The Left Radial Artery Approach in Transradial Coronary Procedures

Indications, supportive data, and technical considerations for the left radial approach.

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As use of the radial approach for coronary angiography and intervention has increased during the last several years, there has been an accumulation of data examining the use of, and potential differences between, left and right radial access. In general, early transradial operators adopted the technique using the right radial artery (RRA), probably due to operator comfort, cath lab design, and concerns about the potential for increased operator radiation exposure on the left. The First Transradial Practice Survey[1] confirmed this RRA preference. Survey respondents reported the right radial artery as the standard approach for 89.4% of transradial operators, whereas the left radial artery (LRA) was used by only 10.6%. In addition, while noting several anatomic situations that may favor the left radial approach, the 2011 SCAI executive summary on transradial access makes no formal recommendations on the use of the LRA versus RRA for coronary procedures.[2]

Despite historic preference for the RRA, recent studies suggest a significant role for the left radial approach to reduce the impact of subclavian tortuosity on procedural success rates and duration, particularly for newer operators. In addition, certain anatomic conditions, such as previous coronary artery bypass grafting (CABG) with the left internal mammary artery, clearly favor the left radial approach. This article highlights the anatomic differences between the left and right radial approaches and reviews the comparative data on the two access sites. We will also briefly review our institution's technical approach and room setup for LRA cases.

ANATOMICAL DIFFERENCES OF THE RRA AND LRA

Most upper extremity vascular anatomic variations such as hypoplastic radial arteries, radial ulnar loops, or high takeoff radial arteries are not side specific and likely occur with equal frequency in the left and right arms. However, subclavian artery tortuosity is significantly more common on the right side than the left and is an important cause of difficult, prolonged, or failed radial procedures (Figure 1). Kawashima et al[3] examined 437 patients undergoing diagnostic angiography through the left and right radial approaches. Severe subclavian tortuosity occurred in approximately 10% of the right approach patients versus none in left approach patients. Freixa et al[4] randomized 100 consecutive octogenarians undergoing radial procedures to the left versus right approach. Although procedural times were similar, there was a marked increase in subclavian tortuosity in the right approach patients (32%) versus left approach patients (6%).

In addition to the side-related frequency of subclavian tortuosity, patient-specific predictors of subclavian artery tortuosity also exist. These predictors make it possible for operators to assess the likelihood of significant right subclavian tortuosity prior to procedures in individual

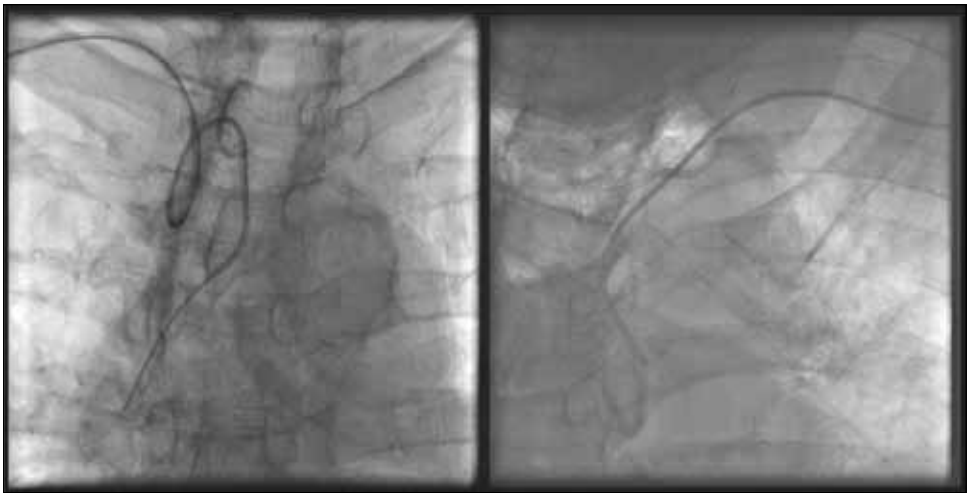

Figure 1. Catheter passage through the left and right subclavian arteries in the same patient. Initial attempts in this 81-year-old man were made via the right radial approach and were abandoned due to an inability to torque the catheter. Approach through the left radial access was straightforward.

patients. Cha et al[5] examined the predictors of severe right subclavian tortuosity in 2,431 consecutive patients undergoing right transradial procedures. The 10% of patients in their data set who had severe tortuosity were older, more frequently women, shorter, and had higher rates of smoking and hypertension.

Dehghani et al[6] examined predictors of transradial failure in 2,100 patients undergoing interventions, > 99% of whom had their procedures performed via the right radial approach (Asim Cheema, personal communication, May 2013). In their series, the independent predictors of radial procedure failure were seen in those who were older than 75 years, had previously undergone CABG, and were shorter in height. An inability to access the central aorta or gain adequate guide support were the most common reasons for failure, and it is likely that right subclavian tortuosity played an important role in many of these unsuccessful procedures. Taken in total, these data sets reveal that subclavian tortuosity is associated with procedural failure, is far more common on the right side than the left, and can typically be predicted based on access side and patient-related features.

RANDOMIZED TRIALS COMPARING THE RIGHT AND LEFT RADIAL APPROACHES

The largest data set comparing the right radial and left radial approaches is the TALENT study.[7] In TALENT, the investigators randomized 1,467 patients undergoing cardiac catheterizations to the left and right radial approach. Of the diagnostic cases studied, 668 patients continued on for a coronary intervention and were also analyzed. Important exclusion criteria included previous CABG, ST-elevation myocardial infarction, and concomitant right heart catheterization. In the diagnostic group, the left radial approach was associated with lower fluoroscopy times and lower dose area product. In the PCI group, there were no significant differences in the primary endpoints of fluoroscopy time or dose area product.

A prespecified subgroup analysis found that the differences in left and right fluoroscopy times were confined to older patients and new operators. The investigators also reported a twofold increase in subclavian artery tortuosity in the RRA group compared to the LRA group (16% vs 8%; $P = .001$). In a separate analysis, the investigators then examined the learning curves for the right and left approaches for trainees who participated in study procedures.[8] They reported that trainees learning the left approach had rapid and significant reductions in fluoroscopy times, with no difference between the trainees and senior operators by the end of the study period (272 left radial procedures). In contrast, trainees learning the right radial approach did not achieve a statistical reduction in the primary outcome of fluoroscopy times and remained significantly slower than the senior operators by the end of the study period (260 right radial procedures). These data suggest that the left radial approach is particularly important for newer or lower-volume radial operators and may allow shorter procedures with higher success rates. This is likely especially true in high-risk subgroups for subclavian tortuosity, such as the elderly and patients of small stature.

THE LEFT RADIAL APPROACH AND OPERATOR RADIATION EXPOSURE

In the past, a concern for operators performing radial procedures was the potential for increased radiation exposure. However, recent data propose that early studies suggesting an increase in radiation exposure with the radial approach overstated the risk. In fact, operator exposure during transradial procedures is likely not sig-

Figure 2. Basic room setup for the left radial approach. The left arm is abducted, and the radial artery puncture is performed from the patient's left side (A). Once the central circulation is accessed, the arm is brought parallel to the patient's body, resting on a pillow (B). The procedure is completed with the operator standing on the patient's right side.

Figure 3. A view of the patient setup from the right side. The arm has been brought parallel to the patient's body, resting on a pillow for comfort and easier operator access. The operator stands on the patient's right side and reaches across to the catheters. Note the enhanced operator shielding in place.

nificantly different from femoral exposure.[9] Despite this reassuring data, many physicians still feel at increased risk of radiation exposure with the left radial approach, principally due to reaching across the body where operator shielding may be inadequate.

However, this fear has not been born out in recent data sets. In fact, the OPERA trial showed that operator exposure, as measured by personal dosimeters, was actually lower with the left radial access during diagnostic cases.[10] Iqtidar et al[11] also showed no significant increase in operator exposure (also measured by personal dosimeters) for both fellows and attending physicians when performing left radial procedures compared to right radial cases. In the same study, the investigators found that enhanced operator shielding could additionally reduce radiation exposure in both left and right radial cases. Therefore, physicians contemplating the use of the left radial approach can be reassured that operator radiation exposure is not only not elevated, but can actually be reduced by enhanced operator shielding protocols.

TECHNICAL APPROACH TO LEFT RADIAL PROCEDURES

Contrary to many operators' perceptions, left radial access procedures do not require any change in the basic cath lab room setup. It is our practice to bring the left arm out on an arm board and access the radial artery with the left arm extended (Figure 2). Once the initial wire has reached the left subclavian artery, the arm is brought parallel to the body and rested on a pillow to aid patient comfort and decrease the distance the operator must reach across the patient's body. In obese patients, this arm positioning can pose some challenges, but with experience, most cases can be performed with very little discomfort to the operators and patients. It is our practice to include enhanced operator shielding for all left and right radial cases (Figure 3). A number of investigators are working on left arm stabilization systems for left radial procedures, but as of now, none are in widespread use.

All other aspects of the procedure are identical to the right radial approach, with the exception of catheter and guide choices. In general, the course of catheters coming through the left subclavian and into the ascending aorta is quite similar to catheters passing over the arch from the femoral approach. Therefore, specialized radial

catheters are not commonly needed, and most cases are performed with femoral equipment. It has also been our practice to perform most transradial procedures in patients who have undergone previous CABG with internal mammary arteries through the left approach. Cannulation of the left internal mammary artery and aortocoronary grafts with standard catheters and guides from the left wrist is generally straightforward, and specialized techniques or equipment are rarely necessary.[12]

SUMMARY

The left radial approach expands the operator's options when performing coronary angiography and interventions. It is often an easier approach in high-risk anatomic subsets, such as short and elderly patients, principally by avoiding right subclavian artery tortuosity. It may also actually provide shorter procedure times with less fluoroscopy exposure for new or low-volume operators. As with all radial procedures, there is no evidence of increased operator exposure with the left approach, and in fact, radial-specific shielding techniques can reduce x-ray exposure even further. The use of the LRA when performing transradial procedures should likely be an integral part of an interventional cardiologist's therapeutic arsenal. ■

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