

# Correlation of Magnetic Resonance Imaging (MRI) and Bone Histopathology in the Diagnosis of Foot Osteomyelitis in Diabetic Patients

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## Introduction

- Inaccurate diagnosis of osteomyelitis(OM) in the setting of foot infection may lead to inappropriate prolonged antimicrobial therapy, unnecessary surgical intervention or amputation, and a high healthcare cost burden.
- Early and precise diagnosis is essential.
- Recommended imaging to discern OM is magnetic resonance imaging (MRI), but studies have shown varied sensitivity and specificity.
- The goal of our study is to determine the accuracy of MRI by comparing it with bone biopsy histopathology.

## Methodology

- Retrospective chart review (2009-2019) of adult patients with diabetes mellitus and foot infection with concern for OM.
- Single University/academic medical center.
- MRI with contrast to evaluate for suspected osteomyelitis, and subsequent bone biopsy (needle or open biopsy), resection or amputation with histologic examination.
- A second, blinded musculoskeletal radiologist reviewed all reports in which there was diagnostic uncertainty.
- Exclusion criteria: foot tumor or recent foot surgery or injury.

## Results

- 63 eligible patients with 87 episodes of foot infection (50 males, 13 females, mean age 55 years) met study criteria. Time gap between biopsy and MRI was mean 6 days (range 0 to 23 days). 72 MRIs were positive (including 7 highly suspicious MRI reads), 11 negative and 4 indeterminate.
- 46 bone specimens were obtained after amputation or resection, and rest were bone biopsy. 53 of the histologic results were positive for OM and 34 were negative.
- Two scenarios were created by placing 4 indeterminate MRI reads as positive in scenario 1 and negative in scenario 2.
- In scenario 1, there was only 1 false negative MRI but 24 false positives. In scenario 2, there were 2 false negative MRI and 21 false positives.
- Out of 74 bone specimens of those not on recent antimicrobial therapy, bone cultures were positive for pathogenic organisms on 22 specimens without histologic evidence of OM.

	Scenario 1	Scenario 2
Sensitivity %	98	96
Specificity %	29	38
Positive predictive value %	68	71
Negative predictive value %	91	87
Positive likelihood ratio %	1.39	1.56
Negative likelihood ratio %	0.06	0.10
Accuracy %	71	73
Disease prevalence %	61	61
Fisher exact test two-tailed p-value	0.0003	0.0001

## Summary/Conclusion

- In both the above scenarios, sensitivity was high. Specificity was found to be lower than the reported specificity of MRI in the diagnosis of diabetic foot OM, which has been reported as 40% to 100%. Negative predictive value was very high ~90%.
- Our data demonstrate that MRI is useful to rule out OM if negative but performs poorly in ruling in OM.
- Bone specimen for histopathology is essential to confirm the diagnosis. Bone culture may be helpful to guide antimicrobial therapy rather than diagnosing OM.
- Prospective studies with long follow up are warranted.

## Limitations

- Retrospective study.
- Only MRI reads with diagnostic uncertainty were reviewed by an expert musculoskeletal radiologist.
- Bone specimen sampling error could have been a potential issue.

## References

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