

## Diagnostic Usefulness of MRI in Discrimination of Tubercular Spondylitis from Pyogenic Spondylitis

\*Sattar A,<sup>1</sup> Nahar N,<sup>2</sup> Rahman S,<sup>3</sup> Islam MM,<sup>4</sup> Upal C,<sup>5</sup> Sultana S<sup>6</sup>

This is a prospective type of clinical study carried out to evaluate diagnostic usefulness of MRI in discrimination of tubercular spondylitis from pyogenic spondylitis. In the past infective spondylitis was diagnosed clinically and radiologically by means of X-Ray. Now-a-days MRI is available for diagnosis of infective spondylitis more precisely. The study was carried out in the department of Radiology and Imaging, Dhaka Medical College Hospital, from July 2008 to June 2010. Samples were selected and followed up purposively by the principle author. Patients were taken first who were diagnosed clinically and radiologically by means of x-ray as patients of infective spondylitis and diagnosis was made by MRI and histopathology later on. Diagnostic MRI features are compared with histopathological findings. Positive association is found between MRI features and histopathological findings of both tubercular and pyogenic spondylitis. Statistical test results are found significant. Validity of MRI is tested and found highly sensitive and specific for most of the MRI features. This study revealed that MRI is the technique of choice for the diagnosis of suspected infective spondylitis which is statistically proven.

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**Key words:** Tubercular Spondylitis, Pyogenic Spondylitis, MRI

### Introduction

It is important to differentiate tuberculous spondylitis (TS) from pyogenic spondylitis (PS) because proper treatment of the different types can reduce the rate of disability and functional impairment. However, it is sometimes difficult to differentiate these two types clinically and radiologically.<sup>1</sup>

More than 90% of global tuberculosis (TB) cases and deaths occur in the developing

world, where 75% of cases are in the most economically productive age (15-54 years) group.<sup>2</sup> It is thought that the incidence of spinal tuberculosis is likely continue to increase with ageing population, increased immigration and in association with AIDS.<sup>3</sup> Vertebral osteomyelitis accounts for 2-4 % of all cases of pyogenic bone infections.<sup>3</sup> Staphylococcus aureus is the most common cause of pyogenic vertebral osteomyelitis.<sup>4</sup>

1. \*Dr Asifa Sattar, Assistant Professor, Sir Salimullah Mediccal College, Dhaka. [sattarasifa@gmail.com](mailto:sattarasifa@gmail.com)
2. Dr Nazmun Nahar, Assistant Professor, Dhaka Mediccal College, Dhaka
3. Dr. Shahedur Rahman, Medical Officer, Sir Salimullah Mediccal College Hospital, Dhaka.
4. Dr. Md. Mahabubul Islam, Assistant Professor, Dinajpur Mediccal College, Dinajpur.
5. Dr. Upal Caesar, Surveillance Medical Officer, WHO, Dinajpur
6. Dr. Shamsunnahar Sultana, Assistant Professor, Department of Pathology, Holy Family Red Crescent Medical College, Dhaka.

\* For correspondence

MRI is the optimal modality to detect the presence of any inflammatory process involving disc, vertebral body and paravertebral soft tissue. MRI examination demands little of patient except motionlessness and considerable cost. It is available now a days, it does not involve risk or pain also.<sup>5</sup>

A study done by Jung et al. (2004) showed MRI could successfully differentiate tuberculous spondylitis from pyogenic spondylitis.<sup>1</sup> According to that study, a well-defined paraspinal abnormal signal, a thin and smooth abscess wall, multiple vertebral body involvement, and subligamentous spread to three or more vertebral levels were more suggestive of tuberculous spondylitis than pyogenic spondylitis.

### Methods

This is a prospective type of clinical study was carried out in the department of Radiology and Imaging, Dhaka Medical College Hospital, over a period of two years to observe the diagnostic usefulness of MRI in discrimination of tubercular spondylitis from pyogenic spondylitis. For this purpose a total of 59 patients who were suspected clinically and radiologically (by means of X-Ray) as a case of infective spondylitis, were included in this study. MRI was done in all of these patients and they were followed up. Operative biopsy or FNAC was done. But histopathology reports of two patients could not be collected and one patient refused FNAC. Thus finally histopathology reports of 56 patients were compared with MRI diagnosis.

Prior to the commencement of this study the research protocol was approved by the local ethical committee. The aims and objectives of the study along with its procedure, alternative diagnostic methods, risk and benefits were explained to the patients in easily

understandable local language and then informed consent was taken from each patient.

For tuberculous spondylitis the diagnostic criteria were - well defined paraspinal abnormal signal and thin and smooth abscess wall after contrast administration. For pyogenic spondylitis the diagnostic criteria were- ill defined paraspinal abnormal signal and thick and irregular abscess wall after contrast administration.

The demographic variables considered were - age of the patient and clinical history. Imaging variables considered were abnormal paraspinal signal, margin of abscess wall, number of vertebral involvement and vertebral levels of subligamentous spread.

### Results

Based on abnormal paraspinal signal and margin of the abscess wall, 38 were found as patients of tubercular spondylitis (TS) and 18 were found as patients of pyogenic spondylitis (PS). Of total 56 patients histopathologically 40 (71%) were diagnosed as TS and 16 (29%) were diagnosed as PS ( $p < 0.001$ ). The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), accuracy values for diagnosis of TS are 90%, 88%, 89%, 94%, 78%. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), accuracy values for diagnosis of PS were 88%, 90%, 89%, 78%, 94%.

Table I: Comparison of abnormal paraspinal signal in tubercular spondylosis and pyogenic spondylitis

MRI Features	Tubercular Spondylitis		Pyogenic Spondylitis	
	Frequency	%	Frequency	%
Well defined	36	90	2	12.5
Ill defined	4	10	14	87.5

(Chi square test;  $p < 0.001$ )

Table II: Comparison of margin of abscess wall in tubercular spondylitis and pyogenic spondylitis

MRI Features	Tubercular Spondylitis		Pyogenic Spondylitis	
	Frequency	%	Frequency	%
Thin & smooth	36	90	2	12.5
Thick & irregular	4	10	14	87.5

(Chi square test;  $p < 0.001$ )

Table II: Comparison of number of vertebral involvement in tubercular spondylitis and pyogenic spondylitis

MRI Features	Tubercular Spondylitis		Pyogenic Spondylitis	
	Frequency	%	Frequency	%
Three or more	26	65	3	20
Less than three	14	35	13	80

(Chi square test;  $p = 0.004$ )

Table IV: Comparison of vertebral level of subligamentous spread in tubercular spondylitis and pyogenic spondylitis

MRI Features	Tubercular Spondylitis		Pyogenic Spondylitis	
	Frequency	%	Frequency	%
Three or more	34	85	6	35
Less than three	6	15	10	65

(Chi square test;  $p < 0.001$ )

Table V: MRI test sensitivity and specificity for tubercular spondylitis

MRI Features	Tubercular Spondylitis				
	Sensitivity %	Specificity %	PPV %	NPV %	Accuracy%
Abnormal paraspinal signal	90	88	95	78	90
Margin of abscess wall	90	88	95	78	90
Number of vertebral involvement	65	81	90	48	70
Vertebral level of subligamentous spread	85	63	85	63	79

Table VI: MRI test sensitivity and specificity for pyogenic spondylitis

MRI Features	Pyogenic Spondylitis				
	Sensitivity %	Specificity %	PPV %	NPV %	Accuracy%
Abnormal paraspinal signal	88	90	78	95	89
Margin of abscess wall	88	90	78	95	89
Number of vertebral involvement	81	65	48	89	70
Vertebral level of subligamentous spread	63	85	63	85	79

## Discussion

The findings of the present study were also established by review studies done by James & Davies (2006), Harada et al (2008) and Smith et al. (1989).<sup>3,4,6</sup> After collection of histopathology reports, in the present study, it was found that 40 patients were diagnosed as TS by histopathological examination. Among them 36 were diagnosed as TS by MRI. Again, 16 patients were diagnosed as PS by

hitopathological examination. Among these, 14 patients were diagnosed as PS by MRI findings, In the present study sensitivity, specificity, accuracy, positive predictive value, negative predictive value of MRI for TS and PS were significantly higher.

### *Conclusion*

Spinal infection remains an important cause of morbidity and mortality. On the basis of the present study MR imaging should be the technique of choice for the evaluation of suspected spinal infection. In the majority of cases of spinal infection, where typical imaging features are present, the diagnosis can be suggested with a high level of confidence.

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