in the Brief Research Reports section of this *Journal*. Because such brief communications should contain no more than 750 words, we could not report all aspects of our literature research, statistical analysis, results, considerations, and conclusions. Reviewers and editors, however, found our work to be worthy of publication. Are Athanasiou and colleagues perhaps complaining about the ability of the Editor or reviewers of this *Journal*? Is one of them suggesting himself as the new Editor of this *Journal*?

Athanasiou and colleagues will be astonished to read that our conclusions are supported and confirmed in a Letter to the Editor from Takagi and associates,⁵ which is an update to our work. Is even Takagi's work an example of fast-track publication of a poorly conducted meta-analysis? Are Athanasiou and colleagues the only researchers who can publish reliable meta-analyses?

Looking to an another "evidence horizon," meta-analysis and systematic review of non-RCTs by Athanasiou and colleagues have encouraged the use of minimally invasive great saphenous vein harvesting in coronary artery bypass grafting.⁶ These conclusions have been strongly disputed by a recent very large study published in the *New England Journal of Medicine*.

Sometime, even a great researcher looks into a black hole.⁷

Umberto Benedetto, MD

Emiliano Angeloni, MD

Riccardo Sinatra, MD

Cardiac Surgery Department

University of Rome "La Sapienza"

II School of Medicine, Rome, Italy

References

1. Wijeyesundera DN, Beattie WS, Djaiani G, Rao V, Borger MA, Karkouti K, et al. Off-pump coronary artery surgery for reducing mortality and morbidity: meta-analysis of randomized and observational studies. *J Am Coll Cardiol*. 2005;46:872-82.
2. Achouh P, Boutekadjirt R, Toledano D, Hammoudi N, Pagny JY, Goube P, et al. Long-term (5- to 20-year) patency of the radial artery for coronary bypass grafting. *J Thorac Cardiovasc Surg*. Epub 2009 Nov 25.
3. Panesar SS, Chikwe J, Mirza SB, Rahman MS, Warren O, Rao C, et al. Off-pump coronary artery bypass surgery may reduce the incidence of stroke in patients with significant left main stem disease. *Thorac Cardiovasc Surg*. 2008;56:247-55.
4. Takagi H, Tanabashi T, Kawai N, Umemoto T. Off-pump surgery does not reduce stroke, compared with results of on-pump coronary artery bypass grafting: a meta-analysis of randomized clinical trials. *J Thorac Cardiovasc Surg*. 2007;134:1059-60.
5. Takagi H, Matsui M, Umemoto T. Total occlusion and string sign of radial artery versus saphenous vein graft conduits: an updated meta-analysis. *J Thorac Cardiovasc Surg*. 2010;139:1671-2.
6. Aziz O, Athanasiou T, Panesar SS, Massey-Patel R, Warren O, Kinross J, et al. Does minimally invasive vein harvesting technique affect the quality of the conduit for coronary revascularization? *Ann Thorac Surg*. 2005;80:2407-14.
7. Lopes RD, Hafley GE, Allen KB, Ferguson TB, Peterson ED, Harrington RA, et al. Endoscopic versus open vein-graft harvesting in coronary-artery bypass surgery. *N Engl J Med*. 2009;36:235-44.

doi:10.1016/j.jtcvs.2010.02.011

TOTAL OCCLUSION AND STRING SIGN OF RADIAL ARTERY VERSUS SAPHENOUS VEIN GRAFT CONDUITS: AN UPDATED META-ANALYSIS To the Editor:

We read with great interest the article by Benedetto and associates.¹ In their meta-analysis of 5 randomized, controlled trials, they demonstrated no significant advantage of radial artery (RA) relative to saphenous vein graft (SVG) conduits in coronary artery bypass grafting for "graft failure" including "total occlusion" and "string sign" (random-effects risk difference [RD], -0.40; 95% confidence interval [CI], -0.128 to 0.048; $P = .372$). More recently, however, Hayward and collaborators² updated the results of the Radial Artery Patency and Clinical Outcomes (RAPCO) trial that were originally reported by Buxton and colleagues³ in 2003. We performed an updated meta-analysis of randomized, controlled trials of RA versus SVG conduits in coronary artery bypass grafting for "total occlusion," "string sign," and "graft failure" ("total occlusion" plus "string sign").

Although Buxton and colleagues³ estimated graft patency in only 24 RA and 22 SVG conduits in the RAPCO trial, Hayward and collaborators² performed protocol angiography in 53 patients assigned to receive RA conduits and 60 patients assigned to receive SVG conduits at mean follow-up of 5.5 years. In total, our meta-analysis included data on 1176 grafts (592 RA and 584 SVG). Pooled analysis of the 5 trials, including updated results² of the RAPCO trial, demonstrated a statistically significant reduction in "total occlusion" (random-effects RD, -0.07; 95% CI, -0.12 to -0.03; $P = .0009$; Figure 1, A) but a statistically significant increase in "string sign" (random-effects RD, 0.04; 95% CI, 0.02 to 0.07; $P = .0002$; Figure 1, B) with RA relative to SVG, resulting in a statistically nonsignificant reduction in "graft failure" ("total occlusion" plus "string sign," random-effects RD, -0.05; 95% CI, -0.13 to 0.02; $P = .16$; Figure 1, C). Sensitivity analyses were performed to assess the contribution of each study to the pooled estimate by excluding individual trials one at a time and recalculating the pooled RD estimates for the remaining studies. Exclusion of any single trial from the analysis of "total occlusion" did not substantively alter the overall result of our analysis. Although elimination of any single trial except for the Radial Artery Patency Study (RAPS)⁴ from the analysis of "string sign" did not substantially change the pooled estimate, exclusion of the RAPS, which included the largest number of grafts, demonstrated a statistically nonsignificant increase in "string sign" (random-effects RD, 0.02; 95% CI, -0.02 to 0.05; $P = .30$) with RA relative to SVG. Although elimination of any single trial except for the RAPS⁴ from the analysis of "graft failure" ("total occlusion" plus "string sign") did not substantially change the pooled estimate, exclusion of the RAPS demonstrated a statistically significant reduction in "graft failure" (random-effects RD, -0.09; 95% CI, -0.17 to 0.00; $P = .04$) with the RA relative to SVG.

FIGURE 1. Risk differences for rates of “total occlusion” (A), “string sign” (B), and “graft failure” (“total occlusion” plus “string sign”) (C) of radial artery (RA) versus saphenous vein graft (SVG). IV, Inverse variance; CI, confidence interval; Gaudino (I) and Gaudino (II), failed (I) and patent (II) coronary stent groups in trial of Gaudino and associates⁵; RAPCO, Radial Artery Patency and Clinical Outcomes trial²; RAPS, Radial Artery Patency Study⁴; RSVP, Radial Artery Versus Saphenous Vein Patency trial.⁶

Our analysis suggests that the RA reduces “total occlusion” but increases “string sign” relative to the SVG in coronary artery bypass grafting. There is no superiority of the RA relative to the SVG in terms of “graft failure” (“total occlusion” plus “string sign”). Sensitivity analyses, however, reveal that our results are influenced by the results of the RAPS,⁴ the largest trial.

Hisato Takagi, MD, PhD
Masafumi Matsui, MD
Takuya Umemoto, MD, PhD
Department of Cardiovascular
Surgery

Shizuoka Medical Center
Shizuoka, Japan

References

- Benedetto U, Angeloni A, Refice S, Sinatra R. Radial artery versus saphenous vein graft patency: meta-analysis of randomized controlled trials. *J Thorac Cardiovasc Surg.* 2010;139:229-31.
- Hayward PA, Gordon IR, Hare DL, Matalanis G, Horrigan ML, Rosalion A, et al. Comparable patencies of the radial artery and right internal thoracic artery or saphenous vein beyond 5 years: results from the Radial Artery Patency and Clinical Outcomes trial. *J Thorac Cardiovasc Surg.* 2010;139:60-7.
- Buxton BF, Raman JS, Ruengsakulrach P, Gordon I, Rosalion A, Bellomo R, et al. Radial

artery patency and clinical outcomes: five-year interim results of a randomized trial. *J Thorac Cardiovasc Surg.* 2003;125:1363-71.

- Desai ND, Cohen EA, Naylor CD, Fremes SE. Radial Artery Patency Study Investigators. A randomized comparison of radial-artery and saphenous-vein coronary bypass grafts. *N Engl J Med.* 2004;351:2302-9.
- Gaudino M, Cellini C, Pragliola C, Trani C, Burzotta F, Schiavoni G, et al. Arterial versus venous bypass grafts in patients with in-stent restenosis. *Circulation.* 2005;112(9 Suppl):I265-9.
- Collins P, Webb CM, Chong CF, Moat NE. Radial Artery Versus Saphenous Vein Patency (RSVP) Trial Investigators. Radial artery versus saphenous vein patency randomized trial: five-year angiographic follow-up. *Circulation.* 2008;117:2859-64.

doi:10.1016/j.jtcvs.2010.01.042