

Case Report

Distal Radial Access for Thoracic Branch Endoprosthesis Deployment: Two Cases of Successful TEVAR with Left Subclavian Artery Revascularization

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Abstract

Background and Clinical Significance: Thoracic endovascular aortic repair (TEVAR) involving zone 2 of the aortic arch frequently necessitates left subclavian artery (LSA) revascularization to reduce the risk of neurologic and ischemic complications. If endovascular methods are employed, conventional upper extremity access via the brachial or axillary artery often requires surgical cutdown and carries meaningful access-site morbidity. Distal radial (snuffbox) access offers a less invasive percutaneous alternative, yet its use for thoracic branch endoprosthesis (TBE) deployment has only rarely been reported; **Case Presentation:** We present two patients who underwent successful zone 2 TEVAR with TBE implantation and LSA revascularization using a femoral-to-distal radial through-and-through wire technique. In both cases, the branch component was deployed via the distal radial artery with excellent angiographic results and preserved antegrade flow to the LSA. Neither patient experienced access-related complications; **Conclusions:** These cases demonstrate the technical feasibility and safety of distal radial access for TBE deployment in zone 2 TEVAR. This approach offers a less invasive alternative to conventional upper extremity access, potentially reducing vascular complications and facilitating earlier recovery.

Keywords: thoracic endovascular aortic repair; thoracic branch endoprosthesis; distal radial access; left subclavian artery revascularization; snuffbox approach

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1. Introduction and Clinical Significance

Thoracic endovascular aortic repair (TEVAR) has become the preferred treatment for descending thoracic aortic aneurysms and dissections, with lower perioperative morbidity and mortality than open surgery [1]. However, when a proximal landing zone in zone 2 is required, coverage of the left subclavian artery (LSA) becomes necessary, which is associated with increased risks of spinal cord ischemia, stroke, and upper extremity malperfusion if revascularization is not performed [2]. Current guidelines therefore recommend routine LSA revascularization in elective TEVAR when coverage is anticipated [3].

The Gore Thoracic Branch Endoprosthesis (TBE) addresses this challenge by maintaining antegrade LSA perfusion through a dedicated side branch during zone 2 repair. Early clinical data have demonstrated high technical success rates and favorable safety profiles in both elective and traumatic settings [4,5]. Upper extremity access for TBE deployment has traditionally been obtained through the brachial or axillary artery, approaches that may require surgical exposure and carry higher risk of complications [6]. Alternatives for LSA preservation include carotid–subclavian bypass or transposition, parallel graft (chimney) techniques, and physician-modified fenestrated endografts, each with specific limitations such as additional surgical morbidity, gutter endoleaks, or off-label device modification.

Distal radial access (the snuffbox approach) has gained traction as a percutaneous alternative for complex endovascular procedures, offering improved patient comfort, fewer access-site complications, and earlier ambulation [7]. Its use for TBE implantation, however, has been underreported [8]. Its limited adoption in aortic interventions may be attributable to the small caliber of the radial artery, which restricts sheath size and raises concerns regarding vasospasm and radial artery occlusion.

Here we describe two patients who underwent TEVAR with TBE implantation and LSA revascularization using a femoral-to-distal radial through-and-through wire technique, highlighting the feasibility and safety of this approach for side branch deployment in complex aortic repair.

Clinical Significance: This report adds to the limited evidence supporting distal radial access for TBE deployment during zone 2 TEVAR. A percutaneous upper-extremity approach may lower access-site morbidity and enable earlier recovery compared with conventional brachial or axillary access.

2. Case Presentation

2.1. Case 1

A 67-year-old man with a history of type A aortic dissection involving the ascending aorta and circumferential arch had previously undergone replacement of the ascending aorta and zone 2 arch. His postoperative course was uncomplicated. Follow-up computed tomography (CT) one month after surgery revealed significant interval expansion in zones 3 and 4 (Figure 1A), necessitating urgent intervention. At presentation, the patient was asymptomatic. Pre-procedural ultrasound showed a patent left distal radial artery.

TEVAR using the Gore Thoracic Branch Endoprosthesis was planned and successfully performed (Figure 2). The branch component was deployed via distal transradial access with excellent angiographic results and preserved LSA perfusion (Figure 3). Completion angiography confirmed successful exclusion of the dissection, side branch patency, and no endoleak. The patient recovered uneventfully and was discharged on post-operative day 2; clinical examination at discharge was unremarkable. Post-procedural CT showed preserved left subclavian artery perfusion, complete false lumen thrombosis, and favorable aortic remodeling (Figure 1B).



Figure 1. (A) Preprocedural sagittal contrast-enhanced computed tomography (CT) of the thoracic aorta in a patient with prior type A aortic dissection and ascending/zone 2 aortic arch replacement. This study revealed rapid enlargement of zones 3 and 4 compared with imaging obtained two months earlier, necessitating urgent treatment. (B) Post-procedural contrast-enhanced sagittal CT demonstrating successful deployment of the thoracic branched endoprosthesis with preserved perfusion of the left subclavian artery, complete thrombosis of the false lumen, and favorable aortic remodeling.



Figure 2. Fluoroscopic images demonstrating contrast-enhanced aortography performed via a pig-tail catheter (A) and a radial sheath (B) prior to deployment of the TEVAR graft, used to delineate the TEVAR and thoracic branched endoprosthesis (TBE) landing zones.

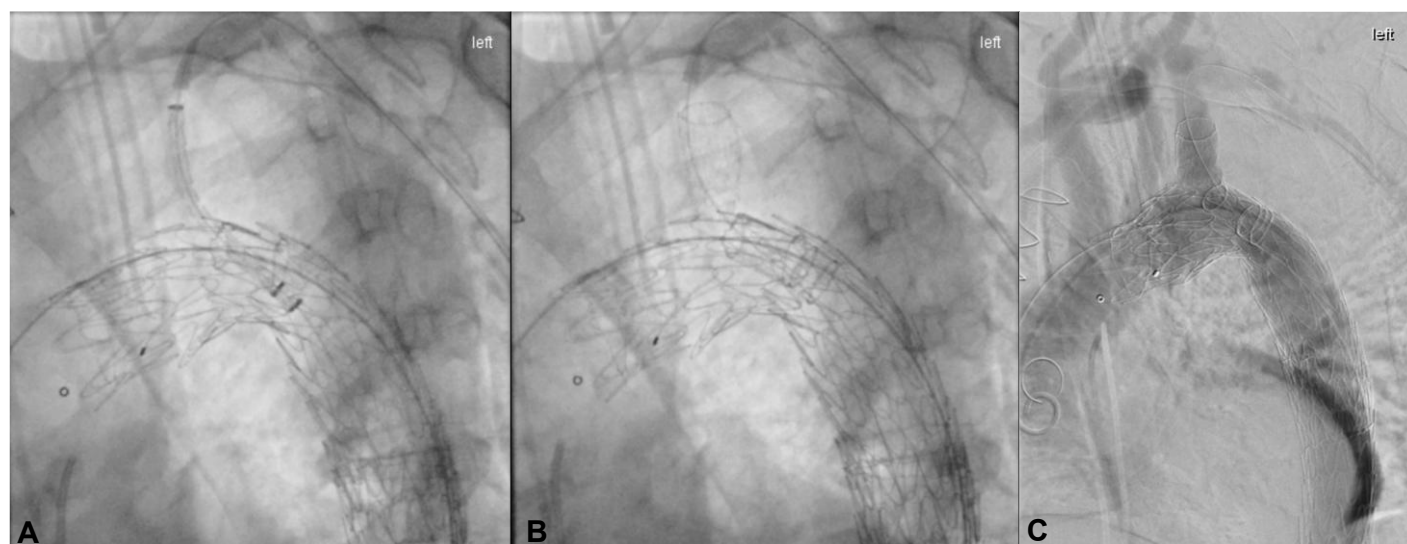


Figure 3. Fluoroscopic and angiographic images depicting staged deployment of a thoracic branched endoprosthesis. (A) Initial fluoroscopic image showing positioning of the TBE within the thoracic aorta and subclavian artery, with radiopaque markers confirming alignment. (B) Fluoroscopic image after stent deployment with full expansion. (C) Post-deployment contrast-enhanced angiogram demonstrating successful revascularization of the left subclavian artery.

2.2. Case 2

A 74-year-old man with a history of smoking, hypertension, and chronic type B aortic dissection presented with progressive aneurysmal degeneration of the descending thoracic aorta. The most recent surveillance CT (Figure 4A) showed zone 3 expansion to greater than 55 mm. At presentation, the patient was asymptomatic. Pre-procedural ultrasound showed a patent left distal radial artery. TEVAR with TBE was planned and successfully performed (Figure 4B und 4C). The patient recovered without complications. Clinical examination at discharge was unremarkable and the patient was discharged on postoperative day 3.

Three-month follow-up CT (Figure 4D) demonstrated patency of the left subclavian artery stent with minimal false lumen opacification along the proximal stent graft without accumulation on delayed-phase imaging. The aortic dimensions remained stable.

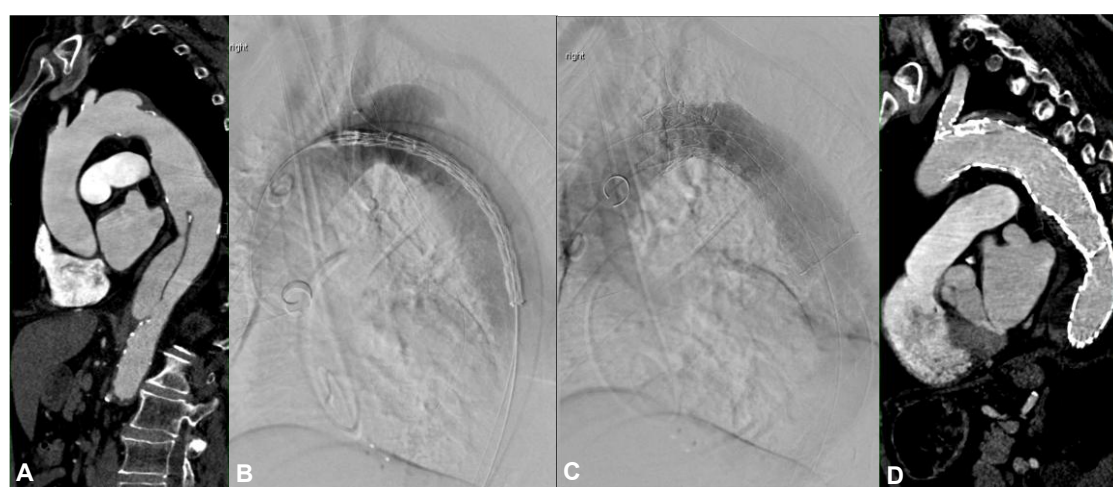


Figure 4. (A) Preprocedural sagittal contrast-enhanced CT of the thoracic aorta in a patient with type B aortic dissection showing focal ectasia of zone 3 with a linear short dissection. In zone 4, a further dissection extends in continuity to immediately above the celiac axis with perfusion of the false and true lumen. (B) Intraoperative fluoroscopic image showing the thoracic branched endoprosthesis (TBE) deployed within the thoracic aorta. (C) Intraoperative fluoroscopic image showing the TBE deployed within the thoracic aorta. (D) Postoperative sagittal contrast-enhanced CT of the thoracic aorta showing the TBE deployed within the thoracic aorta.

true lumen. (B) Early arterial fluoroscopic image before deployment of the TEVAR. Note the wire and radial sheath within the left subclavian artery. (C) Early arterial fluoroscopic image after deployment of the TEVAR and TBE showing preserved perfusion of the left subclavian artery. (D) Sagittal contrast-enhanced CT obtained three months after TEVAR with a thoracic branch endoprosthesis, demonstrating patency of the left subclavian artery stent with minimal false lumen opacification and stable aortic dimensions.

2.3. Procedural Technique

Pre-procedural planning comprised CT angiography for device sizing and landing-zone assessment and ultrasound evaluation of the left distal radial artery. Both procedures were performed in a hybrid operating room under general anesthesia using a standardized approach. Bilateral femoral access was obtained surgically, and left distal radial artery access was achieved under ultrasound guidance. A 90 cm 6Fr R2P Destination Slender Guiding Sheath (Terumo, Somerset, NJ, USA) was inserted and the tip left in the distal subclavian artery. A 150 cm Glidewire and 5 Fr 100 cm DAV catheter were advanced from the sheath into the descending aorta and snared from the right groin to establish a femoral-to-radial through-and-through system, later exchanged for a 450 cm Jagwire (Boston Scientific, Marlborough, MA, USA). Intravascular ultrasound confirmed true lumen placement.

A Lunderquist wire (Cook Medical, Bloomington, IN, USA) was positioned in the ascending aorta from the right groin, and a pigtail catheter from the left groin provided angiographic guidance. The GORE TAG Thoracic Branch Endoprosthesis (Gore Medical, USA) was deployed as per the IFU. Over the through-and-through wire, a self-expanding covered stent was deployed into the LSA, preserving vertebral artery flow. Final angioplasty was performed of the branch graft as per IFU.

Both interventions were technically successful, with no immediate complications and preserved LSA perfusion. No difficulties related to radial artery caliber, such as vasospasm or failure to advance the sheath, were encountered. Hemostasis at the distal radial puncture site was achieved with a compression band. Post-procedurally, patients were monitored as per institutional protocol.

3. Discussion

TEVAR has become the standard of care for zone 2 aortic pathology, offering lower morbidity than open repair. Because LSA coverage carries increased risks of stroke, spinal cord ischemia, and upper extremity ischemia, revascularization is essential in most elective cases [1,2].

The TBE offers a standardized, off-the-shelf solution for endovascular LSA preservation, with high reported technical success and low complication rates [9]. In both cases presented here, TBE deployment achieved effective dissection exclusion while maintaining LSA perfusion.

A notable aspect of our technique is the use of distal radial (snuffbox) access to deliver the branch component. Brachial or axillary access remains the conventional approach but may require surgical exposure and has been associated with access-site complications in some series [6]. Distal radial access has been increasingly adopted in coronary and peripheral interventions for its lower bleeding risk, faster recovery, and better patient tolerance [7]. Of note, femoral access in our patients was obtained surgically; the advantage of distal radial access therefore lies in avoiding an additional upper-extremity cutdown rather than in rendering the entire procedure percutaneous.

Early reports have demonstrated the feasibility of radial access for TEVAR, though data regarding distal radial (snuffbox) access remain limited. Pla MM et al. described two

patients who underwent TBE deployment via proximal transradial access with favorable outcomes and early discharge [8].

Finally, Schneck et al. [10] demonstrated that percutaneous left radial access provides a reliable and safe method for achieving through-and-through wire control during TBE subclavian branch cannulation, reporting universal technical success and side-branch patency with a minimal access-related complication rate of 1.7%. However, it is unclear whether this was proximal or distal radial access.

The main reason interventionalists do not use radial, and particularly distal radial, access for this indication may be the small caliber of the vessel, which limits sheath size and may increase the risk of vasospasm and radial artery occlusion. In a large ultrasonographic study, the mean left distal radial artery diameter was 2.35 ± 0.45 mm, approximately 20% smaller than the conventional radial artery, and it measured less than 2.3 mm in about half of the patients [11]. The 6 Fr R2P Destination Slender sheath used in our patients has a thin-walled design with an outer diameter of 2.5 mm, which is slightly larger than the mean distal radial artery diameter. Nevertheless, in the randomized DISCO RADIAL trial, 6 Fr thin-walled sheaths were used via distal radial access with a radial artery occlusion rate of only 0.31%, albeit with more frequent arterial spasm (5.4% vs. 2.7%) and access crossover (7.4% vs. 3.5%) than with conventional radial access [12]. In our patients, the distal radial artery diameter was not formally documented; patency and adequacy were confirmed by ultrasound before puncture. Given the variability of distal radial artery caliber, pre-procedural ultrasound measurement is advisable, and patients with small or diseased radial arteries may not be suitable for this approach.

In conclusion, our experience supports previous findings in the literature and further suggests that TBE deployment via distal radial access, using a femoral-to-radial through-and-through wire for improved device control, is both feasible and safe in appropriately selected patients.

4. Conclusions

These two cases demonstrate that distal radial (snuffbox) access is a technically feasible and clinically safe route for delivering the branch component during TBE implantation in zone 2 TEVAR. The distal radial approach achieved effective aortic repair with LSA preservation, minimal access-site morbidity, and rapid recovery. Combined with a femoral-to-radial through-and-through wire technique, distal radial access represents a promising alternative to conventional upper extremity approaches. Validation in larger cohorts is warranted to define its broader role in the endovascular management of complex aortic disease.

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Abbreviations

The following abbreviations are used in this manuscript:

CT	computed tomography
DAV	Davis (catheter)
Fr	French
IFU	instructions for use
LSA	left subclavian artery
R2P	radial-to-peripheral
TBE	thoracic branch endoprosthesis
TEVAR	thoracic endovascular aortic repair

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