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"The Accuracy, Sensitivity and Specificity of MRI (Magnetic Resonance Imaging) in Detection of Intraspinal Tumor."

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Abstract:*Intraspinal tumor are not uncommon lesion that may result in serious morbidity. Their clinical symptoms are often non-specific and include back pain, radicular symptom and slowly progressive neurological deficits such as limb weakness, paresthesia, gait problem, impotence bowel and bladder dysfunctions are the most common. Less common are acute headache, skeletal deformity such as kyphoscoliosis.The study was carried out in the department of Radiology and imaging, Dhaka Medical College Hospital, Dhaka (DMCH) in the collaboration with Neurosurgery department of DMCH. A total number of 50 patients from 11-70 years of age were evaluated by detailed history and clinical Examination with special emphasis on nervous system who subsequently underwent for MR Scan of spine.The patient was of both sex and male female ratio about 3:2. Age group 11-70 years and mean age 38.89 years. Efficacy of MRI was also evaluated out of 50 patients 39 were detected by MRI as intraspinal tumor. Sensitivity of MRI was 92.68% and specificity 88% and Accuracy was 92%. This was a cross sectional study was a clinical suspicion of Intraspinal tumor to Radiology & Imaging Department of Dhaka Medical College Hospital (DMCH). Dhaka from July 2008 to March 2010. The study aim was to Magnetic Resonance Imaging Evaluation of Intraspinal Tumor and its Comparison with Histopathological Findings as a noninvasive diagnostic tool in patient with spinal tumors and to correlate the MRI findings with patient's neurological outcome. Radiographic evaluation is crucial in patients with spinal tumor.*

Key words: *Intraspinal, Histopathological, Sensitivity, Specificity, Accuracy*

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I. Introduction

This was a cross sectional study was a clinical suspicion of Intraspinal tumor to Radiology & Imaging Department of Dhaka Medical College Hospital (DMCH), Dhaka from July 2008 to March 2010.The total number of patients was 50 and male to female ratio was 30:20 the age ranged between 11-70years and mean age 38.89 years. The commonest location of spinal tumors isintraduralextra medullary (58%). Most of the tumors show hypo intense signal and hyper intense signal and post contrast heterogeneous enhancement (44%). MRI is strongly recommended for accurate diagnosis of spinal tumors because of its many advantages such as higher contras resolution, absence of bony artifact and multiplane capability. Sensitivity of MRI was 92.68% and specificity 88% and accuracy was 92% More information about neural and extra neural lesions can be obtained.In this study majority of schwannoma 54% intense and 46% were hypo intense, 85% schwannoma were hyper intense. Heterogeneous contrast enhancement was noted in 62% cases. This finding are almost similar to the result of Verdelhan et al[1,2,3,4]. Eleven cases detected meningioma 81% were hyper intenseand 27% were hypo intense. After contrast immediate and homogeneous enhancement occurs in all. In this study which strongly correlate with the study of Dillon et al[3], takemoto et al[4]and Parizel et al[5]. In this study more than 50% of astrocytoma were hypo intense and rest are iso intense. Astrocytoma were hyper intense. After contrast all astrocytoma tend to enhance patchier irregular, consistent with a more diffusely infiltrating tumor. In case of ependymoma 100% were isointense with cord, 100% of ependymoma were hyper intense. After contrast 100% of ependymoma showed intense enhancement. Homogeneous and sharply marginated focal enhancement. These findings are almost similar to the result of the Parizelet al[5]. Goy et al[6] and Bushberg et al[7]all vertebral haemangioma shows intermediate signal intensity and enhancement occurs after contrast which strongly correlate with the study of Jeffery et al[8]. In the present study the overall accuracy of MRI as a diagnostic modality is 92.68% with sensitivity, 88%. Specificity, 92%. Accuracy, predictive value of positive test 97% and predictive value of negative test 72.7%. Takemoto K et al[4]. Have mention the accuracy in detection and identification of intraspinal tumors about 96%. All these results strongly support the present study. With regards

to specificity Verdelhan OD et al[1].In their study found specificity of 83.3% which is almost similar to present study. In present study specific diagnostic rate is 88%. Parizelet al[5].Found in their study 90% sensitivity of MRI in detection of intramedullary spinal cord tumors which is very close to the result of the present study. They concluded that GD-DTPA increases both the MR sensitivity in defining and localizing spinal tumor and the MR specificity in the diagnosis of spinal lesion. Xuet al[9]. Observed in their study. Correlation of the preoperative neuroradiologic MR scanning evaluation with histologic diagnosis of intraspinal tumors. The sensitivity was calculated 84%. Dillon WP et al[3].Found in their study that MRI detection of intramedullary spinal cord neoplasm was 100% sensitive. Jinkins et al[10]found 100% sensitivity of MRI in detecting seven cases of intramedullary spinal cord tumor in patient with neurofibromatosis type-2. From the result of the present study as well as the findings obtained by others Bushberget al[7], Parizel et al[5]. Prior to the commencement of this study the research protocol was approved by the ethical committee, Dhaka Medical College, Dhaka. All the patients included in this study were informed about the nature, risk and benefits of this study and informed written consent was taken from patients and guardians. This study did not involve any additional investigation procedures and significant risk as well as economic burden to the patients. It walls assured that all informed and records would be kept confidential and the procedure would be helpful for both the physicians and patients in making rational approach of the case management. it is conceivable that Magnetic Resonance Imaging Evaluation of Intraspinal Tumor and its Comparison with Histopathological Findings.

II. Objectives

a) General objective:

- To evaluate Accuracy, Sensitivity and Specificity of MRI (Magnetic Resonance Imaging) in Detection of Intraspinal Tumor."

b) Specific Objectives:

To evaluate diagnostic usefulness of MRI in detection of intraspinal tumors in Bangladesh

III. Mrthodology And Materials

The study was conducted during the period from July 2008 to June 2010. The study was carried out in the department of Radiology and imaging, Dhaka Medical College Hospital, Dhaka (DMCH) in the collaboration with Neurosurgery department of DMCH. A total number of 50 patients from 11-70 years of age, all these Patients were evaluated by detailed history and clinical Examination with special emphasis on nervous system who subsequently underwent for MR Scan of spine. Those patients who were operated were continuously followed up after surgery up to histological diagnosis. MR findings were compared with histopathological report**.**

Inclusion Criteria

- Clinically suspected cases of spinal tumor who were referred to Radiology and Imaging department of DMCH from OPD and indoor for MRI

Exclusion Criteria

- Patient unfit or unwilling to undergo surgery.
- Non availability of histopathological report.

IV. Results

The main objective of the study was to establish the diagnostic usefulness of MRI in detection of intraspinal tumor. This cross sectional study was done on 50 purposively selected patients whose age ranged from 11 to 70 years. All the patients who were referred from OPD and indoor in the Department of Radiology and Imaging, Dhaka Medical College Hospital, Dhaka with clinical suspicion of intraspinal tumor during the period from July 2008 to June 2010 were enrolled, MRI of Spine was done and compared with that of histopathological findings Data regarding the clinical, MRI and histopathological findings presented in tables and figures. This study included 50 patients with clinical features compatible with intraspinal tumor. The range of the patient was 11-70. The maximum numbers of the patients were between 41-50 years. Mean age was 38.89 years. Out of 50 patients who were finally included in the study 30(60%) were male and 20(40%) were female. Male to Female ratio was 3:2.Histopathological classification was done on 50 patients. Histologically 13 cases (26%) were diagnosed as Schwannoma 1 case (2%) was neurofibroma, 11 cases (22%) were diagnosed as Meningioma 07 cases (14%) as Ependymoma. Astrocytoma 5 cases (10%) Metastasis 2 cases (4%) Hemangioma were 01 (2%) Chordoma 01 (2%) cases and others /Negative for Intraspinal tumor were 9 (18%). Histopathology diagnosed 41 (82%) was Intraspinal tumor. And 9 (18%) were other than Intraspinal tumor.Among 11(22%) cases as others tumor 5(10%) cases were sequestrated disc, 3(6%) cases were chronic inflammatory lesion, 1(2%) case epidural haematoma,1(2%) case Astrocytoma 1(2%) case was Chordoma. MR

evaluation of intraspinal tumors had overall sensitivity 92.68%, specificity 88%, accuracy 92%, positive predictive value 97% and negative predictive value 72.7%.

Table- I: Age distribution of patients (N=50)

Age in years	n	%	Mean age (In years)
11-20	5	10	**38.89**
21-30	9	18	
31-40	10	20	
41-50	17	34	
51-60	6	12	
61-70	3	6	
Total	**50**	**100**	

Table-II: Sex distribution of patients (N=50)

Clinical features	n	%
Male	30	60
Female	20	40
Total	**50**	**100**

Figure I: Sex distribution of patients (N=50)

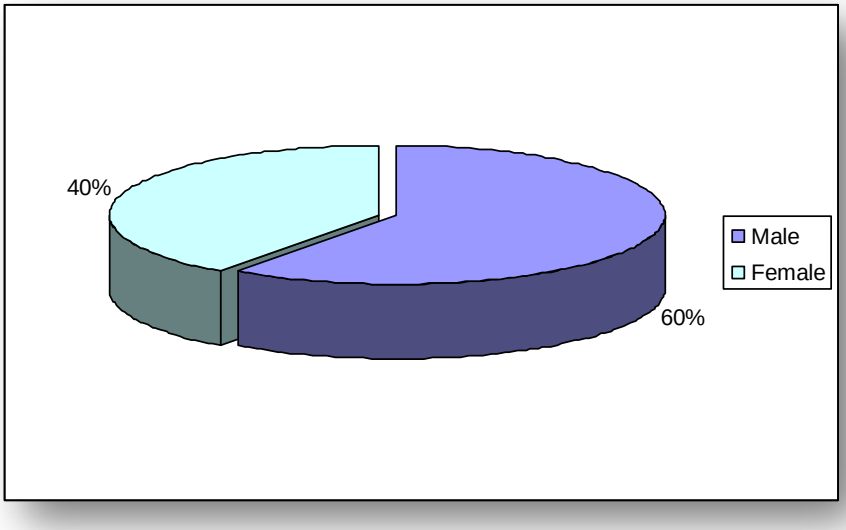

Table III: Histopathologicalclassification of the lesions (N=50)

Histopathological diagnosis	N	%
Schwannoma	13	26
Neurofibroma	1	2
Meningioma	11	22
Ependymoma	07	14
Astrocytoma	05	10
Metastasis	02	4
Hemangioma	01	2
Chordoma	01	2
Others/Negative for Intraspinal tumor.	09	18
Total	**50**	**100**

Table IV: Classification oTumor (N=50)

Histopathological diagnosis	N	%
Intraspinal Tumor	41	82
Others/Lesion negative for Intraspinal Tumor	09	18
Total	**50**	**100**

Table V: MRI diagnosis of others tumors (N=50)

MRI Diagnosis	**No. of cases**	**% (%)**
Sequestrated disc	5	10
Chronic Inflammatory lesion	3	6
Epidural abscess	1	2
Astrocytoma	1	2
Chordoma	1	2
Total	**11**	**22**

Table VI: Validity of MR evaluation of intraspinaltumors (N=50)

MRI	**Histopathology**		**Total**
	Positive	Negative	
Positive	38 (TP)	1 (FP)	**39**
Negative	3 (FN)	8 (TN)	**11**
Total	**41**	**9**	**50**

Table VII: Sensitivity, specificity and accuracy of MRI in compares with histopathology of intraspinal tumors (N=50)

	%
Sensitivity	92.68
Specificity	88
Accuracy	92

V. Discussion

This cross-sectional study was carried in Department of Radiology and Imaging, Dhaka Medical College, Dhaka from July 2008 to March 2010. Finally 50 patients were included in the study. MRI of cervical, dorsal and lumbar spine were done according to requirement. Patients were operated, histopathology reports were collected in each cases. Data were collected in a predesigned data collection sheet. This cross sectional study was carried out by 0.3T MRI with 3-5 mm slice thickness. MRI of spine was performed in all cases. Among the 50 cases MRI diagnosed 39 cases as intraspinal tumor and 11 cases as other than intraspinal tumor. Thirty-eight cases were truly diagnosed as intraspinal tumor by this imaging modality. MRI failed to detect three intraspinal tumors. One histologically proved intramedullary abscess was falsely diagnosed as intramedullary astrocytoma. In eight patients MRI correctly diagnosed the lesion to be other than intra spinal tumors. In the present study the overall accuracy of MRI as a diagnostic modality is 92.68% with sensitivity 88%. Specificity, 92%. Accuracy, predictive value of positive test 97% and predictive value of negative test 72.7%. Takemoto K et al[4]. Have mention the accuracy in detection and identification of intraspinal tumors about 96%. All these results strongly support the present study. With regards to specificity Verdelhan OD et al[1].In their study found specificity of 83.3% which is almost similar to present study. In present study specific diagnostic rate is 88%. Parizelet al[5]. Found in their study 90% sensitivity of MRI in detection of intramedullary spinal cord tumors which is very close to the result of the present study. They concluded that Gd-DTPA increases both the MR sensitivity in defining and localizing spinal tumor and the MR specificity in the diagnosis of spinal lesion. Xuet al[9].Observed in their study. Correlation of the preoperative neuroradiologic MR scanning evaluation with histologic diagnosis of intraspinal tumors. The sensitivity was calculated 84%. Dillon WP et al. (1989) found in their study that MRI detection of intramedullary spinal cord neoplasm was 100% sensitive. Jinkins et al [10] found 100% sensitivity of MRI in detecting seven cases of intramedullary spinal cord tumor in patient with neurofibromatosis type-2. From the result of the present study as well as the findings obtained by others (Bushberget al[7], Parizel et al[5]. it is conceivable that MR scanning is a highly accurate and sensitive modality in the evaluation lf intraspinal tumor.

LIMITATIONS OF THE STUDY

This cross-sectional study was conducted in one tertiary hospital with small sample size which may not represent the whole country.

VI. Conclusion And Recommendations

MRI is crucial in patients with spinal tumors for assessment of the spinal cord and osseous and soft tissue structures. This is especially important when an accurate clinical examination and history are limited because of soft tissue swelling or disturbed consciousness level. The various MR findings in spinal cord tumors

are correlated well with histopathological findings. It can be concluded that based on current results of MRI (Magnetic Resonance Imaging) in detection of Intraspinalcan be accepted as the most effective imaging modality in the diagnosis of intraspinal tumor.

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