Original Research Article

A study of diagnostic accuracy of MRI in the contrast-enhanced magnetic resonance imaging in diagnosis of meningitis correlated with CSF analysis at tertiary health care centre

Vinayak Gautam[1], Shambhavi[2*], Nishit[3]

[1]Associate Professor, Government Medical College, Betiyah, Bihar, INDIA.
[2]Post Graduate, Katihar Medical College, Katihar, Bihar, INDIA.
Senior resident, Department of Pathology, AIIMS, Patna, Bihar, INDIA.
Email: drshambhaviarunkr1118@gmail.com

Abstract

Background: Meningitis is a significant health problem worldwide and can be a life-threatening emergency if not suspected, appropriately diagnosed, and managed expeditiously **Aims and Objective:** To Study diagnostic accuracy of MRI in the Contrast-Enhanced Magnetic Resonance Imaging in Diagnosis of Meningitis Correlated with CSF Analysis at tertiary health care centre. **Methodology:** This was cross-sectional study carried out in the department of radiology at tertiary health care centre during the one year period i.e. March 2017 to March 2018. In the one year period with written and explained consent; 60 patients suspected with meningitis were undergone Contrast-Enhanced Magnetic Resonance Imaging and CSF examination with all standard protocols. The sensitivity and specificity Positive Predictive Value and Negative Predictive Value was calculated by MEDCAL Software. **Result:** In our study we have seen that The majority of the patients were in the age group of 40-50 were 40.00% followed by 50-60 Were 21.67%, 30-40 were 20.00%, >60 were 10.00%, 20-30 were 8.33%. The majority of the patients were Male i.e. 58.33% and Female were 41.67% Sensitivity was 93.33% (77.93% to 99.18%) and Specificity was 90.00 % (73.47% to 97.89%) . Positive Predictive Value 90.32% (76.06% to 96.48%), Negative Predictive Value was 93.10 % (77.88% to 98.11%) **Conclusion:** It can be concluded from our study that Contrast-Enhanced Magnetic Resonance Imaging was very efficacious in the diagnosis of meningitis so must be accompanied with CSF for the correct diagnosis of meningitis.

Key Word: Contrast-Enhanced Magnetic Resonance Imaging (CE-MRI), CSF (Cerebro Spinal Fluid), Meningitis.

***Address for Correspondence:**
Dr. Shambhavi, Post Graduate, Katihar Medical College, Katihar, Bihar, INDIA.
Email: drshambhaviarunkr1118@gmail.com
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INTRODUCTION

Meningitis is a significant health problem worldwide and can be a life-threatening emergency if not suspected, appropriately diagnosed, and managed expeditiously1[2]. Estimated prevalence of meningitis in our region is 1.57%[3]. Delay in administration of antibiotics is associated with death in adults suffering from acute bacterial meningitis. A delay of 4–6 hours in the administration of antibiotics after presentation independently conferred an 8.4-fold greater risk of death from meningitis[4]. Infective meningitis including tuberculous and bacterial meningitis is the leading cause of stroke in young patients in our country[5]. Bacterial meningitis is the major cause of morbidity in children below the age of 5 years[6]. There are typical features of each type of meningitis on MRI and detected by Contrast-Enhanced Magnetic Resonance Imaging So we have compared the Sensitivity and

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specificity of Contrast-Enhanced MRI with respect to Gold standard CSF examination.

METHODOLOGY

This was cross-sectional study carried out in the department of radiology at tertiary health care centre during the one year period i.e. March 2017 to March 2018. In the one year period with written and explained consent; 60 patients suspected with meningitis were undergone Contrast-Enhanced Magnetic Resonance Imaging and CSF examination with all standard protocols. The sensitivity and specificity Positive Predictive Value and Negative Predictive Value was calculated by MEDCAL* Software.

RESULT

Table 1: Age wise distribution of the patients

Age	No.	Percentage (%)
20-30	5	8.33
30-40	12	20.00
40-50	24	40.00
50-60	13	21.67
>60	6	10.00
Total	60	100.00

The majority of the patients were in the age group of 40-50 were 40.00% followed by 50-60 Were 21.67%, 30-40 were 20.00%, >60 were 10.00%, 20-30 were 8.33%.

Table 2: Distribution of the patients as per the sex

Sex	No.	Percentage (%)
Male	35	58.33
Female	25	41.67
Total	60	100.00

The majority of the patients were Male i.e. 58.33% and Female were 41.67%

Table 3: Distribution of the patients as per the MRI and CSF examination

MRI Features of meningitis	CSF Examination Features of Meningitis		Total
	Present	Absent	
Present	**28**	**3**	**31**
Absent	**2**	**27**	**29**
Total	**30**	**30**	**60**

Table 4: Distribution of the patients as per the Sensitivity and Specificity

Statistic	Formula	Value	Range (95% CI)
Sensitivity	$\frac{a}{a+b}$	**93.33%**	77.93% to 99.18%
Specificity	$\frac{d}{c+d}$	**90.00 %**	73.47% to 97.89%
Positive Predictive Value	$\frac{a}{a+c}$	**90.32% (*)**	76.06% to 96.48%
Negative Predictive Value	$\frac{d}{b+d}$	**93.10 % (*)**	77.88% to 98.11%

From Table 3 and 4 the Sensitivity was 93.33% (77.93% to 99.18%) and Specificity was 90.00 % (73.47% to 97.89%) Positive Predictive Value 90.32% (76.06% to 96.48%), Negative Predictive Value was 93.10 % (77.88% to 98.11%)

DISCUSSION

Magnetic resonance imaging (MRI) plays a crucial role in the detection of infectious meningitis, especially in situations where a lumbar puncture is contraindicated. Abnormal meningeal enhancement is an important imaging feature that can reliably indicate meningitis. Modifications of T1-based sequences, incorporating fat suppression (FS), and magnetization transfer (MT) led to an improved detection of enhancing meninges compared to the conventional T1-weighted spin-echo (SE) sequence but presented limitations related to the suboptimal differentiation of vascular from meningeal enhancement[7,8]. The nullification of the cerebrospinal fluid (CSF) signal, inconspicuous vascular enhancement as compared to T1-weighted imaging, and some degree of the T1 relaxivity effect, makes meningeal enhancement easily discernible on contrast-enhanced fluid-attenuated inversion recovery (CE-FLAIR) images, but the sequence has still to find a

place in routine MRI protocol. The existing literature has compared the CE-FLAIR sequence with either of the two T1-based sequences and has yielded variable results[9,16]. In our study we have seen that The majority of the patients were in the age group of 40-50 were 40.00% followed by 50-60 Were 21.67%, 30-40 were 20.00%, >60 were 10.00%, 20-30 were 8.33%. The majority of the patients were Male i.e. 58.33% and Female were 41.67% Sensitivity was 93.33% (77.93% to 99.18%) and Specificity was 90.00 % (73.47% to 97.89%). Positive Predictive Value 90.32% (76.06% to 96.48%), Negative Predictive Value was 93.10 % (77.88% to 98.11%) These findings are similar to Aneel Kumar Vaswani [17] *et al* they found In the diagnosis of meningitis, the sensitivity of postcontrast FLAIR sequence was 96% and specificity 85.71%

CONCLUSION

It can be concluded from our study that Contrast-Enhanced Magnetic Resonance Imaging was very efficacious in the diagnosis of meningitis so must be accompanied with CSF for the correct diagnosis of meningitis.

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