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Commentary

The TA Trial: A Long-Overdue Randomised Test of Total Arterial Revascularisation

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Coronary artery bypass grafting (CABG) remains the most durable revascularisation strategy for patients with multivessel coronary artery disease, with established long-term survival advantages over percutaneous coronary intervention in complex anatomical disease [1,2]. Yet despite decades of surgical refinement, one of the most consequential intraoperative decisions, conduit selection, remains insufficiently resolved by high-quality prospective evidence. The Total Arterial (TA) Trial, (clinical trial registry: ACTRN12623000864628) funded by the Australian Medical Research Future Fund, represents a serious and timely effort to address that gap.

The central question is simple: does the complete exclusion of saphenous vein grafts (SVGs) in favour of total arterial revascularisation (TAR) translate into superior graft patency and better clinical outcomes? The biological basis for expecting so is well-established. SVGs are anatomically and haemodynamically mismatched for the arterial circulation – subjected to pressures they were not designed to withstand – and the consequences are of reasonably predictable and progressive graft failure. Approximately 40–50% of SVGs occlude within 10 years, contributing significantly to postoperative myocardial infarction, repeat revascularisation, and premature mortality [3,4]. Arterial conduits appear to behave differently. Whether internal mammary arteries or radial arteries, they exhibit resistance to progressive atherosclerosis, adaptive remodelling, and durable angiographic patency over decades of follow-up [5,6]. Large registry analyses, including data from the Australian and New Zealand Society of Cardiac and Thoracic Surgeons (ANZSCTS) registries, have consistently associated TAR with a survival advantage [7,8].

The key question is whether this survival signal reflects the true biological superiority of arterial conduits or is substantially confounded by patient selection and operator expertise. Patients who receive TAR tend to be younger, less comorbid, and operated on by surgeons with higher procedural volumes. Observational analyses, however carefully risk-adjusted, cannot fully account for these confounders. Randomised allocation remains the only mechanism to isolate conduit biology from surgical selection – and prior trials have not achieved this adequately.

The Arterial Revascularisation Trial (ART) was undermined by a crossover rate exceeding 10% post-randomisation, diluting the treatment contrast and complicating interpretation of its insignificant result at 10 years [9]. Whether ART failed to show a benefit because none exists, or because insufficient patients received the assigned treatment, remains unresolved. However, it is also noteworthy that both arms could have received SVG. The ongoing ROMA trial, while more rigorously designed than the ART trial, addresses a related but distinct question: the number of arterial grafts, rather than the complete elimination of venous conduits [10]. Both arms of ROMA permit SVG use, which cannot therefore directly address whether abolishing venous grafting entirely – the strategy with the most consistent observational support, could improve survival.

The TA Trial is deliberately designed to address these limitations. By defining its intervention as zero SVGs versus at least one SVG, it isolates the specific variable that observational data most consistently associates with long-term outcome differences [7,11]. For clarity, unlike ART and ROMA, the focus of the investigation relates not to the arterial conduit use - but rather to the venous conduit use. The pragmatic surgical design –imposing no restrictions on conduit type, graft configuration, or reconstruction technique within the TAR arm – reflects clinical equipoise and preserves generalisability. This acknowledges that TAR is not a single operation but a surgical philosophy, executable through multiple technically sound configurations [12,13].

Equally important is the trial's approach to protocol compliance. ART established that investigator non-compliance is a practical threat to trial validity, and not a theoretical one. The TA Trial approach mandates logbook review to confirm surgeon competence in TAR, requiring preoperative written confirmation of equipoise for every randomised patient, and instituting individual investigator follow-up after each protocol breach. These are the structural safeguards upon which the trial's interpretability depends.

Selecting perfect graft patency as the primary endpoint at 24 months is scientifically well-justified. Simple patency captures graft survival but not graft health; a vein graft that is open but internally diseased will ultimately fail, and simple patency misses this trajectory.

Perfect patency – a patent conduit with a smooth, regular lumen free of atherosclerotic change – provides an angiographic surrogate for long-term conduit durability validated against clinical outcomes.[6] Assessment by CT coronary angiography with sensitivity and specificity exceeding 98% [14] allows non-invasive, reproducible assessment across all 18 sites. The additional CTCA at 3 months is a noteworthy design strength, offering a structured examination of early competitive flow effects on arterial graft function, a phenomenon that likely explains a proportion of early graft failures but remains poorly characterised prospectively [15].

Australia is uniquely positioned to conduct this trial. TAR utilisation rates across Australian centres substantially exceed those reported in North America and Europe [7], ensuring a sufficient pool of surgeons with established expertise in both TAR and non-TAR techniques. This mitigates a key methodological concern: differential technical proficiency across study arms could confound the treatment effect. The trial's findings will therefore reflect outcomes achievable within a mature surgical environment, strengthening their external validity and translational relevance.

Conclusion

The TA Trial is the first prospective, randomised investigation designed to directly test whether complete elimination of venous conduits from CABG translates into measurable improvements in graft integrity and, through its comprehensive secondary outcome framework, patient survival and quality of life. If it confirms the observational literature, its implications for surgical practice and guideline development good be substantial and impactful. The cardiac surgery community has waited a long time for this evidence.

Authorship and Contributions

Justin Ren, writing and conceptualization of the manuscript. Alistair Royse, writing and conceptualization of the manuscript. Colin Royse, co-author and reviewer.

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Conflicts

This manuscript has not been funded. The authors declare that they are the architects of the TA Trial study design and have written multiple supporting analyses for this trial.

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