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REVIEW TOPIC OF THE WEEK

The Radial Artery for Percutaneous Coronary Procedures or Surgery?

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ABSTRACT

This article summarizes the current research on the benefits of using the transradial approach for percutaneous procedures and the radial artery as a conduit for coronary artery bypass surgery. Based on the available evidence, the authors provide recommendations for the use of the radial artery in patients undergoing percutaneous or surgical coronary procedures. (J Am Coll Cardiol 2018;71:1167–75) © 2018 by the American College of Cardiology Foundation.

Recently, there has been renewed interest in the radial artery (RA) both for cardiovascular surgery and for percutaneous intervention. Among surgeons, the publication of long-term follow-up data and randomized comparative studies has established the role of the RA as a more durable graft than the saphenous vein (SV) for coronary artery bypass operations (CABG) (1). Among cardiologists, transradial access (TRA) has been shown to be a superior alternative to the classic femoral approach for diagnostic catheterization and percutaneous interventions (2–6), and TRA procedures have become increasingly popular. This convergence of interests, however, has elicited concerns that, after TRA, the RA may not be a suitable CABG conduit due to catheter-induced trauma predisposing to premature graft failure and mitigating long-term survival benefits (7).

To date there are no guidelines for the approach to the RA in patients with known or possible coronary artery disease (8). In this paper, we provide guidance for the use of the TRA approach for percutaneous intervention based on the best evidence and use of the RA as a conduit for CABG and suggest recommendations for optimal use of the RA in patients with coronary artery disease.

METHODS

WRITING PANEL. A writing panel was organized by convening 17 physicians from the fields of clinical cardiology (n = 2), cardiothoracic surgery (n = 7), and

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ABBREVIATIONS AND ACRONYMS

CABG = coronary artery bypass operations

CAD = coronary artery disease

PCI = percutaneous coronary intervention

RA = radial artery

RCT = randomized controlled trial

RITA = right internal thoracic artery

SV = saphenous vein

TFA = transfemoral approach

TRA = transradial access

interventional cardiology (n = 8), highly experienced in the use of the RA for CABG or TRA. The members of the panel agreed to review the best available research and to provide a document with recommendations. Treatment algorithms were drafted when general agreement among panelists was reached.

SEARCH METHOD. In August 2017, a comprehensive search to identify studies that evaluated the use of the RA for TRA and CABG was performed in the following databases from inception to present: Ovid MEDLINE, Ovid EMBASE, and the Cochrane Library (Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials [CENTRAL], and Cochrane Methodology Register). Search keywords included "radial artery" in combination with "coronary surgery," "myocardial revascularization," "coronary artery bypass," "coronary angiography," and "percutaneous coronary interventions." Relevant abstracts were reviewed, and the related articles function was used for all included papers. References for all selected studies were cross-checked. The writing groups selected the most relevant papers according to both methodological and clinical considerations. Observational series were considered only in the absence of data from randomized controlled trials (RCTs). Details of the search are given in Online Figure 1.

USE OF THE RADIAL ARTERY FOR TRANSRADIAL PROCEDURES. Due to the superficial position and easy compressibility of the RA, TRA has been developed as an alternative to the conventional transfemoral approach (TFA) to reduce the risk of procedure-related vascular complications.

A limitation of TRA is the higher crossover rate than that of the TFA, particularly during the learning curve (2,3). However, the crossover rate declines significantly with operator's experience (3). Crossovers are generally due to the smaller size, the wide range of anatomic variations, and the high susceptibility to spasm of the RA (Online Table 1) (4).

The assessment of the adequacy of the ulnar collateral circulation has been conventionally considered necessary before TRA. However, recent findings suggest that the patency of the palmar arches is highly dynamic and that the vascular reserve of the hand circulation can be recruited during and after TRA, even in patients with poor collateral circulation at baseline (5). The safety of using the TRA without previous evaluation of the ulnar collateral circulation has been recently shown in a large cohort of patients with acute coronary syndromes (6).

BENEFITS OF USING THE TRA FOR ANGIOGRAPHY AND PERCUTANEOUS INTERVENTIONS. Randomized and observational studies have shown that the use of the TRA significantly reduces vascular access site complications and bleeding compared to the TFA. A meta-analysis of >600,000 patients from both observational and randomized trials comparing TRA and TFA found that radial access was associated with a 78% reduction in major bleeding and an 80% reduction in post-procedure transfusions (9). Three prospective randomized trials comparing TRA with TFA in the setting of acute coronary syndromes consistently showed that TRA reduced major bleeding, major adverse cardiovascular events, and mortality (6,9,10). The reduction in major vascular complications with TRA has been similar for patients undergoing angiography and percutaneous coronary intervention (PCI) (10). Some data suggest that the benefits of the TRA in terms of mortality, but not of bleeding and vascular complications, are significantly influenced by operator experience (6).

The TRA is also associated with benefits in patient satisfaction, catheter laboratory throughput, and costs. It has been shown that patients prefer TRA over TFA (11). The enhanced recovery associated with TRA increases catheter laboratory efficiency and same-day discharge, leading to significant savings for the health system. A large contemporary observational study showed that adoption of TRA can save $3,689 per procedure. Combining TRA and same-day discharge has the potential to save $300 million per year in the United States (12).

TRA IN SPECIFIC PATIENTS' SUBSETS. The advantages of the TRA have been confirmed in the elderly (6). However, elderly patients have more complex vascular anatomy, and the TRA may be more challenging in this population. In case of elderly patients presenting with ST-segment elevation myocardial infarction, the use of TRA has been shown to be associated with a significantly reduced risk of stroke and lower rate of vascular complications and mortality (13).

Adoption of the TRA has been shown to be associated with clinical benefits in patients with chronic renal disease, particularly in terms of reduction of post-procedural acute kidney injury (14). However, the possible need for an upper extremity arteriovenous fistula for dialysis is a possible argument against the use of the TRA in this group of patients.

In patients with a previous CABG, the use of the TRA requires dedicated skills and techniques (15). In