Initial Coronary Stent Implantation With Medical Therapy vs Medical Therapy Alone for Stable Coronary Artery Disease

Meta-analysis of Randomized Controlled Trials

Kathleen Stergiopoulos, MD, PhD; David L. Brown, MD

Background: Prior meta-analyses have yielded conflicting results regarding the outcomes of treatment of stable coronary artery disease (CAD) with initial percutaneous coronary intervention (PCI) vs medical therapy. However, most of the studies in prior systematic reviews used balloon angioplasty as well as medical therapies that do not reflect current interventional or medical practices. We therefore performed a meta-analysis of all randomized clinical trials comparing initial coronary stent implantation with medical therapy to determine the effect on death, nonfatal myocardial infarction (MI), unplanned revascularization, and persistent angina.

Methods: Prospective randomized trials were identified by searches of the MEDLINE database from 1970 to September 2011. Trials in which stents were used in less than 50% of PCI procedures were excluded. Data were extracted from each study, and summary odds ratios (ORs) were obtained using a random effects model.

Results: Eight trials enrolling 7229 patients were identified. Three trials enrolled stable patients after MI, whereas 5 studies enrolled patients with stable angina and/or ischemia on stress testing. Mean weighted follow-up was 4.3 years. The respective event rates for death with stent implantation and medical therapy were 8.9% and 9.1% (OR, 0.98; 95% CI, 0.84-1.16); for nonfatal MI, 8.9% and 8.1% (OR, 1.12; 95% CI, 0.93-1.34); for unplanned revascularization, 21.4% and 30.7% (OR, 0.78; 95% CI, 0.57-1.06); and for persistent angina, 29% and 33% (OR, 0.80; 95% CI, 0.60-1.05).

Conclusion: Initial stent implantation for stable CAD shows no evidence of benefit compared with initial medical therapy for prevention of death, nonfatal MI, unplanned revascularization, or angina.

Arch Intern Med. 2012;172(4):312-319

PERCUTANEOUS CORONARY INTERVENTION (PCI) reduces death and nonfatal myocardial infarction (MI) in the setting of acute coronary syndromes. However, the role of PCI in treatment of stable coronary artery disease (CAD) remains controversial. Despite recent studies clearly demonstrating that initial PCI offers no benefit in terms of reducing death or other cardiovascular events over optimal medical therapy in the setting of nonacute CAD, these findings have not been incorporated into clinical practice. Perhaps contributing to the ambiguity, recent meta-analyses have yielded conflicting results regarding the impact of PCI on survival of patients with stable CAD. These meta-analyses included studies that enrolled patients in the 1980s and 1990s, an era when balloon angioplasty was the predominant form of PCI. Since that time, interventional practice has evolved toward the placement of coronary stents whenever technically feasible to prevent acute vessel closure and restenosis. Medical therapy has advanced over the last 20 years as well. For example, medical treatment in the Angioplasty Compared with Medicine (ACME) trial, which enrolled patients from 1987 to 1990 included aspirin, nitrates, β-blockers, and calcium channel blockers but did not include 3-hydroxy-3-methylglutaryl coenzyme-A reductase inhibitors (statins), angiotensin-converting enzyme (ACE) inhibitors, or angiotensin receptor blockers, which are now considered essential components of optimal medical therapy. We therefore performed a systematic review and meta-analysis of randomized clinical trials that compared initial stent implantation and medical therapy with a strategy of initial medical therapy alone to determine the ef-
flect of contemporary interventional and medical therapy on outcomes of patients with stable CAD.

**METHODS**

**SEARCH STRATEGY**

A systematic search of published studies in any language in MEDLINE from 1970 to September 2011 was performed independently by both authors. Search terms included stent, medical therapy, stable angina, coronary artery disease, as well as combinations. A filter for randomized controlled trials was used. In addition, bibliographies of retrieved articles and prior reviews on the subject were searched for other relevant studies.

**INCLUSION CRITERIA**

For inclusion, studies were required to be prospective, randomized trials of PCI plus medical therapy vs medical therapy alone in patients with stable CAD with the individual outcomes of death and nonfatal MI reported at a minimum follow-up of 1 year. Stent implantation had to exceed 50% of PCI procedures for inclusion. Although studies randomizing patients with acute coronary syndromes were excluded from the analysis, studies of stable patients following a completed MI were included. Studies were included regardless of the presence of documented ischemia or any functional assessment of the hemodynamic significance of a coronary stenosis. For studies in which medical therapy was compared against separate arms of PCI or coronary artery bypass graft (CABG) surgery, only the comparison of medical therapy vs stent implantation was extracted.

**DATA EXTRACTION**

Patient characteristics, study design, and outcomes were systematically reviewed and recorded independently by each author. Discrepancies were resolved by consensus. Study quality was evaluated according to the criteria of Jadad et al.

**OUTCOMES**

The following clinical outcomes were analyzed: death from any cause (unless only cardiac death was reported); nonfatal MI (or reinfarction in the studies that enrolled post-MI patients); unplanned revascularization (PCI or CABG) during follow-up; and persistent angina. For each outcome, we used data available from the longest follow-up available to a maximum of 5 years. End point definitions were those used in the individual trials and are summarized in Table 1. Postprocedural MI, when identified, was included as a nonfatal MI event. Unplanned revascularization included any PCI or CABG excluding the PCI mandated by initial randomization. Persistent angina was an-

---

Table 1. Outcome Definitions

<table>
<thead>
<tr>
<th>Study</th>
<th>Death</th>
<th>Nonfatal MI</th>
<th>Unplanned Revascularization</th>
<th>Persistent Angina</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOAT</td>
<td>ND</td>
<td>ND</td>
<td>ND</td>
<td>NR; elective revascularization</td>
</tr>
<tr>
<td>Hambrecht et al</td>
<td>Heart death</td>
<td>Cardiac death</td>
<td>CABG, PTCA of target lesion or other coronary segments</td>
<td></td>
</tr>
<tr>
<td>DECODPI</td>
<td>Total mortality</td>
<td>ECG, symptoms and cardiac enzyme abnormality</td>
<td>ND</td>
<td>CCS class &gt;1 angina</td>
</tr>
<tr>
<td>OAT</td>
<td>Death from any cause</td>
<td>2 or 3 of symptoms; &gt;30 min, ECG changes, elevated cardiac biomarkers (CK = 2 × ULN, CK-MB &gt; ULN, troponin I or T &gt;2 × ULN); for reinfarction after revascularization; elevated cardiac marker defined as &gt; 3 × ULN for PCI patients and &gt; 5 × ULN for CABG patients</td>
<td>PCI or CABG excluding protocol-assigned PCI</td>
<td>Angina on Rose angina questionnaire</td>
</tr>
<tr>
<td>MASS II</td>
<td>Overall mortality</td>
<td>Q-wave MI</td>
<td>Additional PCI or CABG after index procedure</td>
<td>Angina symptoms at 5-y follow-up</td>
</tr>
<tr>
<td>COURAGE</td>
<td>Death from any cause</td>
<td>Spontaneous: consistent clinical presentation, new abnormal Q-waves, CK-MB &gt;1.5 × ULN; troponin I or T &gt;2 × ULN; silent MI defined by abnormal Q-waves; Post-PCI: CK-MB &gt;3 × ULN; troponin I or T &gt;5 × ULN associated with new ischemic symptoms; post-CABG: CK-MB, troponin I or T &gt;10 × ULN</td>
<td>Elective or emergency revascularization</td>
<td>Seattle Angina Questionnaire</td>
</tr>
<tr>
<td>JSAP</td>
<td>Death from any cause</td>
<td>New abnormal Q-waves or clinical history with ECG changes, cardiac enzymes &gt;2 × ULN</td>
<td>First PCI or CABG done during follow-up</td>
<td>Modified CCS classification</td>
</tr>
<tr>
<td>BARI 2D</td>
<td>Death from any cause</td>
<td>Spontaneous: 2-fold increase in CK-MB or troponin, ischemia by symptoms, ECG or imaging; post-PCI: CK-MB &gt;3 × ULN; silent: Q-wave change ≥ 2 grades</td>
<td></td>
<td>Angina in patients with angina at entry</td>
</tr>
</tbody>
</table>

Abbreviations: BARI 2D, Bypass Angioplasty Revascularization Investigation 2 Diabetes; CABG, coronary artery bypass graft surgery; CCS, Canadian Cardiovascular Society; CK, creatine kinase; COURAGE, Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation; DECODPI, Desobstruction Coronaria en Post-Infarto; ECG, electrocardiogram; JSAP, Japanese Stable Angina Pectoris Study; MASS, Medicine, Angioplasty, or Surgery Study; MB, MB fraction of CK; MI, myocardial infarction; ND, not described; NR, not reported; OAT, Occluded Artery Trial; PCI, percutaneous coronary intervention; PTCA, percutaneous transluminal coronary angioplasty; TOAT, The Open Artery Trial; ULN, upper limit of normal.
gina following randomization. The definition of angina was that used in the individual trials. In 3 studies,16 this outcome was reported in ancillary publications.19,20,22 When these definitions of angina were not specified, alternative end points consistent with angina were used, including hospitalization and coronary angiography for worsening angina in 1 study16 and elective revascularization in 2 studies.17,21

STATISTICAL ANALYSIS

As patient-level data from each trial were not available, a meta-analysis of summary statistics from individual trials was performed using Comprehensive Meta Analysis software, version 2 (Biostat). Data were analyzed according to the intention-to-treat principle. The Cochran Q statistic failed to indicate statistical heterogeneity for the outcomes of death and nonfatal MI, whereas statistical heterogeneity was present for the end points of unplanned revascularization and persistent angina. Since the absence of statistical heterogeneity does not indicate homogeneity, summary odds ratios (ORs) for all end points were calculated with the inverse variance method using a random effects model. A funnel plot of the logarithm of effect size vs the standard error for each trial was generated. The Egger weighted linear regression test was used to examine the quantitative association between mean effect estimate and its variance.

RESULTS

LITERATURE SEARCH

The electronic search yielded 1572 citations, which were screened by reviewing the title or abstract of each. Of these, 21 publications were reviewed in full, and 8 trials were included in the meta-analysis (Figure 1). These were the Open Artery Trial (TOAT),16 the Medical, Angioplasty, or Surgery Study II (MASS II),14 the trial by Hambrecht et al.,17 Desobstruction Coronaire en Post-Infarctus (DECOPI),18 and the Occluded Artery Trial (OAT).5 The 8 trials enrolled 7229 patients between 1997 and 2005, of whom 3617 were randomized to stent treatment and medical therapy and 3612 were randomized to medical therapy alone. Three studies5,16,18 exclusively enrolled stable patients with a recent MI to compare stenting of the infarct-related artery and medical therapy vs medical therapy alone. Baseline characteristics of the study populations are provided in Table 3.

Table 2. Randomized Trials of Stent Implantation vs Medical Therapy in Patients With Stable Coronary Artery Disease

<table>
<thead>
<tr>
<th>Source</th>
<th>Patients,</th>
<th>Enrollment</th>
<th>Follow-up,</th>
<th>Enrolment Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOAT,16 2002</td>
<td>66</td>
<td>1997-1999</td>
<td>1</td>
<td>Q-wave anterior MI with persistent occlusion of the LAD and absence of chest pain</td>
</tr>
<tr>
<td>Hambrecht et al,17 2004</td>
<td>101</td>
<td>1997-2001</td>
<td>1</td>
<td>Stable angina with documented ischemia</td>
</tr>
<tr>
<td>DECOPI,18 2004</td>
<td>212</td>
<td>1998-2001</td>
<td>3</td>
<td>Stable patients within 15 d of Q-wave MI, no ischemia, and total occlusion of the infarct-related artery</td>
</tr>
<tr>
<td>OAT,5 2006</td>
<td>2166</td>
<td>2000-2005</td>
<td>4</td>
<td>Stable patients 3 to 28 d after MI with total occlusion of the infarct-related artery</td>
</tr>
<tr>
<td>MASS II,14 2007</td>
<td>408</td>
<td>1995-2000</td>
<td>5</td>
<td>Stable angina or ischemia on stress test</td>
</tr>
<tr>
<td>COURAGE,6 2007</td>
<td>2287</td>
<td>1999-2004</td>
<td>4.6</td>
<td>Stable angina; stabilized unstable angina; myocardial ischemia or stenosis &gt;80%</td>
</tr>
<tr>
<td>JSAP,7 2008</td>
<td>384</td>
<td>2002-2004</td>
<td>3.3</td>
<td>Stable exertional angina or inducible ischemia; stenosis &gt;75%</td>
</tr>
<tr>
<td>BARI 2D,7 2009</td>
<td>1605</td>
<td>2001-2005</td>
<td>5</td>
<td>Diabetes with inducible ischemia or angina</td>
</tr>
</tbody>
</table>

Abbreviations: BARI 2D, Bypass Angioplasty Revascularization Investigation 2 Diabetes; COURAGE, Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation; DECOPI, Desobstruction Coronaire en Post-Infarctus; JSAP, Japanese Stable Angina Pectoris Study; LAD, left anterior descending coronary artery; MASS, Medicine, Angioplasty, or Surgery Study; MI, myocardial infarction; OAT, Occluded Artery Trial; TOAT, The Open Artery Trial.
Study quality is summarized in Table 5. None of the trials was blinded. All of the studies were randomized, and all but 1 study reported on study withdrawals and described the completeness of follow-up.

### QUANTITATIVE OUTCOMES

Of the total 649 deaths among the 7229 randomized patients, 322 occurred in the 3617 patients in the stent arms (8.9%), whereas 327 occurred in the 3612 patients in the medical therapy arms (9.1%). The OR for initial stent implantation vs medical therapy for mortality was 0.98 (95% CI, 0.84–1.16) (P = 0.83) (Figure 2A). Results were very similar when the study by Hambricht et al, which had no mortality events in either the stent or medical therapy group, was included in the analysis (Figure 2B). Nonfatal MI was reported in 323 of 3617 patients in the stent arms (8.9%) compared with 291 of 3612 patients in the medical therapy arms (8.1%). The OR for nonfatal MI for stent implantation compared with initial medical therapy was 1.12 (95% CI, 0.93–1.34) (P = 0.22) (Figure 2C). Unplanned revascularization was performed in 774 of 3617 stent patients (21.4%) and in 1049 of 3420 medical therapy patients (30.7%). The OR for unplanned revascularization in the stent vs medical therapy patients was 0.78 (95% CI, 0.57–1.06) (P = 0.11) (Figure 2D). Data on angina status was available for 4122 patients. Among the patients randomized to initial stent implantation, 597 of 2070 experienced persistent angina (29%) compared with 669 of 2052 randomized to medical therapy (33%) (OR, 0.80; 95% CI, 0.60–1.05) (P = 0.10) (Figure 2E).

### SUBGROUP ANALYSIS

There were no significant differences in the point estimates for death, unplanned revascularization, and freedom from angina between the studies of stable post-MI patients and the studies that randomized patients with angina or ischemia. However, the OR for nonfatal MI for stent placement compared with medical therapy was 1.49 (95% CI, 1.00–2.21) (P = 0.05) in the post-MI studies compared with 1.04 (95% CI, 0.84–1.28) (P = 0.73) in the stable angina/ischemia trials.

### PUBLICATION BIAS AND SENSITIVITY ANALYSES

The funnel plot was symmetrical, indicating a lack of publication bias (Figure 3). The Eggers test further supported the absence of publication bias with a 1-tailed P value of .45. Sensitivity analyses to assess...
the potential impact of qualitative differences in study design and patient selection showed that exclusion of any single trial from the analysis for mortality, nonfatal MI, and freedom from angina did not alter the overall findings of the analysis. However, exclusion of TOAT,16 Hambrecht et al.,17 or MASS II14 from the analysis of unplanned revascularization changed the point estimate of the OR to favor initial stent implantation.

The significant finding of this analysis is that compared with a strategy of initial medical therapy alone, coronary stent implantation in combination with medical therapy for stable CAD is not associated with a significant reduction in mortality, nonfatal MI, and freedom from angina after a mean follow-up of 4.3 years. These results are in contrast to 2 recent meta-analyses that found reductions in mortality11 and angina in patients assigned to initial PCI. However, a unique aspect of the current study is likely responsible for the divergent results. By limiting the analysis to studies in which stent implantation was the predominant form of PCI, this meta-analysis, for the first time that we know of, compares contemporary versions of PCI and medical therapy. The exclusion of studies using balloon angioplasty as the primary form of PCI shifted the years of enrollment forward by almost a decade during which time optimal medical therapy evolved to the current regimen that includes aspirin, β-blockers, ACE-inhibitors (or angiotensin receptor blockers), and statins.

The failure of stent implantation to reduce the risk of death or MI compared with medical therapy reinforces current concepts of the underlying pathophysiological characteristics of atherosclerosis as a diffuse arterial inflammatory disease that gives rise to vulnerable plaques, the disruption of which leads to coronary thrombosis, MI, and death.23 Lesions most prone to rupture tend to be those of the least hemodynamic consequence, whereas the obstructive lesions that are stented to treat angina or ischemia are paradoxically less prone to rupture. The current findings fail to support theories suggesting that PCI reduces mortality by improving myocardial blood flow or stabilizing vulnerable plaque in patients with angina or by improving left ventricular remodeling or electrophysiologic stability in patients with an occluded artery following MI.11,26 The loss of the earlier mortality benefit associated with an initial PCI strategy is likely due to the widespread incorporation of potent antiplatelet and anti-atherosclerotic therapies into medical regimens, which has led to a substantial reduction in cardiovascular mortality over the past 20 years.27

The trend toward an increased risk of nonfatal MI in the stent group in the current analysis may reflect the fact that, depending on the diagnostic criteria used, PCI causes periprocedural MI in 5% to 30% of cases due to distal plaque embolization, side branch occlusion, and other mechanisms.28 However, sensitive troponin assays were used to detect myocardial injury in only 2 of the 8 studies5-7 included in this meta-analysis, which may explain why the risk of nonfatal MI was not significantly increased in the stent group. It is unclear why the risk of nonfatal MI was increased in the studies involving post-MI patients with arteries occluded by thrombus. It may be that PCI in these patients is more likely to cause distal embolization of thrombus resulting in infarction of downstream viable territories or occlusion of recruitable collaterals predisposing to reinfarction in the event of stent thrombosis.

Unplanned revascularization by PCI or CABG in patients randomized to initial medical therapy occurs in 3 circumstances: for angina symptoms refractory to medical therapy (crossover), for symptomatic restenosis or graft failure at the site of the crossover PCI or CABG, or for the development of symptomatic hemodynamically significant de novo atherosclerotic lesions. In patients randomized to initial stent therapy, unplanned revascularization is generally required for symptomatic restenosis of the stent site or development of new hemodynamically significant lesions associated with ischemia. Since both groups received the same medical therapy, the development of de novo lesions should occur at the same rate in each group. That unplanned revascularization was not significantly different in initially stented patients compared with those randomized to initial medical therapy suggests that the number of crossover PCs in the medical group approximates the number of restenosis events in the stent group.

Since elimination of any of 3 studies in which the stent group underwent more unplanned revascularizations than the medical therapy arm14,16,17 resulted in a significant reduction in the OR for unplanned revascularization in the stent group, it would be expected that if drug-eluting stents had been widely used, results would have shifted toward a statistically significant reduction in

<table>
<thead>
<tr>
<th>Study</th>
<th>Blinding</th>
<th>Technique</th>
<th>Random Assignment</th>
<th>Withdrawal Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOAT6</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Hambrecht et al7</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>DECOPI8</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>DAT9</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>MASS II10</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>COURAGE11</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>JSAP12</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>BARI 2D13</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

Abbreviations: BARI 2D, Bypass Angioplasty Revascularization Investigation 2 Diabetes; COURAGE, Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation; DECOPI, Desobstruction Coronaire en Post-Infarctus; JSAP, Japanese Stable Angina Pectoris Study; MASS, Medicine, Angioplasty, or Surgery Study; OAT, Occluded Artery Trial; TOAT, The Open Artery Trial.
unplanned revascularization with initial stent therapy.29 However, from the perspective of resource utilization, 4391 total revascularization procedures were performed in the initial stent implantation group compared with 1049 revascularization procedures in patients randomized to initial medical therapy. Thus, any potential benefit accruing from a reduction of restenosis and subsequent unplanned revascularization that might be seen with initial drug-eluting stent treatment would still be greatly offset by the marked reduction in overall procedures in the medical therapy group. Furthermore, the use of drug-eluting stents might come at a cost of increases in death and MI from late stent thrombosis.30 Persistently angina is frequently the symptom that prompts evaluation for and detection of restenosis following PCI. Thus, the ability to render patients free of angina is a major factor that determines the need for revascularization in both the stent and medical therapy groups. It is noteworthy that this meta-analysis found no significant difference between stent and medical therapy arms with regard to this outcome. Early randomized trials of balloon angioplasty vs medical therapy31-33 and a recent meta-analysis34 that included these trials demonstrated greater reduction of angina with angioplasty than with medical therapy. The absence of a benefit in angina relief with stent implantation most likely indicates that the improvement in medical therapy for the treatment of angina superseded the improvement in angina reduction associated with the transition from balloon angioplasty to stent implantation. Furthermore, the antianginal drug ranolazine was not used in any of the studies included in this meta-analysis. Its use in combination with other antianginal agents would be expected to increase the numbers of patients free of angina34 and thereby reduce the number of unplanned revascularizations in both stent and medical therapy arms.

Over 400,000 PCI procedures are performed for the treatment of stable CAD in the United States each year.35 Despite publication of clinical trials and guidelines supporting the initial use of optimal medical therapy prior to PCI, only 44% of patients are treated with optimal medical therapy prior to PCI, and approxi-
Ultimately 50% of patients with an occluded infarct-related artery after an MI undergo PCI of that artery. This resistance to adherence to recommendations derived from high quality evidence is multifactorial, including the fact that the existing data do not demonstrate the clear superiority of medical therapy for any clinical outcome. It has been suggested that financial rewards for physicians and hospitals to perform PCI in the fee-for-service health care environment of the United States may contribute to the persistent use of PCI in settings where it has been shown to offer no clinical benefit. In support of this concept, rates of PCI for stable CAD in Ontario, Canada, where a single-payer government-regulated system controls the annual volume of cardiac procedures, are less than half what they are in New York state.

In the context of controlling rising health care costs in the United States, this study suggests that up to 76% of patients with stable CAD can avoid PCI altogether if treated with optimal medical therapy, resulting in a lifetime savings of approximately $9450 per patient in health care costs. Furthermore, these findings imply that upstream testing to demonstrate ischemia in patients with stable angina symptoms may not be necessary.

This study has several limitations. First, this is a meta-analysis of the pooled results reported from each individual trial because individual patient-level data were not available. Second, data were extracted only from randomized clinical trials. Patients enrolled in such trials may not be representative of patients actually seen in clinical practice. Third, although variables such as age and sex may be related to outcomes, these subgroup analyses could not be performed because outcomes stratified by age and sex were not included in the randomized trials included in this meta-analysis. Finally, as indicated by the confidence intervals, the absence of a detected difference between therapeutic strategies does not exclude the possibility of an undetected benefit or harm. However, given the absence of any detected benefit of stent placement on mortality and nonfatal MI, if subsets of patients such as those with more extensive areas of ischemia are identified who benefit from stent therapy, there is likely to be another subset harmed by a similar degree by stent treatment.

In conclusion, the findings of this analysis support current recommendations for instituting optimal medical therapy in patients with stable CAD rather than proceeding directly to stent implantation.

Accepted for Publication: November 16, 2011.

Correspondence: David L. Brown, MD, Division of Cardiovascular Medicine, Department of Medicine, State University of New York–Stony Brook School of Medicine, Health Sciences Center T16-080, Stony Brook, NY 11794 (david.brown@sbmed.org).

Author Contributions: Study concept and design: Brown. Acquisition of data: Stergiopoulos and Brown. Analysis and interpretation of data: Stergiopoulos and Brown. Drafting of the manuscript: Brown. Critical revision of the manuscript for important intellectual content: Stergiopoulos and Brown. Administrative, technical, and material support: Brown.

Financial Disclosure: None reported.

Funding for Less Is More: Staff support for topics research funded by grants from the California Health Care Foundation and the Parsenous Foundation.

REFERENCES


Figure 3. Assessment of publication bias. This funnel plot is a plot of a measure of study size on the vertical axis as a function of effect size on the horizontal axis for mortality. Large studies appear toward the top of the graph and tend to cluster near the mean effect size. Smaller studies appear toward the bottom of the graph and (since there is more sampling variation in effect size estimates in the smaller studies) will be dispersed across a range of values. In the absence of publication bias demonstrated here, the studies are distributed symmetrically about the combined effect size.
Mounting Evidence for Lack of PCI Benefit in Stable Ischemic Heart Disease

What More Will It Take to Turn the Tide of Treatment?

When treating patients with symptomatic coronary artery disease (CAD), clinicians frequently consider whether the initial management approach should be optimal medical therapy (OMT) alone or OMT in addition to coronary revascularization—generally percutaneous coronary intervention (PCI) in the vast majority of patients for whom revascularization would be considered. Over the past several years, several trials such as the Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation (COURAGE) Trial, Bypass Angioplasty Revascularization 2 Diabetes Trial (BARI-2D), and Japan Stable Angina Pectoris (JSAP) study have challenged the conventional approach to treating patients with stable coronary artery disease. N Engl J Med. 2008;359(7):677-687.

In addition to coronary revascularization—generally percutaneous coronary intervention (PCI) in the vast majority of patients for whom revascularization would be considered. Over the past several years, several trials such as the Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation (COURAGE) Trial, Bypass Angioplasty Revascularization 2 Diabetes Trial (BARI-2D), and Japan Stable Angina Pectoris (JSAP) study have challenged the conventional approach to treating patients with stable coronary artery disease.


Bypass surgery was superior to medical therapy for patients with ischemia, but not for those with no ischemia. J Am Coll Cardiol. 2008;52(11):894-904.

What More Will It Take to Turn the Tide of Treatment?

When treating patients with symptomatic coronary artery disease (CAD), clinicians frequently consider whether the initial management approach should be optimal medical therapy (OMT) alone or OMT in addition to coronary revascularization—generally percutaneous coronary intervention (PCI) in the vast majority of patients for whom revascularization would be considered. Over the past several years, several trials such as the Clinical Outcomes Utilizing Revascularization and Aggressive Drug Evaluation (COURAGE) Trial, Bypass Angioplasty Revascularization 2 Diabetes Trial (BARI-2D), and Japan Stable Angina Pectoris (JSAP) study have challenged the conventional approach to treating patients with stable coronary artery disease.