Diagnostic accuracy of beta-methyl-p-[123I]-iodophenyl-pentadecanoic acid (BMIPP) imaging: a meta-analysis

Inaba Y, Bergmann SR

CRD summary
The review assessed the evidence for the diagnostic accuracy of resting beta-methyl-p-[123I]-iodophenyl-pentadecanoic acid (BMIPP) imaging in detecting coronary artery disease, and concluded that imaging with BMIPP exhibited a moderate sensitivity and high specificity. Methodological limitations of the review, coupled with significant variation between studies, means the authors' conclusions should be interpreted with caution.

Authors' objectives
To summarize the evidence for the diagnostic accuracy of resting beta-methyl-p-[123I]-iodophenyl-pentadecanoic acid (BMIPP) imaging in detecting coronary artery disease.

Searching
MEDLINE was searched to the end of 2006 for studies published in English or Japanese using the search term 'BMIPP'. Reference lists of included studies were also searched.

Study selection
Studies where all participants underwent both BMIPP imaging and coronary angiography (as reference standard), for coronary artery disease diagnosis, were eligible for inclusion. The absolute numbers of true-positive, false-positive, false-negative, and true-negative results needed to be reported. Studies of patients who had received percutaneous coronary intervention for the assessment of long-term stent patency were excluded, as were studies recruiting fewer than 20 participants.

The included studies used different models of BMIPP imaging and different criteria for a positive result. The mean age of participants in the included studies ranged from 57 to 67 years, and around two-thirds were male. Across studies, between 48% and 80% of patients had coronary artery disease. One study included participants who had had a previous myocardial infarction. Most studies defined coronary artery disease as a 75% reduction in luminal diameter. Where reported, the interval between tracer injection and imaging ranged from 15 to 30 minutes.

The authors did not state how studies were selected for the review.

Assessment of study quality
Study quality was assessed using the QUADAS (Quality Assessment of Diagnostic Accuracy Studies Assessment) tool, which included 14 criteria.

The authors did not state how many reviewers assessed validity.

Data extraction
Sensitivity, specificity, diagnostic odds ratios (DORs), and positive and negative likelihood ratios (LRs), with 95% confidence intervals (CIs), were calculated for each study.

The authors did not state how data were extracted for the review, or how many reviewers performed the data extraction.

Methods of synthesis
Pooled estimates for sensitivities, specificities, positive and negative likelihood ratios, and diagnostic odds ratios were calculated using a random-effects model. A summary receiver operating characteristic (ROC) curve was produced. Meta-regression analysis of study-specific covariates was also performed. Heterogeneity was assessed using the $\chi^2$ test.
Results of the review

Seven studies (n=528 participants) were included in the review. Sample sizes ranged from 20 to 130 participants. Study quality appeared generally good, although some studies lacked blinding.

BMIPP (beta-methyl-p-[123I]-iodophenyl-pentadecanoic acid) imaging had an overall sensitivity of 0.78 (95% CI 0.73 to 0.82; $I^2=90.4\%$), a specificity of 0.84 (95% CI 0.77 to 0.89; $I^2=52.5\%$), a positive likelihood ratio of 3.99 (95% CI 2.75 to 5.79; $I^2=4.8\%$), a negative likelihood ratio of 0.28 (95% CI 0.17 to 0.45; $I^2=81.6\%$), and a diagnostic odds ratio of 27.1 (95% CI 14.4 to 51.0; $I^2=0\%$).

The Spearman correlation coefficient for the receiver operating characteristic curve was 0.893 ($p=0.007$), suggesting a threshold effect among studies. The area under the curve was 0.91.

Meta-regression analyses suggested test accuracy was not affected by publication year, lack of blinding, selection bias, or inclusion of patients with vasospastic angina.

Authors' conclusions

Imaging with BMIPP at rest exhibited a moderate sensitivity and high specificity to detect coronary artery disease in patients with a high prevalence of coronary artery disease. This tracer may be of great value for patients with acute chest pain and those with relative contraindications to exercise or pharmacologic stress myocardial perfusion imaging.

CRD commentary

The review addressed a clear question, supported by appropriate inclusion criteria. Only studies published in English or Japanese were eligible, and only one keyword was used in searching a single database, so some relevant studies may have been missed. The authors did not state that methods were employed to reduce the risks of reviewer error and bias for the processes of study selection, data extraction, and quality assessment. Adequate study details were provided. Study quality was assessed and used in interpreting the results of the review. Appropriate methods were used to pool data and assess heterogeneity (possible causes were discussed). However, in light of the limited search strategy and review methods used, and the heterogeneity found between studies, the authors' conclusions should be interpreted with caution.

Implications of the review for practice and research

Practice: The authors stated that BMIPP imaging may be an alternative for those who are unable to perform adequate exercise testing or pharmacologic stress myocardial perfusion imaging, especially patients with acute chest pain, and that BMIPP may serve as a noninvasive measure for detecting coronary spasm.

Research: The authors stated that a large randomised controlled trial is needed to fully assess the role of BMIPP imaging in the management of patients with coronary artery disease, and that more studies are needed to support the validity of BMIPP imaging for detecting coronary spasm.

Funding

One author previously received grant support from Molecular Insight Pharmaceuticals (which is involved in manufacturing BMIPP).

Bibliographic details


PubMedID
18513641

DOI
Original Paper URL

Indexing Status
Subject indexing assigned by NLM

MeSH
Clinical Trials as Topic /statistics & numerical data; Coronary Artery Disease /epidemiology /radionuclide imaging; Fatty Acids; Humans; Iodine Radioisotopes; Iodobenzenes; MEDLINE; Prognosis; Radiopharmaceuticals; Reproducibility of Results; Risk Assessment /methods; Risk Factors; Sensitivity and Specificity

AccessionNumber
12008104595

Date bibliographic record published
02/03/2009

Date abstract record published
11/11/2009

Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.