Commentary: Automatic distal anastomotic connector—Carrying away a small stone toward moving the entire robotic coronary artery bypass grafting mountain

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Left to right: Ahmad Mahajna, MD, Oz M. Shapira, MD, and Gal Aviel, MD

Central Message

Use of an automatic connector in TECAB may provide the opportunity to construct the distal anastomoses more reliably and faster, facilitating the procedure in patients with multivessel disease.

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The man who moves a mountain begins by carrying away small stones.

—Usually attributed to Confucius
(552 BCE–479 BCE)

The first-in-human robotically assisted totally endoscopic coronary artery bypass (TECAB) was performed in 1999.¹ The concept was embraced by only a handful of surgeons because of its enormous technical challenge. A decade later, a state-of-the-art review headed by one of the early adaptors predicted that “given the ongoing development in hardware, software, and surgical techniques, robotically-assisted CABG is here to stay, and broader application is most likely.”² Indeed, because of the vision and strong commitment of a few pioneers, the TECAB procedure advanced from a robotic internal thoracic artery harvesting only to a single-vessel coronary artery bypass grafting [CABG] and to multivessel CABG.^{2–5} TECAB has been performed as a stand-alone procedure or as a component of a hybrid coronary revascularization in conjunction with percutaneous coronary intervention.^{4,5}

Despite the great progress, TECAB is infrequently used by coronary surgeons. Since its inception, TECAB has been routinely performed by just a few very dedicated teams worldwide. In a recent report from the Society of Thoracic Surgeons Adult Cardiac Surgery Database, the use of robots has increased from 0.59% to 0.97% of CABG procedures performed in the United States between 2006 and 2012.⁶ The reluctance of the cardiac surgeon community to adopt this approach stems from a number of issues. First is limited applicability. A stand-alone TECAB on an arrested or a beating heart is currently performed mostly for a 1- or 2-vessel coronary disease.^{3–5} These indications account for a small minority of patients referred for CABG.⁷ Second is a slow learning curve. The TECAB procedure is technically

complex. Successful implementation requires a dedicated team effort and adequate case volume.^{2–5} Third is lack of strong evidence that TECAB is associated with superior outcomes relative to conventional CABG. The current TECAB outcomes data are based on retrospective single-institutional reports on small, low-risk patient cohorts. In experienced centers, TECAB was associated with as predicted (but not superior) low mortality and major complications and improved short length of stay, early return to work, and quality of life.^{2–5} High rates of reoperation for bleeding and conversion to an “open” case, however, remain major concerns.^{2–5} Fourth is the significant amount of resources required to implement and maintain a robotic program, which might be unjustified in light of the limited applicability and convincing outcomes data.

So, should the TECAB idea be abandoned? Absolutely not! In this issue of the *Journal*, Hashimoto and colleagues⁸ describe the technical details of using an automatic connector to construct the distal left internal thoracic artery-to-left anterior descending coronary artery anastomosis.⁸ Although TECAB with this connector is still complex and perhaps not applicable to the entire spectrum of coronary artery atherosclerotic pathology, this technical progress may provide the opportunity to construct the distal anastomoses more precisely, reliably, and faster than with the robotically hand-sewn technique. The anastomotic

connector described by Hashimoto and colleagues⁸ has been previously evaluated for vein-to-coronary anastomosis, with excellent short-term patency rates.⁹ In a more recent report from Balkhy and colleagues,⁴ the use of the distal anastomotic connector expanded TECAB to patients with multivessel disease, with excellent clinical outcomes and midterm graft patency.

TECAB may not be ready yet for “prime time.” The pioneering group of Hashimoto and colleagues,⁸ however, have (once more) moved away a small but critical stone, in the effort to move the entire TECAB mountain of challenges.

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