

CASE REPORT

ADVANCED

CLINICAL CASE SERIES

Transradial-Transfistula Access for Cardiac Catheterization in Patients With Abandoned Hemodialysis Fistulas



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ABSTRACT

Guidelines consider radial access a relative contraindication in patients with end-stage renal disease as part of a vessel preservation strategy. Radial access distal to a hemodialysis fistula, what we term transradial-transfistula access, offers a solution to radially access this population without affecting their vessel preservation plan. (**Level of Difficulty: Advanced.**) (J Am Coll Cardiol Case Rep 2022;4:101658) © 2022 Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

The radial artery is the preferred access option for cardiac catheterization and coronary intervention due to an improved safety profile relative to transfemoral access.¹ Patients with end-stage renal disease (ESRD) are an exception to the “radial first” mantra as vessel preservation strategies take precedence to safeguard future radiocephalic fistula sites. Accordingly, the Society for Cardiovascular Angiography and Interventions lists planned or present hemodialysis (HD) as a relative contraindication for radial artery access.² Similarly, the National Kidney Foundation recommends radial

access be avoided and femoral access strongly considered in patients with ESRD.³ As femoral access site complications are more frequent in patients with renal dysfunction, providing radial options to the ESRD population remains an unmet clinical need.⁴ For select patients already receiving HD, we offer a simple solution. Based on the “distal first to proximal next” principle, an HD access site proximal to the radial artery precludes placement of a future ipsilateral radiocephalic fistula. The ipsilateral radial artery, now exempt from vessel preservation, can be accessed through an approach we call transradial-transfistula (TRTF) access. We herein present our initial experience with successful and unsuccessful attempts using this strategy. To eliminate the possibility of damaging functional HD access sites, we restricted TRTF access to limbs with abandoned fistulas. Currently, data on TRTF access is limited to a single case report, as larger studies on radial access in the dialysis population excluded or failed to specify if TRTF access was performed.⁵⁻⁸

LEARNING OBJECTIVES

- To recall that in patients with ESRD, guidelines recommend against radial access as vessel preservation plans take precedence.
- To recognize that patients with abandoned HD fistulas have radial access options that do not impact their vessel preservation plans.

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The authors attest they are in compliance with human studies committees and animal welfare regulations of the authors' institutions and Food and Drug Administration guidelines, including patient consent where appropriate. For more information, visit the [Author Center](#).

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**ABBREVIATIONS
AND ACRONYMS****HD** = hemodialysis**ESRD** = end-stage renal disease**PCI** = percutaneous coronary intervention**PATIENT 1**

A 76-year-old male with ESRD presented with non-ST-segment elevation myocardial infarction in the setting of severe hypertension and volume overload. He was on HD via a transposed right brachio basilic fistula. His left brachiocephalic fistula was abandoned after an infected interposition graft, initially placed to treat cannulation site aneurysms, required excision. Diagnostic coronary angiography via right femoral access revealed a 90% left circumflex stenosis. After further medical optimization, a staged percutaneous coronary intervention (PCI) was performed. The left radial artery was accessed using a 4-cm 21G radial needle. A 0.014-inch Runthrough wire (Terumo Medical Corporation, Somerset, New Jersey) was advanced under fluoroscopic guidance into the subclavian artery without difficulty (Video 1) and a 6F hydrophilic sheath was placed. A 4F Angled Glidecath (Terumo Medical Corporation) facilitated a wire exchange for a 0.035-inch wire which supported insertion of a 6F XB 3.5 guide (Video 2). Left circumflex PCI was completed without complication with an excellent angiographic result after drug-eluting stent placement (Figure 1). The sheath was removed with patent hemostasis and no vascular complications.

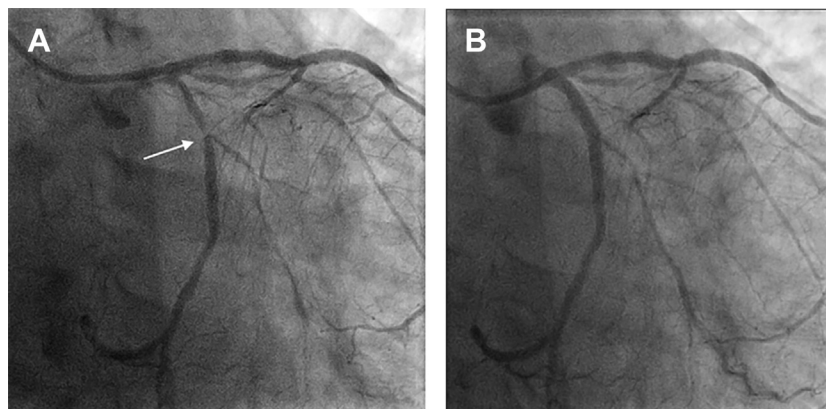
PATIENT 2

A 56-year-old male with ESRD presented for coronary angiography for evaluation of renal transplant candidacy. He was on HD via a right brachiocephalic fistula after his left brachiocephalic fistula was

abandoned following multiple angioplasties for venous limb stenosis. The left radial artery was accessed with a 4-cm 21G radial needle, a 0.014-inch guidewire was advanced without resistance into the aortic root, and a 5F hydrophilic sheath was placed. A 5-F JR4 diagnostic catheter was advanced over the coronary guidewire for right coronary angiography. A JL3.5 diagnostic catheter was exchanged over a 0.035-inch exchange wire for left coronary angiography. The patient had no significant disease. The sheath was removed with patent hemostasis and no vascular complications.

PATIENT 3

A 71-year-old male with ESRD presented for coronary angiography during evaluation for severe aortic stenosis. He was on HD via a tunneled right internal jugular catheter with an abandoned radiocephalic fistula in the proximal left forearm. The left radial artery was accessed using a 4-cm 21G radial needle. A 0.014-inch wire advanced smoothly into what fluoroscopically appeared to be the aortic root. A 5F hydrophilic sheath was inserted into the radial artery over the wire and a 5-F JL4 diagnostic catheter was advanced into the thorax. Subsequent hemodynamic monitoring revealed a right atrial pressure tracing, suggesting that the wire inadvertently entered the venous limb of the fistula during initial advancement. The JL4 catheter was exchanged for a 4F catheter to perform a fistulagram which revealed brisk fistula flow (Video 3). Further attempts to navigate into the arterial limb with the wire were unsuccessful. Access was converted to the right radial artery and coronary

FIGURE 1 Coronary Angiography**(A)** Initial angiogram showing a 90% left circumflex stenosis (**arrow**). **(B)** Successful PCI via left TRTF access.

angiography revealed no obstructive disease. The left radial sheath was removed with patent hemostasis and no vascular issues.

DISCUSSION

Our case series shows that in patients with abandoned HD fistulas, TRTF access is technically feasible, relatively safe, and does not impact the vessel preservation plan. As the abandonment rate for upper extremity arteriovenous fistulas ranges from 25% to 36%, a significant percentage of HD patients are candidates for this approach.⁹ Here we discuss our framework for patient selection, focusing on the challenges of TRTF access.

The initial step is to categorize the fistula into 1 of 3 groups: abandoned without flow, abandoned with flow, or active/maturing. This can be determined at the bedside. For abandoned fistulas, the flow state of the venous limb is determined by the presence of a bruit or palpable thrill. The flow state helps anticipate challenges staying arterial as the guidewire navigates past the arteriovenous anastomosis. In patients 1 and 2, the absence of fistula flow made wire advancement uneventful whereas the actively flowing venous limb in patient 3 prohibited successful wire advancement.

In addition to defining the flow state, the operator should have a heightened suspicion for additional “anatomic complexity” such as additional fistulas or bypass grafts, arterial or venous stenosis, or venous thrombus, all of which could complicate navigating wires and catheters up the arm. In flowing fistulas with thrombus, there is a risk of pulmonary embolism, as equipment may dislodge clot after inadvertently entering the venous limb.¹⁰

In summary, the order of risk and difficulty for TRTF access (from low to high) is abandoned fistulas without flow, abandoned fistulas with flow, and active/maturing fistulas. The key question for future studies is to define where femoral access fits in along this spectrum, especially for those with anatomic complexity. The question as to whether a “TRTF first” approach can be taken even in the setting of an active fistula will require the accumulation of significant safety data (which is currently not available). Finally, one must involve nephrology and vascular surgery if there are questions surrounding a patient’s ESRD “life plan” as it pertains to vessel preservation and candidacy for TRTF access. Although our preliminary experience is in its infancy, we remain optimistic that further studies will confirm the practice changing potential of this access site option.

CONCLUSIONS

In patients with abandoned HD fistulas, TRTF access is technically feasible, relatively safe, and does not impact the vessel preservation plan. Further studies are needed to refine patient selection and procedural technique, and to understand the risks compared to transfemoral access, especially in patients with anatomic complexity.

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KEY WORDS awareness, coronary angiography, percutaneous coronary intervention

APPENDIX For supplemental videos, please see the online version of this paper.