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Original article

Role of MRI in the evaluation of Intradural Extramedullary Spinal tumours with histopathological correlation.

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Abstract:

This cross sectional study was carried out in the department of radiology & imaging, Neurosurgery, Spine Surgery Unit of BSMMU and Sir Salimullah Medical College & Mitford Hospital, DMCH, during 1st January 2006 to 31st December 2007, to establish the diagnostic usefulness of MRI in evaluation of spinal tumours .A total of 57 patients having nerve sheath and meningioma tumour were enrolled in this study. The age ranged from 10 to 67 years and the maximum number was found in the age group of 31-40 years. The mean age was 39.9 years with standard deviation (SD) ±15.2 years. Out of 57 patients, 57.9% were male and rest 42.1% were female patients and male female ratio was 1.4:1. In MRI diagnosis there were highest incidence of nerve sheath tumours 43 cases in intradural extramedullary compartment and 14.3% was meningioma the next commonest tumour in this compartment. Schwannoma was the most commone lesion in intradural extramedullary tumours, which was 40.4%, followed by Neurofibroma 35.1% and meningioma 24.6% by histopathology among all intradural extramedullary spinal tumours. Commonest location of intradural extramedullary spinal tumours were found in thoracic (36 cases) followed by cervical (14 cases) and lumbar (7 cases).

Introduction:

Spinal tumour is an abnormal mass of tissue within or surrounding the spinal cord and spinal column, in which cells grow and multiply uncontrollably, seemingly unchecked by the mechanisms that control normal cells[1]. Spinal tumours can be benign or malignant.

Primary tumours originate in the spinal cord and metastatic tumors result from cancer spreading from different sites (breast, lung, colon etc.) to the spine[2]. Approximately 20% of all central nervous system tumours lie within the spinal canal. Estimates of location suggest that 25% are extradural, 50% are intradural extramedullary and 25% are intramedullary[1].

Spinal tumours may be referred to by the area of the spine in which they occur. These basic areas are cervical, thoracic, lumbar and sacrum. Additionally, they are also classified by their location in the spine-anterior (front) and posterior (back)[3]. With the increasing availability of new radiological tool such as magnetic resonance imaging (MRI) spinal tumours are discovered more frequently[1].

Intradural extramedullary tumours constitute about half of all spinal tumours[4]. Schwannoma and meningioma make up approximately 90% of the intradural extramedullary tumour.

Most nerve sheath tumours arise from dorsal sensory root. Depending on the origin along the root, nerve sheath tumour can be intradural (70-75%), extradural (15%) or combined intradural and extramedullary "dumbbell" (15%). A dumbbell shaped enhancement pattern is typical of schwannoma. Distribution of nerve sheath tumours throughout the spine is uniform with slight lumbar predominance[2].

More than 80% meningioma occur in women, where as schwannoma has slight female predominance[4]. Thoracic spine is the most common site for meningioma (80%), followed by cervical spine (15%). The lumbar spine is an uncommon location for meningioma[6].

Most spinal meningioma has "the dural tail sign"[7]. The gold standard for imaging spinal cord tumour is MRI[8]. MRI became the primary diagnostic modality in the assessment of spinal tumour and tumour like lesions. MRI evaluation include viewing of all three planes (Axial, sagittal, coronal) both with and without administration of paramagnetic contrast agents such as Gd, DTPa[1]. Nerve sheath tumours account for approximately 30% of all primary intraspinal neoplasm[9]. Two main types are schwannoma and neurofibroma. Ganglioneuroma is relatively rare. On MRI, 75% of these tumours are isointense to cord on T1W images. On T2W sequences these tumours are hyperintense. A "target" appearance is often seen on T2W and contrast enhanced sequences in neurofibroma. Sometimes schwannoma may show a cystic component, necrosis or hemorrhage. Schwannoma and neurofibroma can not be reliably distinguished on MR scans[5].

Most spinal meningioma are isointense with spinal cord on both T1 and T2 weighted sequences. Moderate relatively homogenous enhancement is seen following contrast administration[10]. Occasionally densely calcified meningiomas are profoundly hypointense on MRI scans and show minimal contrast enhancement[4]. Most of the metastases are extradural, only 2-4% are intradural and 1-2% are intramedullary.

Material and methods:

This cross sectional study was carried out on 70 patients having clinical suspicion of intradural extramedullary spinal tumour. These patients were evaluated by MRI and postoperative histopathological finding to confirm the diagnosis. Among all patients 5 were refused to do surgery, no histopathology reports were available from 3 patients and 5 were diagnosed as intramedullary. Finally we evaluate only 57 patients and they were considered as study sample.

Observations and results :

Patients were divided into six age groups. The age ranges from 10 to 67 years and the maximum number was found in the age group of 31-40 years. The mean age was 39.9 years with standard deviation (SD) ±15.2 years.

Table I: Age distribution of the patients (n=57)

Age in years	No. of Patients	Percentage
10-20	5	8.1
21-30	12	21.6
31-40	18	32.5
41-50	14	24.3
51-60	6	10.8
≥60	2	2.7
Total	57	100

Table II: Distribution of intradural extramedullary spinal tumours by histopathology (n=57)

Intradural extramedullary	Cervical	Dorsal	Lumbar	Total	Percent
Nerves sheath tumours	9	13	1	23	40.4
Schwannoma					
Neurofibroma	4	14	2	20	35.1
Meningioma	1	9	4	14	24.6
Total	14	36	7	57	100.0

Out of the 57 cases 43(75.4%) cases were intradural extramedullary nerve sheath tumours and 14 (24.6%) cases were negative for nerve sheath tumours in MRI. On the other hand, 42 (73.7%) cases were positive for nerve sheath tumours and rest of the 15(26.3%) cases were negative for nerve sheath tumours in histopathology.

Table III: MRI and histopathological diagnosis of Intradural Extramedullary nerve sheath tumours.

MRI diagnosis	Histopathological Diagnosis		Total
	Present	Absent	
Present	41	2	43
Absent	1	13	14
Total	42	15	57

Discussion:

With the advent of modern imaging technologies such as MRI, it has been easier to diagnose spinal tumours preoperatively accurately[7]. MRI has been the investigation of choice in patients with suspected spinal tumours. In addition to superior tumour resolution, it has the added advantage of delineating the extradural compartment, intradural extramedullary compartment and intramedullary compartment and paraspinous soft tissue involvement as well as cord compression[7].

This cross sectional study was carried out with an objective to evaluate the usefulness of MRI in diagnosis of spinal tumours and to evaluate the sensitivity, specificity between MRI findings of spinal intradural extramedullary tumours with postoperative histopathological reports.

In this study it was observed that schwannoma was the most common lesion in intradural extramedullary tumours, which was 40.4% followed Neurofibroma 35.1% and meningioma 24.6% by histopathology among all intradural extramedullary spinal tumours. In this current series, in MRI 57 cases were diagnosed as

intradural extramedullary tumour out of which 43 cases were correlated with histopathology as Nerve sheath tumours, whereas rest were diagnosed as meningioma. On the other hand, 14 cases were correlated with histopathology as meningioma tumours, whereas, rest were diagnosed as Nerve Sheath tumours.

Out of the 57 cases 43 (75.4%) cases were intradural extramedullary nerve sheath tumours and 14(24.6%) cases were negative for nerve sheath tumours in MRI. On the other hand, 42(73.7%) cases were positive for nerve sheath tumours and rest of the 15(26.3%) cases were negative for nerve sheath tumours in histopathology. Among the 43 cases, which were positive for nerve sheath tumours by MRI, 41 cases were positive for nerve sheath tumours and 2 cases were found to be negative for nerve sheath tumours in histopathology. Whereas, 1 case was found positive for nerve sheath tumours in histopathology among the negative for nerve sheath tumours , which were diagnosed by MRI.

Sensitivity of MRI in diagnosis of intradural extramedullary nerve sheath tumours was 97.6%, specificity 86.7%, accuracy 94.7%, positive predictive values 95.3% and negative predictive values 92.9% in the present study.

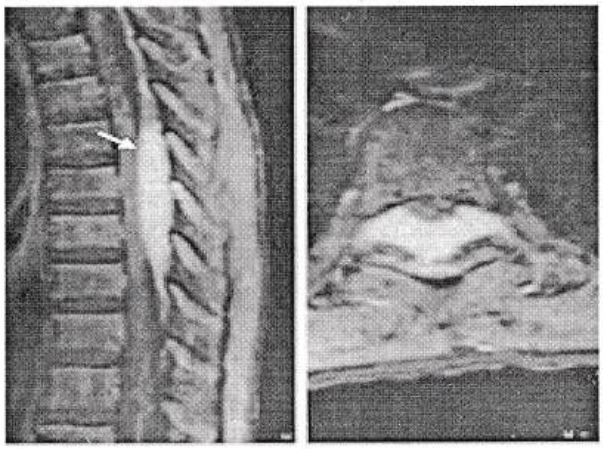

Fig1: Post contrast MRI of spinal meningioma

This study is consistent with Kyoshima et al., (2005)[5] where sensitivity of MRI in diagnosis of Intradural Extramedullary nerve sheath tumours was 96.6%, specificity 95.7%, accuracy 97.7%, positive predictive values 93.3% and negative predictive values 94.9%.

In this current series, out of the 57 cases 14(24.6%) cases were intradural extramedullary meningioma tumours and 43(75.4%) cases were negative for meningioma tumours in MRI. On the other hand, 14(24.6%) cases were positive for meningioma tumours and rest of the 43(75.4%) cases were negative for meningioma tumours in histopathology. Among the 14 cases, which were positive for meningioma tumours by MRI, 13 cases were positive for meningioma tumours and 1 case was found to be negative for meningioma tumours in histopathology. Whereas, 1 case was found positive for meningioma tumours in histopathology and 42 cases were found negative for meningioma tumours among the negative for meningioma tumours , which were diagnosed by MRI.

Fig 2: MRI of spinal schwannoma

In the present study sensitivity of MRI in diagnosis of meningioma tumours was 92.9%, specificity 97.7%, accuracy 96.5%, positive predictive values 92.9% and negative predictive values 97.7%. This study is consistent with Gezen et al., (2000)[10] where sensitivity of MRI in diagnosis of meningioma tumours was 94.9%, specificity 95.7%, accuracy 95.5%, positive predictive values 94.9% and negative predictive values 96.7%

Out of 57 cases, 42 cases were confirmed by histopathology as nerve sheath tumours. In MRI 57 cases were diagnosed as intradural extramedullary tumour out of which 43 cases were correlated with histopathology as Nerve sheath tumours, whereas rest were diagnosed as meningioma.

According to histopathology, out of 57 cases, 14 cases were meningioma tumours. In MRI 57 cases were diagnosed as intradural extramedullary tumour out of which 14 cases were correlated with histopathology as meningioma tumours, whereas, rest were diagnosed as Nerve sheath tumours

Conclusion :

MRI is unquestionably the best initial procedure of suspected tumours of the spine, regardless of the space in which they may lie and accurate pre-operative diagnosis helps in the correct decision making for the optimal surgical management of the patients.

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