

## Commentary

**Debate: PCI vs CABG: a moving target, but we are gaining**

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Published online: 28 November 2001

*Curr Control Trials Cardiovasc Med* 2001, **2**:263-265

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**Abstract**

The treatment of patients with coronary artery disease continues to evolve; all three strategies – medical therapy, surgical revascularization, and percutaneous coronary intervention – have changed. Medical therapy with intense risk-factor modification and treatment with a statin, aspirin, and angiotensin-converting enzyme (ACE) inhibitors, should be used unless contraindicated. Surgical therapy has also changed with the introduction of minimally invasive, beating heart surgery. Percutaneous coronary intervention has perhaps changed the most radically with adjunctive therapy – glycoprotein IIb/IIIa inhibitors, thienopyridines, and reliance on stent implantation. The future, with new distal protection devices and drug-coated stents, should continue to see increased numbers of patients who can benefit from percutaneous intervention.

**Key Words** PCI, stent implantation, coronary surgery

The treatment of patients with coronary artery disease continues to evolve. This evolution proceeds in fits and starts – rapid changes interspersed with plateaus. Upon reaching each plateau, there is the temptation to believe that it is now time to address the question, once and for all, of what is the best treatment strategy for patients. Such an approach has some disadvantages: the procedure is continually evolving; yardsticks (endpoints) in use also continue to change; and patients (and their expectations) continue to change. These caveats are not meant to denigrate randomized clinical trials because they remain the key to evidence-based medicine.

**Treatment strategies**

The three components of current treatment strategy – medical therapy, surgical revascularization, and percutaneous coronary intervention (PCI) – are all changing. Medical therapy, however, should remain the mainstay. Intensive risk-factor modification with medical therapy is essential, irrespective of whether it is the sole therapy or whether the patient requires revascularization.

Surgical revascularization has also changed [1–5]. This change has arguably (but probably) been the result of the competition from the “newer kid on the block” – PCI. Even surgeons have finally embraced the ideal of “less invasiveness” with new approaches such as the minimally invasive “beating heart surgery”.

However, the field that has changed the most is PCI, with the introduction of stents (previously only used in few patients up to the mid-1990s, but now in approximately 90% of cases) [6–9], thienopyridines [10–12], and glycoprotein (GP) IIb/IIIa inhibitors [13–17]. It has been documented to reduce enzyme elevation post-procedure, and may improve harder endpoints in other patient groups.

**Trials comparing therapies**

The article by Bhatt and Topol, in this issue of *Current Controlled Trials in Cardiovascular Medicine*, reviews the latest trials comparing stenting with bypass surgery, for the treatment of multivessel coronary disease [18]. Both the Arterial Revascularisation Therapy Study (ARTS) and the

ACE = angiotensin-converting enzyme; CABG = coronary bypass graft surgery; CK = creatinine kinase; GP = glycoprotein; PCI = percutaneous coronary intervention; PTCA = percutaneous transluminal coronary angioplasty.  
ARTS = Arterial Revascularisation Therapy Study; BARI = Bypass Angioplasty Revascularization Investigation; SoS = Stent or Surgery.

Stent or Surgery (SoS) trial, are important additions [2–3]. However, as yet, we have details only for ARTS, as the SoS trial has only recently been presented at the 2001 American College of Cardiology Scientific Sessions and has not yet been published.

For the ARTS trial, we know that one-year mortality rates and the combined endpoint (death, myocardial infarction, and cerebrovascular accident) were similar [2]. These trends were also seen after two years of follow-up. Follow-up target vessel revascularization rates remain higher in the stent group, but the gap between the stenting and surgery has closed dramatically from previously published trials of percutaneous coronary intervention versus surgery.

In the Bypass Angioplasty Revascularization Investigation (BARI), diabetic patients treated with coronary bypass graft surgery (CABG) had a better mortality at two years [1]. There were other important differences in the ARTS trial, namely, creatinine kinase (CK) elevation was more than twice as frequent in the surgical group (12.6% versus 6.2%,  $P < 0.001$ ). Of interest, elevated level of CK-MB was the main predictor of a poor outcome in the surgical group, but not in the PCI group in which the main factor for a poor outcome was the presence of diabetes mellitus. The authors concluded that, “coronary stenting for multivessel disease is less expensive than bypass surgery and offers the same degree of protection against death, stroke, and myocardial infarction; however, stenting was associated with a greater need for repeat revascularization”.

Details of the SoS trial remain unpublished, but are hopefully in press at this time. The investigators have showed a mortality disparity with the PCI group having increased mortality. This imbalance in mortality was apparently related to malignancy and, as Bhatt and Topol suggest, “play of chance is the likeliest explanation for this finding” [18].

### Which is the winner?

Bhatt and Topol speculate on “the winner” of the controversy [18]. This is difficult to determine, as it depends on the “scorecard” system used to define “winning.” If the scorecard endpoint were death or myocardial infarction, at least with nondiabetic patients, the answer would be a toss-up (it could go either way). The ten-year follow-up data on nondiabetic patients from the BARI trial show almost identical event-free survival in both surgery and percutaneous transluminal coronary angioplasty (PTCA), using this endpoint. If, however, the scorecard endpoint is the avoidance of the potentially debilitating effects of central nervous system function disturbance, post revascularization with dramatic decrease in neurocognitive function, then PCI is the clear winner [19]. This is, in part, because there is considerable evidence of neurocognitive changes after CABG, but it has not been assessed after PCI; the SoS trial may help with this. On the other hand, if the scorecard is avoidance of a repeat

procedure, such as repeat PCI, then CABG is the winner. Patient expectation plays a major role here.

### Do GP IIb/IIIa inhibitors improve outcome?

There are other issues with these trials; as Bhatt and Topol discuss, GP IIb/IIIa inhibitors were used infrequently [18]. These agents have been studied intensively in the setting of acute coronary syndromes as well as PCI, and have been found to dramatically decrease periprocedural cardiac enzyme elevation. Whether this would have made a large difference in the follow-up of these patients with multivessel disease, is as yet undetermined. In diabetic patients, [15–17] there is longer-term evidence that mortality rates may be improved with GP IIb/IIIa agents, although this has not been specifically studied in a randomized trial. The lower use of GP IIb/IIIa agents, mirrors the practice in Europe where these agents are not used routinely – primarily because of cost. There are other advances which these trials also do not take into consideration because these were not either available or not widely used as the standard of care.

There is great interest in the use of distal protection devices, which may improve the outcome of PCI and decrease embolization [20]. Similarly, drug-coated stents appear to dramatically decrease restenosis rates, and if the forthcoming trials substantiate the early results, they will revolutionize the field [21].

### Conclusion

Bhatt and Topol wondered if the battle was over. I believe entirely that it is not. There have been dramatic changes in interventional cardiology. GP IIb/IIIa agents have been introduced which will be used to prevent lesions and periprocedural infarction in higher risk patients, and drug-coated stents may prevent angiographic and clinical restenosis. This will dramatically improve the early and longer-term success rate of PCI. Surgery, however, will remain an excellent treatment strategy, at least for patients who are not candidates for percutaneous intervention and probably for the diabetic patients (particularly those with advanced multivessel disease and impaired left ventricular function). For the majority of patients who could have either PCI or surgery, the less invasive approach with percutaneous intervention, will become the standard.

### Competing interests

None declared.

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