gottfried et al series.^{11,12}

In present series histopathology had shown 44% meningothelial and 56% Psammomatous meningiomas (Table 6).

CONCLUSION

Nerve Sheath tumours and meningiomas were the most common in intradural extramedullary spinal lesions and complete excision was possible in almost all cases. Prognosis is usually is good, in spite of Poor neurological status at the time of presentation.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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