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Submission date: 11-May-2023 04:50PM (UTC+0700)

Submission ID: 2090282085

File name: culous_Spondylitis_Patients_at_Dr._Mohammad_Hoesin_Palembang.pdf (185.37K)

Word count: 2416

Character count: 13673



Compatibility between MRI Examination and Histopathological Findings in Tuberculous Spondylitis Patients at Dr. Mohammad Hoesin Palembang

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ARTICLE INFO

Keywords:

Tuberculous spondylitis
Pott's disease
MRI
Histopathology

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All authors have reviewed and approved the final version of the manuscript.

<https://doi.org/10.37275/OAJSS.v5i1.71>

ABSTRACT

Tuberculous spondylitis or Pott's disease is an infectious disease caused by Mycobacterium tuberculosis that affects the spine. Tuberculous spondylitis is the most dangerous form of musculoskeletal Tuberculosis because it can cause severe morbidity due to bone destruction, deformity, and paraplegia. Therefore the early diagnosis is very important. This study aims to determine the compatibility between clinical diagnosis and histopathological findings in patients with tuberculous spondylitis. This research is diagnostic research conducted in the polyclinic, orthopedic surgery, radiology room, and Pathology laboratory of Mohammad Hoesin Hospital Palembang. The sample in this study were all patients with suspected being diagnosed tuberculous spondylitis who underwent an MRI examination and surgery, and histopathological examination. There were 15 patients suspected of being diagnosed with tuberculous spondylitis. In this study, histopathologically, there were 12 samples with a diagnosis of tuberculous spondylitis, while based on MRI, 14 samples were obtained with a diagnosis of tuberculous spondylitis. The results of the MRI examination had a sensitivity of 100%, specificity of 33.3%, PPV of 85.7%, NPV of 100%, a positive likelihood ratio of 1.499, and a negative likelihood ratio of 0. The accuracy between MRI examination and histopathological findings in tuberculous spondylitis patients was 0.867 with this test. Kappa obtained a conformity value of 0.444 with a significance of 0.038 ($p < 0.05$). The accuracy between MRI examination and histopathological findings in patients with tuberculous spondylitis had very good reliability with a moderate degree of compatibility.

1. Introduction

Tuberculous spondylitis or Pott's disease is an infectious disease caused by Mycobacterium tuberculosis that affects the spine.¹ Tuberculous spondylitis can occur at any stage. The most common localization was in the lower thoracic and lumbar vertebrae (T8 – L3), followed by the upper thoracic, cervical, and finally sacral areas.² Mycobacterium tuberculosis in the spine is mostly spread through

infection of the disc. The mechanism of disease is mainly by hematogenous spread.¹

Indonesia is ranked third after India and China as the country with the largest population of TB cases.³ At least up to 20 percent of people with pulmonary TB will experience extrapulmonary TB spread.⁴ Extrapulmonary TB can be brain, gastrointestinal, renal, genital, skin, lymphatic, osteoarticular, and

endometrial TB. About 11 percent of extrapulmonary TB are osteoarticular, and approximately half of patients with osteoarticular TB have spinal TB infection.⁵

Tuberculous spondylitis is the most dangerous form of musculoskeletal Tuberculosis because it can cause severe morbidity due to bone destruction, deformity, and paraplegia. Therefore the early diagnosis is critical. Early diagnosis of tuberculous spondylitis is difficult to establish and is often misunderstood as spinal neoplasms or other pyogenic spondylitis.⁶ The diagnosis is usually only made at an advanced stage. This study aims to determine the compatibility between clinical diagnosis and histopathological findings in patients with tuberculous spondylitis.

2. Methods

This research is diagnostic research conducted in the polyclinic, orthopedic surgery, radiology room, and Pathology laboratory of Mohammad Hoesin Hospital Palembang. This research was conducted after being approved by the Ethics Committee to meet the minimum sample. The sample in this study were all patients with suspected being diagnosed tuberculous spondylitis who underwent an MRI examination and surgery, and histopathological examination. The inclusion criteria in this study were all subjects suspected of being diagnosed with tuberculous spondylitis, which was established based on anamnesis (clinical symptoms consisting of limb weakness, gibbous, pain, palpable mass,

numbness), incontinence, fever, fistula, stiffness (stiffness), dysphagia, coughing) and physical examination by the researcher. The exclusion criteria in this study were all subjects suspected of being diagnosed with tuberculous spondylitis. Still, they did not undergo Magnetic Resonance Imaging (MRI) examination, did not undergo surgery, and did not perform histopathological examination. Variable analysis used bivariate analysis with a chi-square test. If the data scale used is nominal, the kappa test is used. Comparison of examination results is known using correlation, accuracy, sensitivity, specificity, positive predictive value, and negative predictive value. They used statistical computer SPSS (Statistical Package for Social Sciences) version 25. Significance was determined if $p < 0.05$.

3. Results

There were 15 patients suspected of being diagnosed with tuberculous spondylitis. In this study, histopathologically, there were 12 samples diagnosed with tuberculous spondylitis, while based on MRI, 14 samples were obtained with a diagnosis of tuberculous spondylitis.

Based on table 1, the mean age of tuberculous spondylitis patients in this study was 39.5 ± 10.86 years (21-56 years), with the highest age range being 36-45 years. In this study, most patients with tuberculous spondylitis were male (75%), with a male to female ratio of 3:1.

Table 1. Characteristics of tuberculosis spondylitis patients

Characteristics	N = 12
Age, Mean \pm SD (Min-Max)	39,5 \pm 10,86 (21-56)
Age, n (%)	
• 17 – 25 years	2 (16,7)
• 26 – 35 years	2 (16,7)
• 36 – 45 years	4 (33,3)
• 46 – 55 years	3 (25,0)
• 56 – 65 years	1 (8,3)
Gender, n (%)	
• Male	9 (75%)
• Female	3 (25%)

All samples (100%) of both tuberculous spondylitis and non-tuberculous spondylitis complained of leg weakness and pain, while fistula and dysphagia were not found in all samples. Either tuberculous spondylitis or non-tuberculous spondylitis. Other complaints felt by patients with tuberculous spondylitis were gibbous (16.7%), palpable mass (25%), numbness (50%), and incontinence (75%). However, in patients with non-tuberculous spondylitis, there was no palpable mass. In addition, it was also found in patients with non-gibbus tuberculosis spondylitis found more gibbous

(33.3%); Numbness was also found to be more (66.7%), while incontinence was found to be less (33.3%) in patients with non-tubercular spondylitis than in patients with tuberculous spondylitis. Another complaint showed that all patients with non-tuberculous spondylitis had a fever. In contrast to tuberculous spondylitis patients, only 33.3% complained of fever. With statistical analysis, there was no difference in complaints between patients with tuberculous spondylitis and non-tuberculous spondylitis ($p > 0.05$).

Table 2. Complaints of the research sample

Clinical complaint	Histopathology		Total	P-value
	Tuberculous spondylitis	Non-tuberculous spondylitis		
Leg weakness				
• Yes	12 (100)	3 (100)	15 (80)	-
• No	0 (0)	0 (0)	0 (0)	
Gibbus				0,516
• Yes	2 (16,7)	1 (33,3)	3 (20)	
• No	10 (83,3)	2 (66,7)	12 (80)	
Pain				-
• Yes	12 (100)	3 (100)	15 (80)	
• No	0 (0)	0 (0)	0 (0)	
Palpable mass				1,000
• Yes	3 (25)	0 (0)	3 (20)	
• No	9 (75)	3 (100)	12 (80)	
Numbness				1,000
• Yes	6 (50)	2 (66,7)	8 (53,3)	
• No	6 (50)	1 (33,3)	7 (46,7)	
Incontinence				0,242
• Yes	9 (75)	1 (33,3)	10 (66,7)	
• No	3 (25)	2 (66,7)	5 (33,3)	
Fever				0,077
• Yes	4 (33,3)	3 (100)	7 (46,7)	
• No	8 (66,7)	0 (0)	8 (53,3)	
Fistula				-
• Yes	0 (0)	0 (0)	0 (0)	
• No	12 (100)	3 (100)	15 (100)	
Stiffness				0,200
• Yes	12 (100)	2 (66,7)	14 (93,3)	
• No	0 (0)	1 (33,3)	1 (6,7)	
Disphagia				-
• Yes	0 (0)	0 (0)	0 (0)	
• No	12 (100)	3 (100)	15 (100)	

Fisher exact test, $p = 0,05$

Based on table 3, the results of the MRI examination had a sensitivity of 100%, specificity of 33.3%, PPV of 85.7%, NPV of 100%, a positive likelihood ratio of 1.499, and a negative likelihood ratio of 0. The accuracy between MRI examination and histopathological findings in tuberculous spondylitis patients was 0.867, which means the

measurement conformity (reliability) was very good. Kappa obtained a conformity value of 0.444 with a significance of 0.038 ($p < 0.05$), which means that there is a moderate concordance (0.41 – 0.60) and statistically significant ($p < 0.05$) between MRI examinations and histopathological findings.

Table 3. Accuracy of MRI examination with histopathological findings in tuberculosis spondylitis patients

Diagnosis		Histopathology		Total
		Spondylitis TB	Non-Spondylitis TB	
MRI	Spondylitis TB	12 ^a	2 ^b	14
	Non-Spondylitis TB	0 ^c	1 ^d	1
Total		12	3	15

4. Discussion

Tuberculous spondylitis can affect all age groups, but middle-aged adults are the most commonly affected. Research conducted by Dharmajaya in 2018 in North Sumatra reported that the average age of tuberculous spondylitis patients was 34.85 ± 18.37 years, with an age range of 7 to 65 years. Another study conducted by Alivi and Sharifi in 2010 in Iran reported the mean age of tuberculous spondylitis patients was 43.7 ± 18.3 years, with the majority aged > 35 years (84,1%). In this study, the majority of patients with tuberculous spondylitis were male (75%), with a male to female ratio of 3:1. This result is in line with the study conducted by Ramos et al. in 2017 in Baltimore, which found the majority of tuberculous spondylitis patients were male (61%).

Local pain and swelling a symptom that is often complained about. Subfebrile and weight loss occur in a minority of patients. Skin fistulas, abscesses, and obvious joint deformities appear when the disease process is active and chronic. Lymph nodes, local symptoms will be more prominent than systemic constitutional symptoms. A retrospective study of spinal Tuberculosis stated that 69.2% complained of leg weakness, gibbous (46.4%), but also pain, mass, incontinence, and other complaints.^{7,8}

In this study, all patients with histopathological tuberculous spondylitis experienced limb weakness, pain, and stiffness, but no fistula and dysphagia were found. In patients suspected of tuberculous spondylitis but histopathological results showed non-tuberculous spondylitis also, found all patients experienced limb weakness and pain, which means that these two complaints do not specifically lead to a diagnosis of tuberculous spondylitis. It was similar in other complaints such as gibbus, mass, numbness, incontinence, and fever which showed no significant relationship.

Tuberculous spondylitis can cause severe morbidity, including neurological deficits and permanent spinal deformities. Therefore the early diagnosis is critical.⁶ Establishing the diagnosis as in other diseases is through history taking, physical examination, followed by investigations. Magnetic resonance imaging (MRI) is the best diagnostic modality for tuberculous spondylitis because it is more sensitive than radiography and more specific than a CT scan.

The results of the MRI examination had a sensitivity value of 100%, which means that all patients with positive MRI results of tuberculous spondylitis showed positive histopathological results

of tuberculous spondylitis, and no patient with positive MRI results of tuberculous spondylitis showed negative histopathological results of tuberculous spondylitis. That can be concluded that the MRI results are positive for tuberculous spondylitis, so the histopathological results are definitely positive for tuberculous spondylitis.

The specificity value of MRI is only 33.3%, which means that only 33% of patients with negative MRI results of tuberculous spondylitis also showed negative histopathological results of tuberculous spondylitis, while 66.7% of other patients showed positive histopathological results of tuberculous spondylitis. That means the negative MRI results of tuberculous spondylitis cannot exclude the histopathological absence of tuberculous spondylitis because many patients with negative MRI results show histopathologically positive results of tuberculous spondylitis.

The positive predictive value of MRI in this study was 85.7%, which means that the probability of the patient showing a positive histopathological result of tuberculous spondylitis is 87.5% if the MRI result is positive for spondylitis. This is because, in patients with a positive diagnosis of tuberculous spondylitis, histopathologically MRI results can show positive or negative tuberculous spondylitis. However, the negative predictive value of MRI was 100%, which means that all patients who showed negative histopathological results for tuberculous spondylitis had a positive-negative MRI result for tuberculous spondylitis. These results are supported by the results of the study, which showed that there were no patients with negative results of tuberculous spondylitis who had positive MRI results.

The value of the MRI accuracy on the histopathology of tuberculous spondylitis in this study was 0.867, which means the degree of suitability of the measurement (reliability) is very good. The high sensitivity and accuracy values in this study indicate that MRI can be considered a diagnostic tool for tuberculous spondylitis, but it

should be remembered that due to the low specificity value of MRI suggests that a negative MRI value cannot exclude the possibility of a positive histopathological result of tuberculous spondylitis.

5. Conclusion and Suggestions

MRI examination based on histopathological findings in patients with tuberculous spondylitis has good accuracy and sensitivity for diagnosing tuberculous spondylitis, but the specificity is very low, so further research is needed with larger samples so that more samples of non-tuberculous spondylitis are obtained.

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