We thank Drs. Chugh and Chugh for their interest in our work (1) and for their comments. We agree that access failure remains a limitation of transradial intervention (TRI). As demonstrated in SAFE-PCI for Women (Study of Access Site for Enhancement of PCI for Women) trial, radial artery spasm (RAS) is a major contributor to access site crossover from radial to femoral. Women generally have smaller radial arteries, and as the authors suggest, arterial-sheath size mismatch might cause RAS. Our protocol did not recommend sizes for sheaths/catheters, nor did we routinely collect this information, limiting our ability to explore this hypothesis in our female population. Data suggest that most U.S. operators use 5-F or 6-F sheaths for diagnostic catheterization and 6-F sheaths for coronary intervention (2). More slender equipment might reduce RAS in women. However, our access site crossover rate was consistent with that from the RIVAL (Radial versus Femoral Access for Coronary Intervention) trial, which studied a predominantly male population (3), suggesting that factors other than arterial diameter contribute to access site failure. We have demonstrated that a radial learning curve exists (4), and variables such as operator experience, catheter manipulation, multiple arterial punctures, catheter exchanges, and use of sedation/vasodilator therapy can all impact RAS and crossover rates.

The authors propose using pre-procedural ultrasound to aid in access site decisions. Although not routinely used in the United States and not included in the SAFE-PCI for Women trial protocol, pre-procedural ultrasound may provide valuable information using relatively inexpensive, portable, and noninvasive technology. Theoretically, ultrasound might also reduce access-related trauma. However, arterial size is dynamic and is affected by variables such as the degree of patient sympathetic tone and use of intra-arterial vasodilators. The timing of use of imaging and ultrasound-based triaging of patients to access site strategy should account for these factors. Furthermore, the risks/benefits of recommending a “femoral first” strategy to avoid risk of radial access failure should be weighed carefully against the added bleeding risk associated with femoral access. For example, in obese, short females with small radial arteries, one might still attempt TRI first.

Further understanding of the correlation between radial artery size, spasm, and access failure should be pursued before routine use of ultrasound to guide access decisions. The use of imaging for preemptive crossover risk stratification and to optimize contemporary TRI should also be systematically investigated in future studies.

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Safety and Feasibility of Transradial Catheterization in Breast Cancer Survivors
A 2-Center International Experience

The technical feasibility of transradial access (TRA) in breast cancer survivors is usually not a concern; even so, the perceived fear of lymphedema, both on the part of the survivor and medical staff, is the limiting factor. Cardiac catheterization and percutaneous coronary intervention using TRA is associated with lower rates of vascular and bleeding complications (1–3). However, relegating breast cancer survivors to only femoral access denies these benefits of TRA to a large group of predominantly female patients. Therefore, the aim of this report is to describe the safety and feasibility of TRA in patients with prior ipsilateral breast cancer undergoing cardiac catheterization.

We retrospectively analyzed all breast cancer patients who underwent coronary catheterizations over a 4-year (2009 to 2013) period from 2 academic,
tertiary-care institutions; one located in the United States and the other in Quebec City, Quebec, Canada. Both centers had >15 years of experience with transradial catheterization. At the U.S. center, 4 of 5 operators were experienced radialists, whereas the fifth operator’s default access was femoral with an overall institutional TRA utilization of 65%. At the Canadian center, 4 operators usually performed TRA in more than 90% of the patients. The primary endpoint was defined as either the development of lymphedema, soft tissue infection, and/or other vascular-related complications within 30 days. The secondary endpoint was any long-term complication, up to 4 years. The data were then collected by retrospective chart review of the pre-existing electronic medical records, regarding patient demographics, type of breast cancer surgery (lumpectomy, partial/total mastectomy), and whether they had axillary dissection and/or radiation therapy.

Qualitative variables were expressed as n (%) and the quantitative variables as mean ± SD. The comparison of numerical variables was performed using the Student t test. The chi-square test was used to compare qualitative variables. The differences were considered statistically significant when a p value was <0.05.

A total of 129 patients were found to have a diagnosis for both breast cancer and coronary catheterization and underwent 134 procedures. The population was then collated into an ipsilateral group (n = 42 procedures) that had transradial catheterizations ipsilateral to their breast cancer; and an alternate access group (n = 92 procedures) that had transradial catheterizations contralateral to the breast cancer side or by the transfemoral approach. Operator’s preference (right radial access comfortability, radial inexperience, presence of bypass grafts, left internal mammary graft), or patient’s beliefs on the basis of the advice from the breast surgeon were considered drivers for the choice of access site. The ipsilateral group tended to be younger than the alternate access group (66 ± 10 years and 69 ± 10 years, respectively, p = 0.07), and cancer therapy received by these patients was similar across the study population. Baseline and procedural characteristics as well as clinical outcomes of the study groups are shown in Online Table 1. None of the patients had pre-existing arm lymphedema in either group. Seven patients in the ipsilateral group had right heart catheterization performed via a forearm vein on the same side of the breast cancer. There were no reports of access failure or technical difficulties during the procedure, post-procedure lymphedema, and soft tissue infection within 30 days and up to 4 years of follow-up in either of the 2 groups. The alternate access group had numerically more access site vascular complications, (2 femoral hematomas, medically managed) versus the ipsilateral group (p = 0.54). Of note, when all TRA (ipsilateral or contralateral, n = 82) patients were compared with the transfemoral (n = 52) cases regarding vascular complications, the TRA group exhibited a strong trend towards lower complications rate (p = 0.073).

The major finding of this 2-center international study reveals that transradial cardiac catheterization can be safely performed on the ipsilateral side in breast cancer patients without increasing the risk of lymphedema or other vascular arm complications.

A common ritual to prevent lymphedema in breast cancer patients is the avoidance of intravenous catheters, needle sticks, or any potential trauma of the ipsilateral arm, also including blood pressure measurements (4). Lymphedema implies obstruction of the lymphatic conduits, and arterial circulation is typically not impaired. The effect on the venous system is poorly understood, and whether venous obstruction may be contributive is unclear. Interestingly, our data included 7 patients who underwent simultaneous right heart catheterization via the forearm ipsilateral to cancer resections, and none of these patients had any apparent adverse events. Despite the lack of evidence for avoidance of the ipsilateral arm, the radial access contralateral to the cancer side may be preferred to avoid potential conflicts with this sensitive patient issue. However, the contralateral radial may not always be an option (bilateral breast cancer, mammary graft with ipsilateral breast cancer, surgical removal/occlusion of the radial artery, and so on), and the operator may choose femoral access and its associated increased risk of vascular complications. In the present study, patients in whom an alternate access site for catheterization was chosen, less than one-half had a mastectomy. Hence, patient instructions and warnings should be tailored to the individual patient. Because the majority of breast cancer patients are women and at risk of higher bleeding complications from femoral catheterization, this known bleeding risk with strong evidence needs to be weighed against the ritual advice to prevent lymphedema before radial access is denied.

The present study has limitations inherent to retrospective data collections. No objective measurements of the lymphedema such as arm circumference or skin thickness were captured. However, it is reassuring that there were no reports of clinically significant lymphedema from a patient population that is in general sensitized to this potential complication. Although the results of this report are...
encouraging, they are preliminary and do not have the strength of evidence to completely redefine risk reduction behaviors for lymphedema. Prospective larger studies are needed to address this concern.

Ipsilateral transradial cardiac catheterization can be safely performed in breast cancer survivors without increasing the risk of lymphedema or other vascular arm complications.

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APPENDIX For a supplemental table, please see the online version of the letter.

Coronary In-Stent Restenosis in Patients Treated With Thoracic External Beam Radiation for Cancer

We read with interest the paper of Liang et al. (1) about the outcomes of percutaneous coronary interventions (PCI) with stents in patients undergoing external beam thoracic radiation therapy (EBRT) for cancer. The authors identified 115 patients treated with EBRT a median 3.6 years after stenting (group A) and 45 patients treated with EBRT a median 2.2 years before stenting (group B), demonstrating that long-term mean target lesion revascularization rates in group A (3.2 vs. 6.6%; hazard ratio: 0.6; 95% confidence interval: 0.2 to 1.6; p = 0.31) and group B (9.2 vs. 9.7%; hazard ratio: 1.2; 95% confidence interval: 0.4 to 3.4; p = 0.79) were similar to rates in corresponding control patients (group A: 1,390 control patients; group B: 439 control patients). The authors concluded that thoracic EBRT is not associated with increased stent failure rates when used before or after PCI, and a history of PCI should not preclude the use of curative thoracic EBRT in cancer patients or vice versa. However, restenosis is a complex process involving multiple players, especially in patients with cancer. As reported by the authors, the effect of EBRT on vascular stents remains unclear, as both animal and human studies have found variable effects of EBRT on preventing stenosis in coronary and noncoronary arteries after arterial injury and stenting. Moreover, in patients with cancer the administration of systemic chemotherapy may also affect the restenotic process. Of importance, some chemotherapy drugs (i.e., paclitaxel for breast cancer and non-small cell lung cancer, fludarabine for non-Hodgkin lymphoma) are well-known antiproliferative agents with established effects on vascular smooth muscle cells and also used for drug-eluting stent technology to reduce neointima proliferation (2,3). As a consequence, we think it would be of interest to consider in the analysis the effect of concomitant chemotherapy, in order to clarify the role of thoracic EBRT on PCI outcomes in patients with cancer.

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