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Demographics & Inferences of Spinal Meningioma

Neurosurgery

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ABSTRACT

Introduction: Spinal meningiomas are benign tumors with a wide spectrum of clinical and radiological features. They compromise 7.5-12.7% of all meningiomas and approximately 25% - 46% of primary spinal tumors [1.2]. As we still need studies to provide an insight into the demographic features, clinical presentation, histopathology, and management, this study was carried out.

Objectives: This study highlights the demographic features, clinical presentation, histopathology and management.

Results: In a cohort of 87 treated patients, the majority were women (70), representing 80.5% of patients. The mean age was 50.4 for women, and 49.9 for men. The Mean follow-up was 37 months (14-149 months). Demographic features detailed in Table 1. Clinical presentation: Neurogenic pain in 78.2% of patients, neurological deficits in 34 persons (39.1%) was found during preoperative neurological examination. Radiological examination showed that all lesions were intradural with predilection to the thoracic spine 63.2%.

Surgical results were complete excision in all cases except one, 10.3% Complication rate. Histopathological examination showed all the specimens to be of grade WHO-I meningiomas, except in 3-cases 3.4% found to be grade who-II.

Conclusions: This is a retrospective study of spinal meningioma with a long-term follow-up. Being an uncommon disease entity with a discrete pathology and symptomatology. This study provides a representative review due to an adequate number of cases and a sufficient follow-up. The results of our study are in line with the reported literature in terms of epidemiology, histology, clinical manifestations with minor differences.

KEYWORDS:

Spinal meningiomas, psammomatous, meningothelial, atypical meningioma.

Introduction: Spinal meningiomas are benign tumors with a wide spectrum of clinical and radiological features at presentation. They compromise 7.5-12.7% of all meningiomas and approximately 25% - 46% of primary spinal canal tumors [1.2]. As we still need studies to provide an insight into the demographic features, clinical presentation, histopathology, and management, this study was carried out.

Patients and Methods:

A retrospective review was performed for 87 consecutive surgically treated patients with spinal meningiomas treated in our setup in a single centre over a period of 15-years from January 2000 to January 2016. With a mean follow-up of 37 months (ranging from 14 to 149 months).

The clinical diagnosis was supported by radiological studies (CT scan, MRI…) in all patients and confirmed by histopathological reports. Clinical, radiological and histopathological data reviewed and analyzed.

Surgical technique

The surgical steps were common for all the cases and were as follows: with the patient in a prone position under general anesthesia, the level of the neoplasm was marked under fluoroscopy guidance. The region is draped in a standard sterile fashion, with a conventional midline approach centered over the appropriate segment using anatomical landmarks and fluoroscopy, then skin and the subcutaneous tissues are opened one-level above and below for adequate exposure, with sub periosteal dissection done down to the specified level to expose the spinous process and the laminae bilaterally, fluoroscopy was used to reconfirm the level and a laminectomy performed. The dura was opened at the midline with a scalpel, according to the location of the tumor. The incised dura then reflected, and tacked-up with the para-spinal muscles. Tumor removal was performed in a piece meal fashion and dissected from the surrounding neural tissue using a microsurgical technique, care was taken to coagulate the Dural base of the attachment with no excision of the dura due to the anterolateral position of the attachment making the dural repair technically demanding and susceptible to CSF leak. Meticulous hemostasis achieved before the dural closure, which was performed using 4-0 vicryl or 6-0 nylon suture with interrupted sutures or continuously locked sutures.

Results

In a cohort of 87 treated patients, the majority of the patients were women (70), representing 80.5% of patients. The mean age was 50.4 for women, and 49.9 for men. The mean age for both genders was 50.3-years, ranging between (18-87) years. The Mean follow-up was 37 months (14-149 months). Demographic features detailed in Table I.

Neurogenic pain was the predominant symptom and observed in 78.2% of patients, mostly in the form of dull aching back pain or dermatomal distribution. Somatic night pain reported in 52% of patients. The preoperative neurological examination was abnormal in 34 persons (39.1%): sensory level found in 25 patients (28.7%), paresis of the lower limbs in 7 patients (8%), while 2 patients (2.3%) had quadri-paresis, in 8 patients (2.3%) sphincteric dysfunction was observed in association with other neurological deficits.

Radiological investigations were critically dependent on contrasted MRI which showed homogenous enhancement of the lesions which were all intra-dural and extramedullary in this study. Topographic distribution was 63.2% exclusively in the thoracic spine, 16.1% in the lumbar and in 20.7% in the cervical spine. The majority of the lesions were anteriorly located in relation to the spinal cord in 73.2% of patients.

Outcome; complete excision in all cases except one, early complications occurred in 9 patients (10.3%); wound problems occurred in 4 patients (4.6%), transient neurological deterioration occurred in 3 patients (3.4%), and pseudo-meningo-cele was evolved in one patient (1.14%), requiring revision for primary repair and complicated with meningitis which was controlled with antibiotics.

Follow-up ranged from (14-149 months), with mean follow-up of 37 months, all patients were in a good neurological status and had normal MRI follow-ups, except for 3-cases which showed recurrence on routine follow-up MRI without neurological impairment.

Amongst spinal meningiomas in this group of patients, histopathological examination revealed that psammomatous subtype dominated-51 cases (58.6%), followed by meningothelial subtype-21 cases (24.1%), Transitional (mixed) meningioma -5 cases (5.7%); Clear-cell meningioma -4 cases (4.6%). Three cases (3.4%) turned out to be atypical meningioma.

Table.I: Demographic details of all patients

Parameter	patients number
GENDER	
Male	17
Female	70
AGE group	
>60	17
40-60	16
30-40	46
30<	8

Discussion

Primary neoplasms of the spine arise within the spinal canal and from the surrounding tissues. [1, 2] Spinal Meningiomas are derived from arachnoid cap cells of the shielding lining of the brain and spinal cord; the meninges near the ventral nerve root. Most are benign, though in rare cases they can be cancerous (malignant). Stereotypically, meningiomas are benign tumors with a wide spectrum of clinical and radiological features at presentation and account for approximately 25% - 46% of spinal canal tumors, they are the second most common intra-spinal neoplasms after nerve sheath tumors. [3-6]

Spinal meningiomas are most commonly reported in elderly patients with a peak incidence in the seventh decade of life. Reports established a female preponderance (4:1). [2.7.8] Our analysis revealed that 70-cases 80.5% of patients were women. The mean age was 50.4 for women, and 49.9 for men. Mean of ages for both genders was 50.3 year, ranging between (18 -87) year.

Symptoms are invariably non-specific. A non-mechanical back pain dominating the clinical presentation, which is persistent, unrelated to activity and classically worsened in the recumbent position, during rest and at night. This should be distinguished from common back pain. Time delay occurs between symptom commencement and conclusive diagnosis, because of the initial non-specific symptoms, most commonly a dull aching pain followed by delayed neurological deficit occurs after significant compression resulted from slow growth [8-10]. In our study, back pain was the cardinal symptom in 78.2% and progressive neurological deficit noticed in 39.1% of our cases (Table **II**).

Table II: Clinical presentation details of all patients

Presentation	patients number
Pain	68
Sensory deficit	25
Paraplegia /paresis	7
Quadriplegia/ paresis	2
Sphincteric dysfunction	8

Topographically they are mostly intradural in location although approximately 10% of intradural spinal meningiomas are associated with some extradural extensions. Exclusively extradurally located meningiomas are extremely rare. [11] Bias towards thoracic spine (with around 80% of the tumors occurring in the thoracic spine) and commonly ventral/ ventrolateral (Figure I). [2.3.5.7.12] In our study results revealed that all cases were intradural, thoracic area dominated-55 cases (63.2%); cervical region came in second place 18-cases (20.7%) and least in lumbar segments with 14-cases (16.1%) (Figure II). (Table **III**)

Table III: Topographic wise details of all patients

Tumor topography	patients number
Cervical	18
Thoracic	55
Lumbar	14
Junctional	0

Radiological evaluation is a cornerstone for surgical planning, as a differentiation tool between the tumor and neural tissues. Contrasted Magnetic Resonance Imaging (MRI) being the best imaging modality for spinal meningiomas. The lesion typically appears as isointense to slightly hypo intense and may have a heterogeneous texture on T1-weighted images. While in T2-weighted images they look isointense to slightly hyper intense. However, in post contrast images show moderate homogeneous enhancement. Occasionally, densely calcified meningiomas are hypo intense on T1 and T2 and show only minimal contrast enhancement. [4.13] Our cases showed a similar radiological presentation and strong enhancement (Figure III). CT scan show an isodense or moderately hyper dense mass, hyperostosis may be seen but far less common than the intracranial forms due to a well formed epidural space in the spinal canal, also calcification may be present. [4.14]

Common histological patterns are meningothelial, fibroblastic, transitional and psammomatous, with most case reports demonstrating the meningothelial and psammomatous types. [15] Amongst spinal meningiomas in this group of patients, postoperative histopathological examination showed psammomatous subtype dominated-51 cases (58.6%). Followed by meningothelial subtype-21 cases (24.1%), Transitional (mixed) meningioma 5-cases (5.7%); Clear-cell meningioma 4-cases (4.6%). The remaining 3-cases (3.4%) in which histopathology revealed atypical meningiomas subtype (Figure IV).

Intradural extramedullary meningiomas are usually amenable to surgical resection with a good outcome (Figure V). Although in many studies optimal treatment for primary spinal meningioma was total microsurgical resection, some authors advocated adjunctive radiotherapy in cases of recurrent tumors [15-17]. In our review all patients underwent gross total resection and 3-cases received adjuvant radiotherapy in which atypical meningioma subtypes diagnosed. Recurrence of spinal meningiomas was rare, and in most series, the rate ranged from 1.3 to 6.4% [7.14.17.18]. Three cases showed recurrence on routine follow-up and were of grade WHO-I and treated by second surgery, in our opinion surgery was better than exposing the delicate spinal cord to unnecessary radiation.

Complications reported in the range of 0-10% in many reports[4.7.16.17.19]. In our analysis, complications occurred in 9 patients (10.3%) and no mortality reported. In detail, a wound problem occurred in 4 patients (4.6%), and transient neurological deterioration occurred in 3 patient (3.4%), and pseudo-meningo-cele was evolved in one patient (1.14%),

requiring revision for primary repair and complicated with meningitis which was controlled with antibiotics.

Conclusions

This is a retrospective study of spinal meningioma with a long-term follow-up. Being an uncommon disease entity with a discrete pathology and symptomatology. This study provides a representative review due to an adequate number of cases and a sufficient follow-up period. The results of our analytical study are in line with the reported literature in terms of epidemiology, histology, clinical manifestations with minor differences.

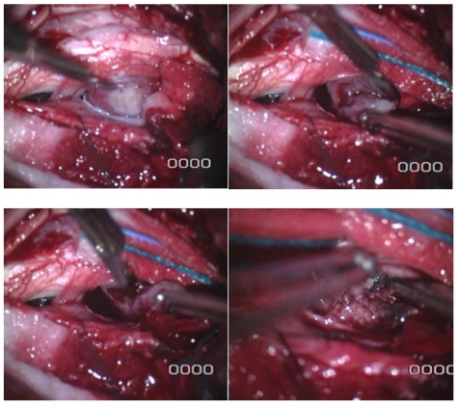

Figure I. Intra-operative Images, showing intradural and ventrally located of spinal meningioma.

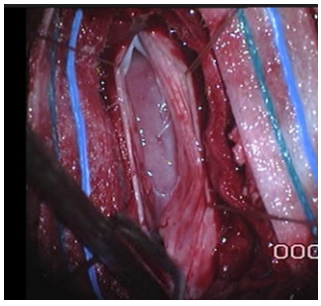

Figure II. Intra-operative Images, showing intradural meningioma, located anterolateral to the cauda-equine.

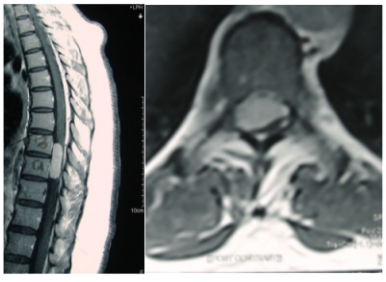

Figure III. Thoracic MRI, Sagittal & axial cuts, showing intradural and ventrally located of spinal meningioma

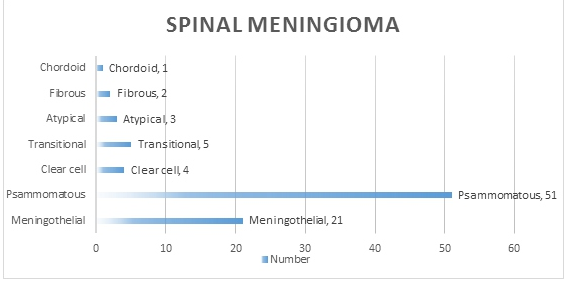

Figure IV: Histopathological subtype of spinal meningiomas patients.

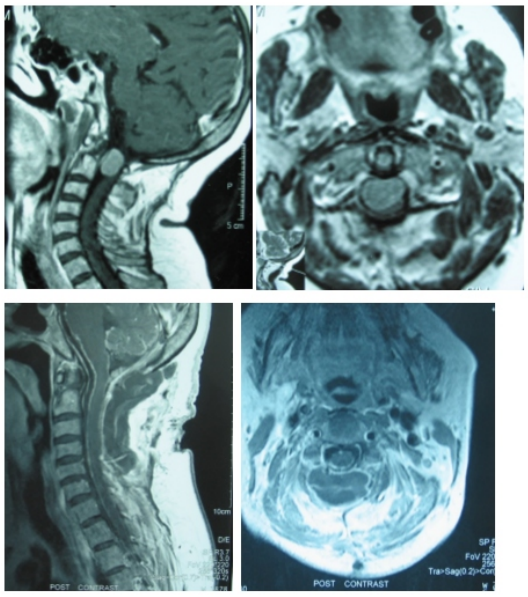

Figure V. Pre-operative and postoperative radiological Images, showing spinal meningioma totally resected

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