# Single access covered endovascular reconstruction of the aortic bifurcation

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## ABSTRACT

We describe the feasibility of covered endovascular reconstruction of the aortic bifurcation (CERAB) through a single femoral access and a steerable sheath. We present the technique, which we used for a patient with severe aortoiliac calcification and bilateral involvement of the common femoral artery. The patient underwent endarterectomy of the left common femoral artery plus CERAB with an aortic stent graft and bilateral covered stents for the common iliac artery with kissing dilatation with a steerable sheath using only left femoral access. CERAB can be performed using unilateral access with the aid of a steerable sheath, reducing the potential for access site complications. (J Vasc Surg Cases Innov Tech 2023;9:101343.)

**Keywords:** CERAB; Aortoiliac disease; Steerable sheath

With the aim of reducing the surgical trauma from open surgery in the treatment of aortoiliac occlusive disease, endovascular therapy has become the treatment of choice in many countries. In the kissing stent technique, stents from each iliac artery are deployed in parallel, landing side by side inside the distal aorta and elevating the anatomic aortic bifurcation. In selected studies, the use of covered stents has demonstrated patency that can approach those shown with aortobifemoral bypass.[1,2] Based on this technique, covered endovascular reconstruction of the aortic bifurcation (CERAB) has achieved progressive popularity, with studies reporting promising results in terms of patency and low rates of postoperative complications.[3-5]

Combined with aortoiliac occlusive disease, patients frequently present with significant common femoral artery (CFA) disease that can require surgical treatment or be a source of arterial access complications. We present a technical note showing the feasibility of CERAB using a single femoral access with the aid of a steerable sheath, thus, avoiding a contralateral puncture in a diseased CFA and reducing the risk of operative complications. The patient provided written informed consent for the report of her case details and imaging studies.

## CASE REPORT

A 79-year-old smoker and obese woman with a history of hypertension presented with a complaint of bilateral claudication after walking 50 m that was worse on the left side. Her physical examination showed no palpable femoral pulses. Computed tomography angiography (CTA) showed a 16-mm-diameter aorta with severe calcification and a 20-mm infrarenal aortic pseudoaneurysm. CTA also showed pseudoaneurysms of both common iliac arteries (CIAs; 23 mm on the left and 27 mm on the right), with the right side completely thrombosed. Both CIAs and CFAs were severely calcified, with the right CIA and left CFA presenting with severe stenosis and the right CFA with intermediate stenosis (Fig 1). It was decided to perform CERAB and endarterectomy of the left CFA without intervention of the diseased right CFA to minimize possible wound complications. The expectation was to improve claudication by enhancing only the left CIA flow.

Initially, left CFA endarterectomy with a bovine pericardial patch was performed. Aortoiliac digital subtraction angiography was performed, a Lunderquist wire (Cook Medical) was positioned in the descending thoracic aorta, and a 14F Sentrant sheath (Medtronic) was introduced. Through the Sentrant sheath, a 20 × 20 × 82-mm Endurant iliac extension (Medtronic) was deployed below the renal arteries, covering the aortic pseudoaneurysm. An 8 × 57-mm balloon-expandable covered stent (iCOVER; iVascular) was then deployed in the left CIA, landing in the distal part of the aortic stent graft. A 10F Fustar steerable sheath (Lifetech Scientific) was modified by puncturing the valve and inserting a 0.014-in. wire to obtain a through-and-through wire for stabilization of the curve.[6] We introduced this system inside the 14F sheath and positioned it within the aortic stent graft, where it was adequately steered (Fig 2, *a*). Through this antegrade access, the right CIA artery was catheterized, and a Rosen wire (Cook Medical) was positioned in the right external iliac artery (Fig 2, *b*). Another 8 × 57-mm iCOVER stent

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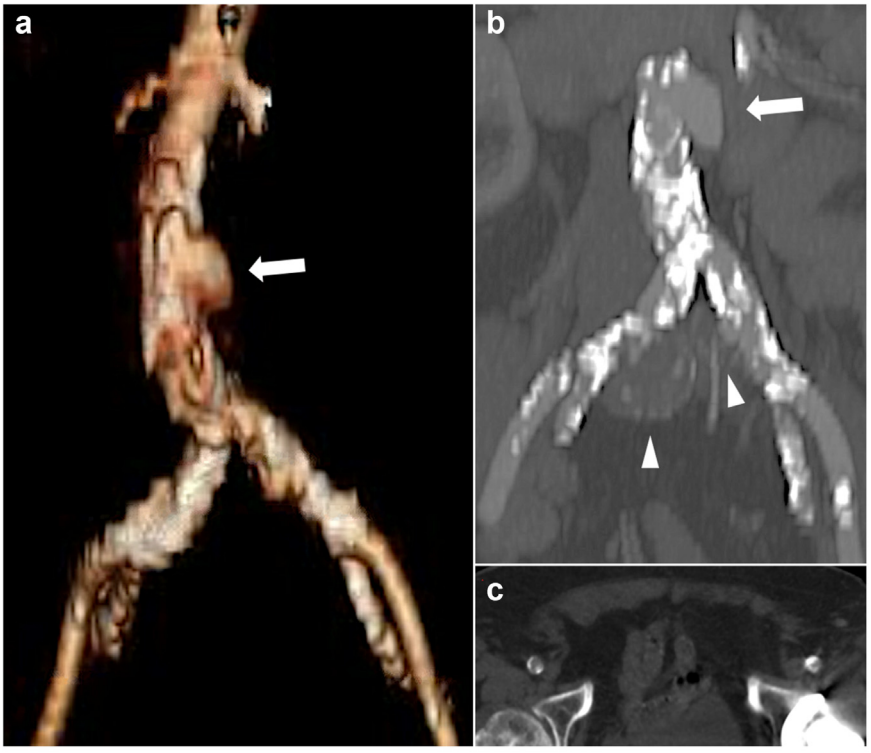


**Fig 1. a,** Three-dimensional reconstruction of computed tomography angiography (CTA) of the aorta. *White arrow* indicates aortic saccular aneurysm. **b,** Coronal multiplanar reconstruction image showing severe calcification of the aorta on bilateral common iliac arteries (CIAs). *Arrowheads* indicate both CIA aneurysms. **c,** CTA showing severe calcification of both common femoral arteries CFAs), with significant stenosis on the left side.

was deployed in the right CIA, parallel to the left iliac stent, and extended distally with another 9 × 27-mm iCOVER stent. Subsequently, a long-shafted 9 × 40-mm semicompliant balloon was advanced to the right CIA and inflated. It was left inflated while the steerable sheath was retracted. Additional access was obtained by puncturing the 14F sheath valve, and 9 × 40-mm semicompliant balloon was advanced and inflated in the left CIA, thus, performing a kissing balloon maneuver (Fig 2, *c*). Finally, a 9 × 27-mm iCOVER stent was deployed distally on the left side. After completion angiography (Fig 2, *d*), which demonstrated unimpeded flow in both iliac arteries, the catheters and sheaths were removed, and the left side of the groin was closed.

Postoperative CTA showed excluded aortic and bilateral CIA pseudoaneurysms. The iliac stents were widely open, with a nice parallel configuration and minimal space outside them (Fig 3). The postoperative course was uneventful, with discharge on the sixth postoperative day. At 6 months of follow-up, the patient reported no complaints and was walking without claudication and with a healed surgical wound.

## DISCUSSION

In-stent restenosis has been observed in approximately 15% of cases of endovascular treatment of the aortic bifurcation with kissing stents.[7] One reason might be the radial mismatch (a mismatch between the stented lumen and the aortic lumen surrounding the stents) or undersizing of the stents, which can cause hemodynamic alterations that can lead to intimal hyperplasia and organized thrombi. Another possible reason is the position adopted by the stents within the distal aorta.

CERAB is a technique for reconstructing the aortic bifurcation with the use of covered stents that was first reported in 2013.[8] It requires the use of an aortic covered stent that is overdilated in its proximal part, leaving a distal smaller diameter, creating a so-called funnel shape. Within this stent graft, bilateral covered iliac stents are deployed with a kissing stent configuration, ideally achieving a minimal radial mismatch due to the intimate contact with the walls of the distal part of the stent. Groot Jebbink et al[9] conducted an in vitro study and demonstrated that CERAB reduced the area of mismatch in the distal aorta by up to sixfold compared with the use of balloon-expandable covered kissing stents alone. This difference was also confirmed in a CTA-based study.[10]

Although providing limited evidence, case series have reported 1-year patency from 80% to 90% and 5-year

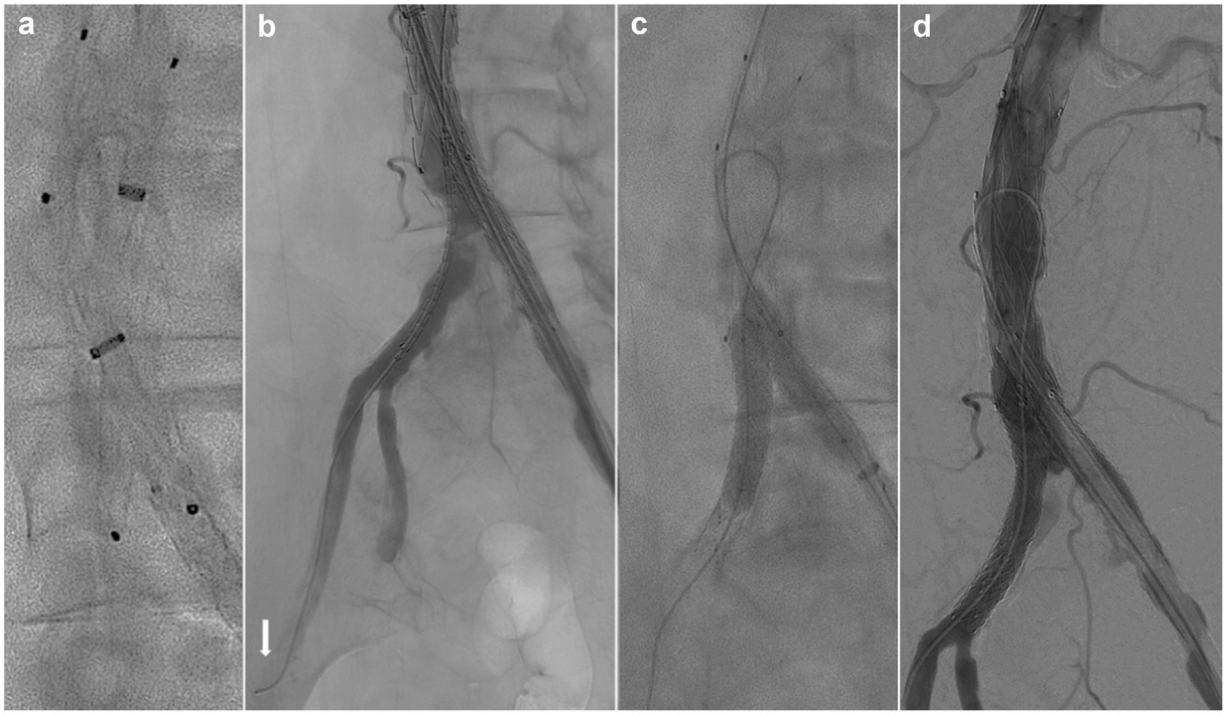


**Fig 2.** **a,** Steerable sheath already placed toward the right common iliac artery (CIA). **b,** Right CIA covered stent in position. *White arrow* indicates the tip of the Rosen wire in the distal external iliac artery. **c,** Kissing balloons shown in iliac covered stents. **d,** Final digital subtraction angiography showing unimpeded flow through the reconstruction.

patency of approximately 80%. However, although endovascular procedures are minimally invasive, access complications present in 5% to 10% of cases, which could be even higher in patients requiring femoral endarterectomy.[3-5]

For the present patient, the steerable sheath allowed us to avoid one extra access site in a diseased femoral artery, while maintaining adequate support for the intervention. In our experience, since the first description of the use of steerable sheathes for antegrade branches in complex aortic repair, the stabilized steerable sheath technique through transfemoral access has widely replaced antegrade upper extremity access with the consequent decreased risks of access site complications or cerebral embolism.[11] We consider this approach especially helpful in cases with unilateral groin infection or previous surgery, for which an increased unilateral sheath size (required for the stabilized steerable sheath technique), is not a limitation, such as when CFA endarterectomy is also required.

Some technical aspects should be considered when planning a single access CERAB case:

- A single access site should be avoided if the contralateral side has severe outflow disease, because of the risk of postoperative stent occlusion in such cases
- The aortic stent graft should be deployed first and, if a balloon-expandable stent graft is used, its proximal part can be dilated, leaving a funnel shape
- A steerable sheath with strong support should be chosen; otherwise, delivery of the stents might not be feasible (another option, used with our patient, is to provide support with a 0.014-in. through-and-through wire that enters and exits through the access vessel[6])
- Stents should be placed sequentially but should be dilated simultaneously

## CONCLUSIONS

This technique minimizes the invasiveness of the procedure, avoiding the potential complications derived from a second access site. This approach should be adapted to each particular case; however, we believe it is a simple and reproducible procedure that could enable patients with additional disease of the external iliac arteries and CFAs to be treated with the CERAB technique with a less invasive option.

## DISCLOSURES

T.K. receives consulting, proctoring, and intellectual property fees, royalties, and research and travel grants

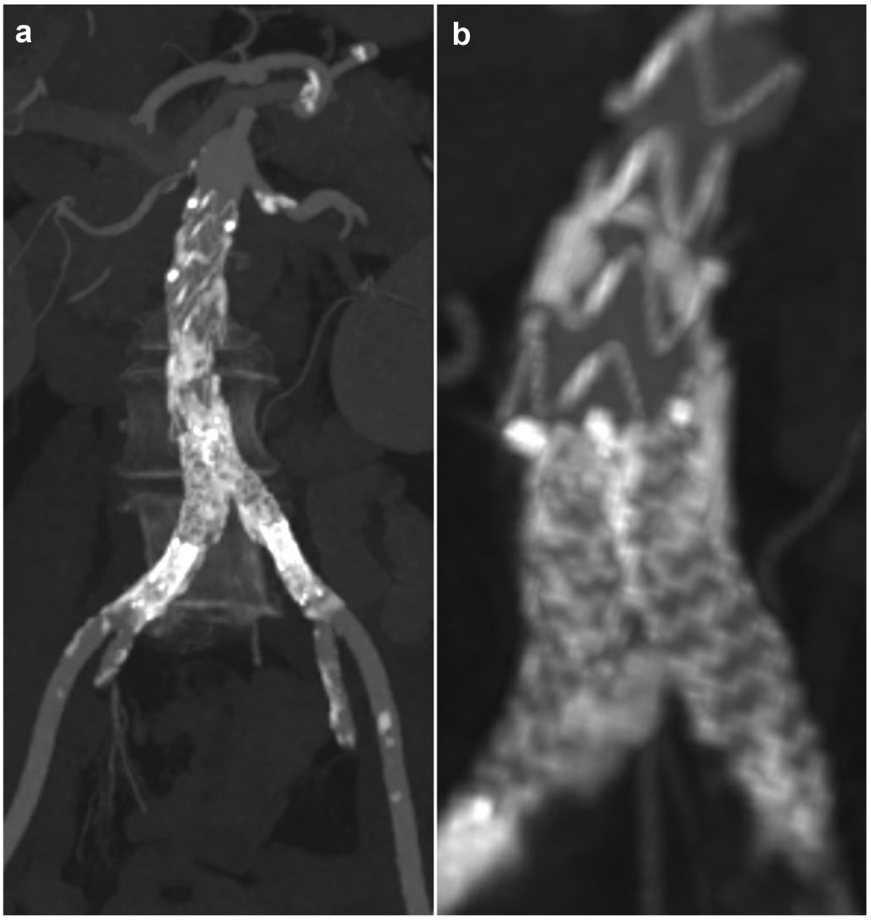


**Fig 3. a,** Multiplanar reconstruction of computed tomography angiography (CTA) of aorta and bilateral common iliac arteries (CIAs),showing widely patent stents without perfusion of the pseudoaneurysms. **b,** Magnified image showing the kissing stents and their relationship to the aortic stent graft, with the desired parallel configuration without radial mismatch (mismatch between stented lumen and aortic lumen surrounding the stents).

from Cook Medical Inc. J.T., E.B., F.R., G.P., and S.C. have no conflicts of interest.

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