7 studies demonstrated no statistically significant difference in arterial graft occlusion (RR, 1.01; 95% CI, 0.63–1.60; \( P = .98 \); \( P \) for heterogeneity = .16) between OPCAB and CABG-CPB but a statistically significant increase in venous graft occlusion (RR, 1.29; 95% CI, 1.08–1.54; \( P = .006 \); \( P \) for heterogeneity = .98; Figure 1, A)\(^{1,3-7} \) and overall graft occlusion (RR, 1.29; 95% CI, 1.00 [1.0028]–1.42; \( P = .05 \) [0.0465]; \( P \) for heterogeneity = .27) with OPCAB relative to CABG-CPB in the fixed-effects model. Two of the 7 studies stated 3-month graft patency, whereas the remaining 5 studies reported ≥1-year patency. In a sensitivity analysis, pooled analysis of the 5 studies reporting ≥1-year graft patency demonstrated no statistically significant difference in arterial graft occlusion (RR, 0.98; 95% CI, 0.58–1.68; \( P = .95 \); \( P \) for heterogeneity = .36) and overall graft occlusion (RR, 1.16; 95% CI, 0.97–1.40; \( P = .11 \); \( P \) for heterogeneity = .83) between OPCAB and CABG-CPB but a statistically significant increase in venous graft occlusion (RR, 1.27; 95% CI, 1.06–1.53; \( P = .01 \); \( P \) for heterogeneity = .94; Figure 1, B)\(^{1,5-7} \) with OPCAB relative to CABG-CPB in the fixed-effect model.

The results of our analysis suggest that OPCAB may attenuate venous graft patency over CABG-CPB. Four of the 5 studies included in the sensitivity analysis, however, had merely 1-year follow-up duration as contrasted with 7-year follow-up in the study by Angelini and coworkers.\(^1 \) Further long-term follow-up results of randomized controlled trials are needed to confirm our results.

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**References**


doi:10.1016/j.jtcvs.2009.04.051

**Reply to the Editor:**

In this issue, Takagi and Umemoto\(^1 \) report a meta-analysis of patency after coronary artery bypass (CABG) and off-pump CABG (OPCAB) that we and others declined to conduct.\(^2,3 \) We have 4 comments on the appropriateness of both their revised and original analyses.\(^4 \)

The authors make the mistake that we described in our article—\( \)that is, they assumed statistical independence of multiple grafts in the same patients. We reiterate that this “could seriously undermine statistical inferences.”\(^5 \) In our own primary patency analysis, ignoring the dependency between grafts within patients would have narrowed the confidence interval by 40%. Underestimating the standard errors by this amount would make all of their pooled estimates not statistically significant.

Meta-analysts should write a protocol in advance,\(^3 \) including specifying the planned analyses. Can Takagi and Umemoto confirm that the subgroup analysis by different conduit type was prespecified? In the Beating Heart Against Cardioplegic Arrest Study (BHACAS) follow-up, the 2 groups had very similar overall occlusion rates, but the proportions of vein and arterial grafts occluded in the OPCAB compared with the CABG group happened to be in the directions observed in the original meta-analysis.\(^4 \) We had no prior hypothesis that veins should be more at risk of occlusion with OPCAB and concluded that our nonsignificant findings arose by chance. Did Takagi and Umemoto report the subgroup analyses because it showed statistical significance, without a prior intention to do so?

Although updating a meta-analysis is always worthwhile, one should not expect the addition of a single new result to overturn a previous conclusion unless the new trial contributes an overwhelming amount of new information (depicted by the size of a “blob” in a forest plot) or a substantially different estimate (which might cause concern about heterogeneity). Neither was the case here.

Inspection of the blobs does, however, show that one trial contributes most of the statistical weight.\(^6 \) Interestingly, the PRAGUE-4 trial reported patency findings for a similar number of patients (255) as the BHACAS trials (199), highlighting that the large weight is due to a high rate of overall occlusion (45%) compared with the other trials (7%–17%). Meta-analysts need to judge whether it makes sense to pool data.\(^5 \) We question whether the PRAGUE trial should be pooled with the others, even in the absence of statistical heterogeneity and without obvious major design differences between studies. Moreover, there are other important sources of heterogeneity between trials.
such as duration of follow-up and susceptibility to attrition bias.

We conclude that there is no current evidence that the patency rates are statistically significantly different for OPCAB and CABG. The pooled point estimate is unaffected by the flawed data analysis, so the risk of a vein graft occlusion using the OPCAB technique may be \( \approx 25\% \) higher. However, even if future data confirm that the risk is higher, the best answer to the question ‘Dare we perform OPCAB… to merely improve [these] selected clinical and resource outcomes?’4 is provided by analyses of outcomes that are more relevant to patients and less susceptible to attrition (survival free from major adverse cardiac-related events and health-related quality of life). There is no hint from a systematic review6 or the BHACAS trials2 that these outcomes are better after CABG than OPCAB, either in the short or long term.

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References

doi:10.1016/j.jtcvs.2009.05.043

**Notices of Correction**


In the above-noted article, the spelling of Dr Behjati’s surname was incorrect. The corrected author list is printed below.

U. Abdel-Rahman, MD, P. Risteski, MD, K. Tizi, S. Kerscher, MD, PhD, S. Behjati, K. Zwicker, MD, M. Scholz, MD, PhD, U. Brandt, MD, PhD, and A. Moritz, MD, PhD


In the above-noted article, the spelling of Dr Meerkov’s surname and his degree were incorrect. The corrected author list is printed below.

Himanshu J. Patel, MD, David M. Williams, MD, Meir Meerkov, MSE, Narasimham L. Dasika, MD, Gilbert R. Uphchurch, Jr, MD, and G. Michael Deeb, MD