

Review: Functional testing for restenosis after PTCA has limited value

Garzon P, Eisenberg MJ. Functional testing for the detection of restenosis after percutaneous transluminal coronary angioplasty: a meta-analysis. *Can J Cardiol*. 2001 Jan;17:41-8.

QUESTION

In patients who have had percutaneous transluminal coronary angioplasty (PTCA), what are the diagnostic characteristics of functional testing (exercise treadmill testing [ETT], stress nuclear imaging [SNI], and stress echocardiography [SECG]) for detecting restenosis 6 months after PTCA?

DATA SOURCES

Studies were identified by searching MEDLINE (1975 to 2000) with the terms PTCA, angioplasty, detection, restenosis, functional testing, exercise testing, sestamibi, thallium, and echocardiography. Bibliographies of relevant studies were also scanned.

STUDY SELECTION

Studies were selected if functional testing (ETT, SNI, and SECG) and angiography (diagnostic standard) to detect restenosis were done approximately 6 months after successful PTCA, tests were assessed in a blinded manner, and sensitivity and specificity could be calculated.

DATA EXTRACTION

Data were extracted on patient population (symptomatic and asymptomatic); number of vessels involved in PTCA (single or multiple); study characteristics, including timing

of test; diagnostic standard (angiography); definition of restenosis and how it was determined; rate of restenosis; sensitivity; and specificity. The sensitivity and specificity across studies were summed using a random-effects model, and Bayes' theorem was used to assess predictive values in various populations.

MAIN RESULTS

36 studies were initially evaluated; 13 met the inclusion criteria. Substantial variation in sensitivities and specificities was found across studies. Only the sensitivities for restenosis of > 50% and > 70% coronary artery diameter narrowing with SNI were higher than for the sensitivities of the other tests (Table). All other sensitivities and specificities were not statistically different across tests.

Functional testing (exercise treadmill testing [ETT], stress nuclear imaging [SNI], and stress echocardiography [SECG]) for detecting > 50% and > 70% restenosis 6 months after percutaneous transluminal coronary angioplasty*

Test	Restenosis	Studies	Patients	Sensitivity (95% CI)	Specificity (CI)	+LR	-LR
ETT	> 50%	5	527	46% (33 to 58)	77% (67 to 86)	1.94	0.71
	> 70%	5	667	50% (30 to 70)	84% (77 to 92)	3.18	0.59
SNI	> 50%	3	262	87% (74 to 100)	78% (74 to 81)	3.93	0.16
	> 70%	2	136	94% (80 to 100)	89% (79 to 100)	8.74	0.07
SECG	> 50%	2	183	63% (15 to 100)	87% (72 to 100)	4.94	0.43
	> 70%	2	125	73% (65 to 80)	90% (85 to 95)	7.27	0.30

*Diagnostic terms defined in Glossary.

CONCLUSIONS

A wide range of sensitivities and specificities is found for functional testing (exercise treadmill testing, stress nuclear imaging, and stress echocardiography) to detect restenosis 6 months after percutaneous transluminal coronary angioplasty. Stress nuclear imaging has the highest sensitivities for restenosis > 50% and > 70% coronary artery diameter narrowing.

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COMMENTARY

The results of the review by Garzon and Eisenberg question whether routine use of functional testing for the detection of restenosis is appropriate. By using the pooled sensitivity and specificity and Bayes' theorem, the authors compute the positive and negative predictive values of the 3 modes of functional testing in different populations.

For asymptomatic patients with stents who are estimated to have roughly a 10% pretest probability of restenosis, a negative SNI test result or a normal stress echocardiogram essentially rules out restenosis. However, most of the positive test results would be falsely positive. Therefore, the use of functional testing in this population would lead to many unnecessary catheterization procedures.

For symptomatic patients without stents who are estimated to have a pretest probability of restenosis of approximately 50%, a negative test result on even the most sensitive of the functional tests (SNI) does not rule out restenosis, because approximately 14% of such results would be falsely negative. When the pretest probability of patients is in the medium range (approximately 30%), which the

authors believe might be expected for symptomatic patients who received a stent, the false-negative rate falls to 7%.

These estimates are the product of several assumptions. Most important, the pretest probabilities of different groups of patients have not been well characterized. In addition, the authors assume that the sensitivity and specificity found in the studies, which were mostly done in the era before stents and in heterogeneous populations, would apply across all patients groups—those with single or multivessel disease, with symptoms or without, and with stents or without.

Nevertheless, the pooled results suggest that the presence or absence of symptoms is far more important than the results of functional testing in determining the need for follow-up angiography. Although functional testing may still be useful in specific cases, routine testing appears to have limited value, especially in asymptomatic patients who have received stents.

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