

Review: Magnetic resonance imaging is an accurate test for diagnosing foot osteomyelitis

Kapoor A, Page S, LaValley M, Gale DR, Felson DT. Magnetic resonance imaging for diagnosing foot osteomyelitis: a meta-analysis. Arch Intern Med. 2007;167:125-32.

Clinical impact ratings: Endocrinology ★★★★★☆☆ Infectious Disease ★★★★★☆☆

QUESTION

How accurate is magnetic resonance imaging (MRI) for diagnosing foot osteomyelitis?

METHODS

Data sources: MEDLINE, EMBASE/Excerpta Medica (to June 2006), reference lists, and experts in the field.

Study selection and assessment: English-language studies that evaluated the diagnostic test performance of MRI in mainly adult patients ($\geq 80\%$ of patients ≥ 16 y of age) with foot infection or suspected osteomyelitis of the foot or ankle, using bone biopsy (histologic analysis or culture) as the reference standard. 16 studies ($n = 485$, mean age range 46 to 66 y) met the selection criteria.

Outcomes: Sensitivity, specificity, diagnostic odds ratio, and positive and negative likelihood ratios (LRs).

MAIN RESULTS

Diagnostic test characteristics for MRI in diagnosing foot osteomyelitis are shown in the Table. MRI was a more accurate diagnostic test than technetium-99m bone scan-

ning, plain radiography, or white blood cell scanning (Table). With a pretest probability for osteomyelitis of 50% (prevalence in the studies ranged from 32% to 89%), a positive MRI would result in a posttest probability of 84%, whereas a negative MRI would result in a posttest probability of 11%.

CONCLUSION

Magnetic resonance imaging has good diagnostic performance for foot osteomyelitis.

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Diagnostic accuracy of magnetic resonance imaging (MRI) for foot osteomyelitis with bone biopsy as the reference standard*

Tests	Number of studies (n)	Sensitivity (range)	Specificity (range)	Diagnostic odds ratio (95% CI)†	+LR	-LR
MRI	16 (485)	90% (77 to 100)	83% (40 to 100)	42 (15 to 120)	5.1	0.12
Comparisons‡				Diagnostic odds ratio (CI)†		
				MRI	Comparator	
MRI vs technetium-99m bone scanning	7 (163)			150 (55 to 411)	3.6 (1 to 13)	
MRI vs plain radiography	9 (224)			82 (14 to 466)	3.3 (2 to 5)	
MRI vs white blood cell scanning	3 (63)			120 (62 to 234)	3.4 (0.2 to 62)	

*Abbreviations and diagnostic terms defined in Glossary.

†Diagnostic odds ratio = (true positive x true negative)/(false positive x false negative).

‡In studies that compared 2 diagnostic techniques in the same patients.

COMMENTARY

The diagnosis of osteomyelitis in patients with diabetes and foot infections has important clinical implications. It dictates much longer antibiotic treatment and sometimes earlier surgical intervention (1). The review and meta-analysis by Kapoor and colleagues showed that MRI has high specificity and even higher sensitivity for diagnosing osteomyelitis and compares favorably with other imaging methods. However, the figures given in the review might be overestimates. Studies with better methodology showed poorer performance. The prevalence of osteomyelitis in the included studies was higher than the rate of 20% observed in patients with a foot infection in an outpatient diabetes practice (2). Such a difference might raise doubt about whether the spectrum of patients enrolled in the studies is representative of different clinical settings.

In clinical practice, patients with a positive plain radiograph or with bone exposed by examination or probing are managed as having osteomyelitis (1-4); it would be informative to know the performance of MRI in patients who score negative for these 2 clinical features.

Nevertheless, the original studies and the review by Kapoor and colleagues show convincingly that MRI is the most accurate imaging procedure for diagnosing foot osteomyelitis in patients with diabetes. MRI should be considered in patients who have foot infection with no bone exposed, have been treated for 2 to 3 weeks with little clinical improvement, and have negative or inconclusive plain radiographs (1). In each

medical setting, one needs to consider not only the cost-effectiveness of the test but also the availability of MRI for patients with diabetes and foot infections (a relatively common problem), given the existing infrastructure. In our setting (a large health maintenance organization), it will probably be the exceptional (rather than the common) patient who will undergo MRI for this indication.

Future research should address the question of whether managing patients with diabetes and foot infections using MRI leads to better outcomes.

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References

- Lipsky BA, Berendt AR, Deery HG, et al. Diagnosis and treatment of diabetic foot infections. Clin Infect Dis. 2004;39:885-910.
- Lavery LA, Armstrong DG, Peters EJ, Lipsky BA. Probe-to-bone test for diagnosing diabetic foot osteomyelitis: reliable or relic? Diabetes Care. 2007;30:270-4.
- Grayson ML, Gibbons GW, Balogh K, Levin E, Karchmer AW. Probing to bone in infected pedal ulcers. A clinical sign of underlying osteomyelitis in diabetic patients. JAMA. 1995;273:721-3.
- Shone A, Burnside J, Chipchase S, Game F, Jeffcoate W. Probing the validity of the probe-to-bone test in the diagnosis of osteomyelitis of the foot in diabetes [Letter]. Diabetes Care. 2006;29:945.