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Images in Cardiology

Retrograde Pull-through Approach with Double Guiding Catheters When Antegrade Left Ventricular Lead Implantation Is Infeasible

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A 62-year-old woman with dilated cardiomyopathy, left ventricular (LV) ejection fraction of 26%, and left bundle branch block (QRS interval, 160 ms) underwent cardiac resynchronization therapy (CRT) defibrillator placement (Gallant, Abbott, Chicago, IL). After right ventricular lead placement, a coronary sinus (CS) guiding catheter (GC; CPS Direct, Abbott) was engaged. The preoperative echocardiogram showed poorer motion in the posterior region compared to that in the anterior side. The posterior branch was therefore chosen for LV lead placement according to CS angiography (Fig. 1A). We could not engage a subselector catheter into the target branch (TB). Moreover, attempts to cross the TB with a 0.014-inch guidewire (Sion black, Asahi Intecc, Aichi, Japan) were unsuccessful. We therefore decided to use a microcatheter (FineCross, Terumo, Tokyo, Japan). During the microcatheter advancement into the anterior interventricular vein and contrast injection, a TB collateral channel was identified (Fig. 1B; Fig. 2A). A 0.014-inch guidewire (Suoh03, Asahi Intecc) was advanced through the collateral channel to the TB, CS ostium, and right atrium (Fig. 1C; Fig. 2B; Video 1, view video online). We did not cannulate these other channel veins because we found the collateral channel to the TB in the first attempt. Another GC was added through an additional subclavian vein puncture site. The 0.014-inch guidewire was snared (Osypka snare catheter, Osypka Medical GmbH, Berlin, Germany) in the second GC (Fig. 1D; Fig. 2C), facilitating externalization (pull-through). We used a 6-F snare catheter and a 2.6-F microcatheter, which could not both fit simultaneously into our 8-F GC, departing from Worley's et al.'s method.[1] By applying traction to the guidewire, the second GC was engaged into the CS. The LV lead (Quartet, Abbott) in the second GC was successfully advanced to the TB (Fig. 1E; Fig. 2D). To prevent the "cutting-cheese" effect, the microcatheter remained in place from the antegrade approach to the distal TB during LV lead implantation. The postoperative electrocardiogram shows that the QRS has narrowed sufficiently (from 160 ms to 118 ms; Fig. 1F), and thus, the LV lead was not implanted in the anterolateral vein, to shorten the procedure time. After 6 months, the LVEF had increased to 48%.

Compared to Worley's method with a single GC, our approach allows for a wider range of configurations: a slender GC (8-F vs 9-F) and a snare catheter with larger diameters (6-F vs 4-F). Moreover, Worley's method grasps the guidewire with a snare inside the CS, for which a smaller snare catheter is sufficient. However, when the target vein opens near the CS ostium, as in our case, the margin is small, and the wire is at risk of returning to the collateral channel due to heartbeats. Therefore, a better approach is to grasp the guidewire with a snare in the right atrium using another GC, where the larger

Novel Teaching Points

- Double Guiding Catheters: Effective use of two guiding catheters for retrograde pull-through in cases with difficult coronary sinus access.
- Collateral Channel Use: Innovative use of a collateral channel for guidewire placement when direct access to the target branch is not feasible.
- Preventing 'Cutting-Cheese' Effect: Maintaining the microcatheter in place during LV lead implantation to enhance safety and prevent complications.

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See page 576 for disclosure information.

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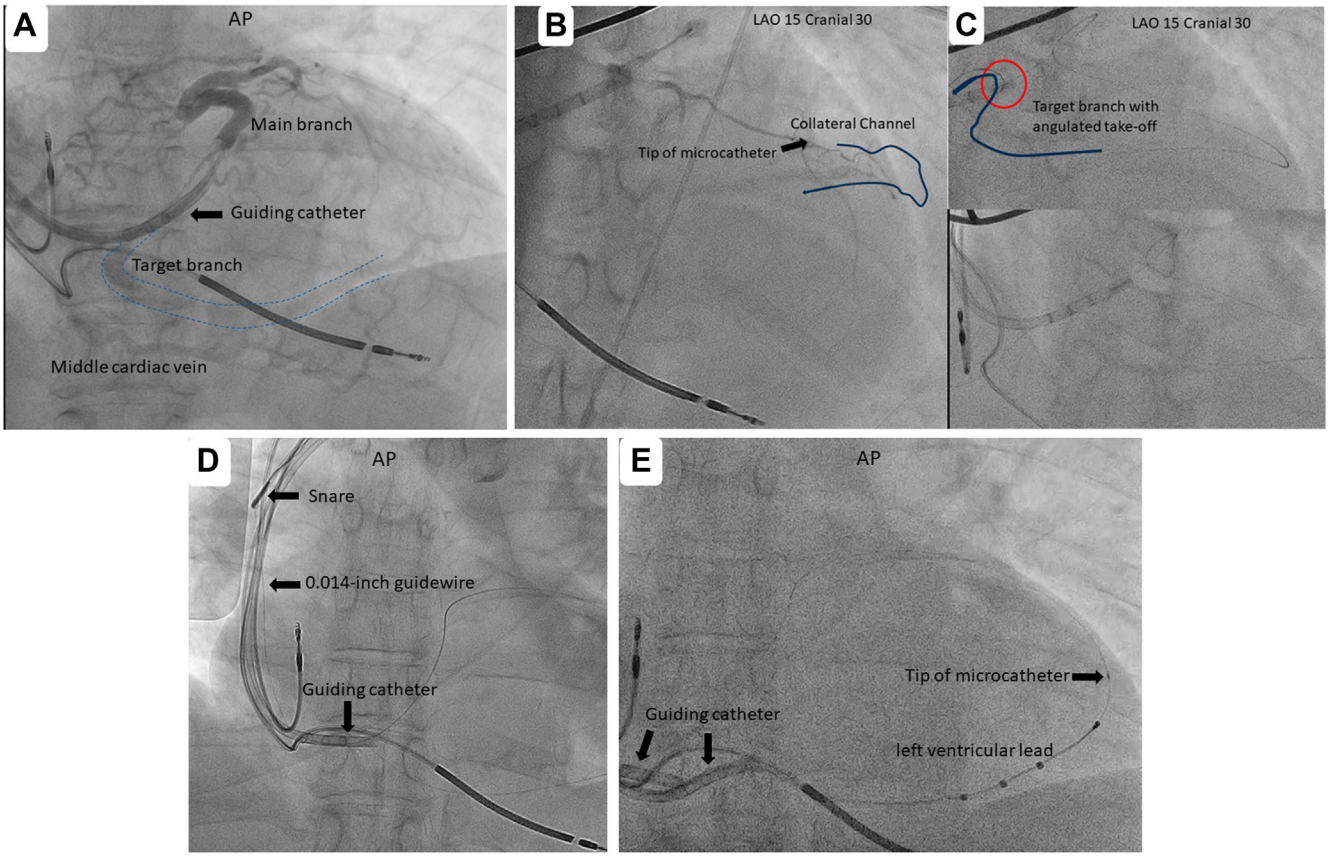

Figure 1. Fluoroscopic images of retrograde pull-through. (**A**) Coronary sinus angiography. (**B**) Collateral channel on microcatheter angiography. We prioritized distinguishing the collateral channel to the target branch to carefully check the guidewire's passage (left anterior oblique [LAO] 15 degrees; cranial 30 degrees). (**C**) Successful retrograde wiring from the collateral channel. (**D**) The 0.014-inch guidewire was snared and externalized. (**E**) Successful left ventricular lead implantation. (**F**) Comparison of pre- and postoperative 12-lead electrocardiograms. AP, antero-posterior.

Figure 1. (*continued*).

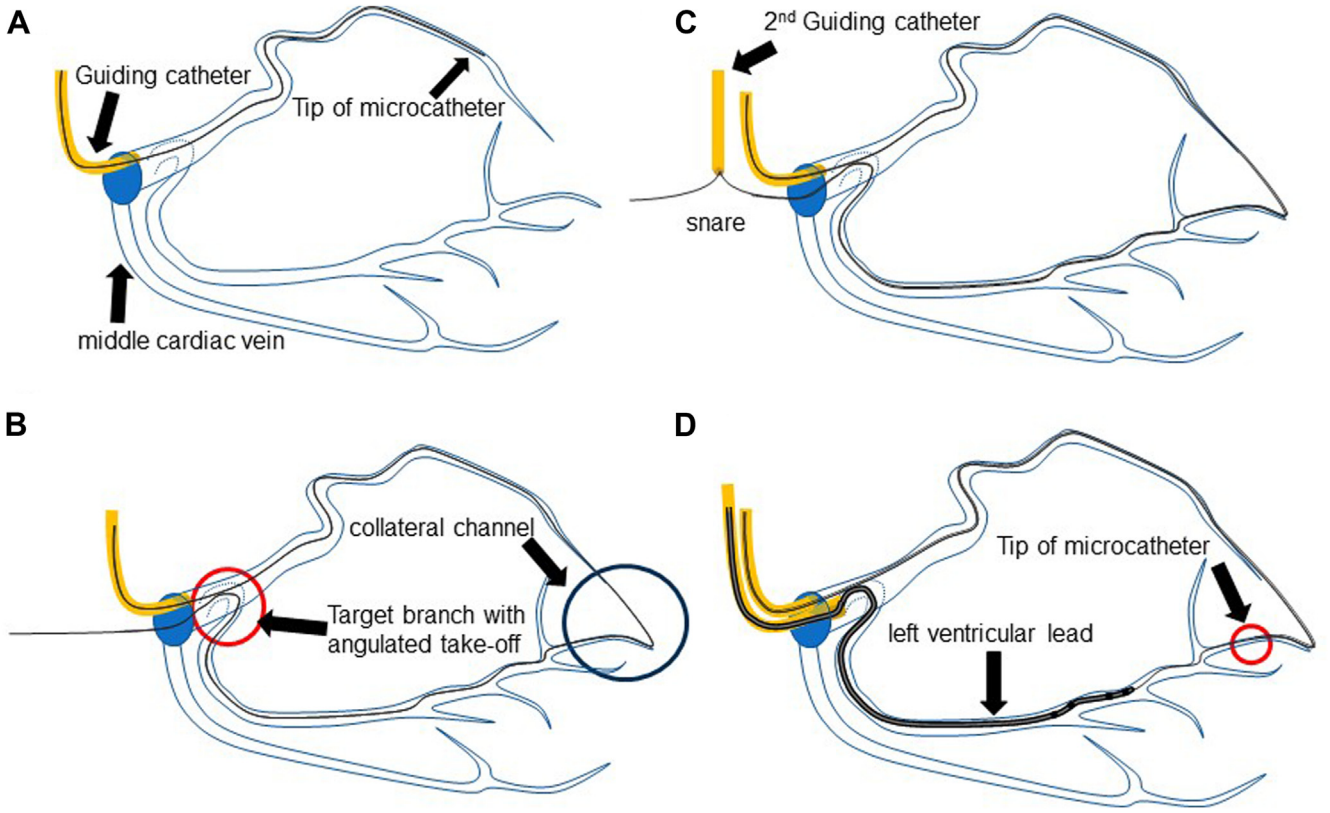

Figure 2. Schematic of retrograde pull-through. (**A**) The microcatheter was delivered to the anterior interventricular vein. (**B,C**) Successful wiring to approach the target branch from the collateral channel was followed by right atrial guidewire snaring. (**D**) The second guiding catheter was engaged into the coronary sinus, and the left ventricular lead was successfully advanced to the target branch.

space makes it easier to use a larger snare. This case highlights the efficacy of retrograde pull-through using double guiding catheters when the antegrade approach to the CS is infeasible owing to an angulated take-off.

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Ethics Statement

The research reported has adhered to the relevant ethical guidelines.

Patient Consent

The authors confirm that a patient consent form has been obtained for this article.

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Disclosures

The authors have no conflicts of interest to disclose.

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Supplementary Material

To access the supplementary material accompanying this article, visit *CJC Open* at https://www.cjcopen.ca/ and at https://doi.org/10.1016/j.cjco.2023.11.016.