Gonadal vein as a bypass conduit for arterial reconstruction during an aortic debranching repair of a paravisceral aortic aneurysm

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ABSTRACT

We report a case of a hybrid aortic debranching procedure for repair of a paravisceral inflammatory aortic aneurysm. Vein grafts were chosen over prosthetics because of concern for infection as a possible etiology. The gonadal vein was successfully used as a vein graft between the right common iliac artery and the right renal artery before aortic endograft placement. (J Vasc Surg Cases Innov Tech 2021;7:374-7.)

Keywords: Ovarian vein; Gonadal vein; Vascular grafting; Aortic debranching; Visceral reconstruction

Aortic debranching is an important option in the therapeutic arsenal for thoracoabdominal or paravisceral aortic aneurysms considered high risk for open repair and unsuitable for fenestrated endovascular aneurysm repair (EVAR).[1,2] First described in 1999, this technique involves aortic debranching and retrograde perfusion of the visceral and renal vessels, followed by endovascular repair and aneurysmal exclusion.[3] Prosthetic grafts and the greater saphenous vein (GSV) are the most commonly used bypass conduits.[4] We report a case of a patient debranched and the gonadal vein used as part of the hybrid repair of a paravisceral aortic aneurysm. Patient consent was obtained for this case report.

CASE PRESENTATION

A 61-year-old woman presented to the emergency department with a 3-day worsening of abdominal pain, nausea, vomiting, and malaise. Seven months prior, she was diagnosed with abdominal aortitis with a 3.7 cm pararenal aortic inflammatory aneurysm thought to be secondary to large vessel vasculitis after presenting with chronic back pain, 20-pound weight loss and elevated C-reactive protein at 51 and erythrocyte sedimentation rate at 120. Her previous workup did not suggest an infectious etiology (negative blood cultures, syphilis serology, interferon-gamma release assay, hepatitis B/C serology, and human immunodeficiency virus screening assay), and she was medically managed with prednisone, methotrexate, and serial imaging follow-up.

Computed tomography angiography revealed rapid aneurysmal expansion from 4.2 to 6.2 cm over the last month. There was worsening circumferential thickening and cephalad extension up to the level of the diaphragm spanning T11-L3. The celiac and superior mesenteric artery origins were occluded within the inflammatory process (Fig 1), with a patent modest sized inferior mesenteric artery retrogradely supplying the mesenteric circulation. The patient was admitted for urgent repair. Her blood and urine culture unexpectedly grew *Klebsiella pneumoniae* 24 hours after admission. This introduced the possibility of an infected aneurysm. We decided to treat her with a staged hybrid EVAR with autogenous vein debranching.

An abdominal aorta debranching was performed. The left GSV was harvested from the thigh and used as a conduit between the left common iliac artery (CIA) and the left renal artery, and left CIA and inferior mesenteric artery. An adequate length of the GSV was used for an end-to-side anastomosis from the left renal artery bypass to the superior mesenteric artery. The left GSV distal to the knee and the right GSV were found to be of poor quality and not used.

During laparotomy, a sizeable right gonadal vein was identified that appeared suitable as a conduit. It was harvested from the inferior vena cava to the level of the ovaries. The right gonadal vein was anastomosed to the right CIA and subsequently end-to-end to the right renal artery (Fig 2). A jump graft to the common hepatic artery was created using the residual segment of the harvested GSV. All distal bypasses demonstrated good Doppler signals at the end of the case.

Six days after debranching, an EVAR was performed with no complications (Fig 3). Four days later, the patient was taken back for a relook laparotomy for bleeding. Intraoperatively, a slow trickle from one anastomosis was found and reinforced with a 6-0 Prolene suture. All grafts were patent. She remained clinically stable and was discharged on high-dose prednisone with regular follow-up by rheumatology and vascular surgery.

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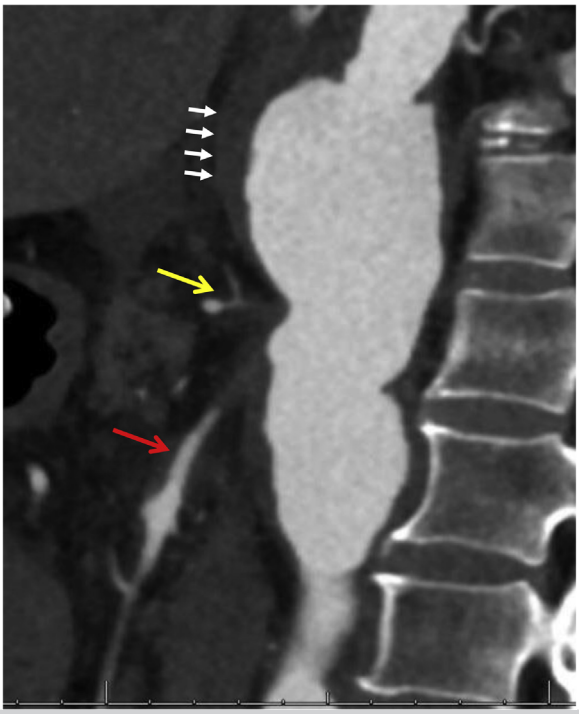

Fig 1. Sagittal reconstruction of the computed tomography angiogram before the endovascular aneurysm repair procedure showing the occlusions of the proximal celiac artery and superior mesenteric artery (SMA). Please note the inflammatory aortic rind indicated by the *white arrows*. The *yellow arrow* indicates the reconstituted celiac artery bifurcation, and the *red arrow* indicates the reconstituted SMA.

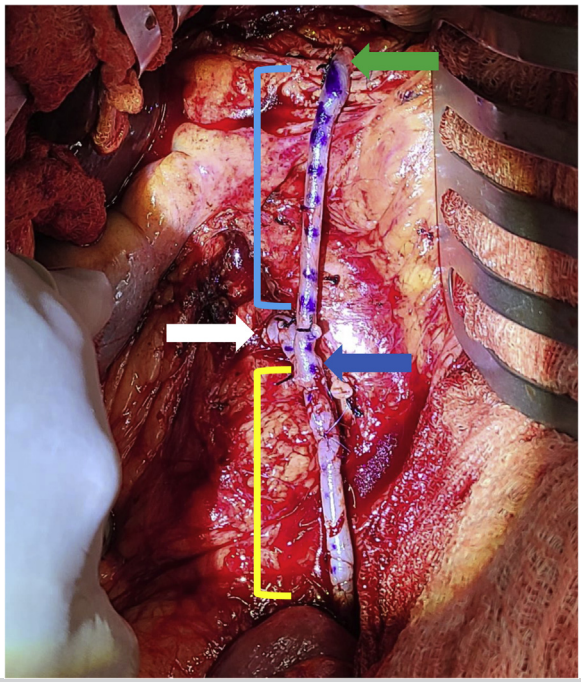

Fig 2. Intraoperative photograph of the ovarian vein bypass. The *yellow bracket* indicates the aorto-right renal bypass using the ovarian vein. The *blue bracket* indicates the graft to the hepatic artery using the saphenous vein. The *white arrow* indicates the right renal anastomoses. The *blue arrow* indicates the end-to-side anastomoses of the saphenous and the ovarian vein. The *green arrow* indicates the hepatic anastomoses.

A computed tomography angiography at 2 months showed a widely patent right renal bypass and appreciable decrease in the degree of aortitis with the endograft (Fig 4).

DISCUSSION

The debranching repair of suprarenal aortic aneurysms avoids cross-clamping, reduces visceral and renal ischemic times, and allows for broad applicability to a range of patient anatomy.[5] Prosthetic conduits are most commonly used, and there are commercially available Dacron grafts designed specifically for this use.[5,6] Alternatively, autologous veins may be used for situations where risk of infection is a concern. In a study of 40 patients undergoing total visceral and renal revascularization, synthetic grafts were used in all but one case that used the saphenous vein.[7]

This case is a patient with a rapidly expanding paravisceral aortic aneurysm, in whom we avoided prosthetic grafts due to their higher infection risk.[8] Instead, we used autologous veins, one of them being the right gonadal vein for the right renal bypass. Although the initial plan was to use the GSV exclusively, we ran out of GSV, and the gonadal vein appeared robust and suitable in size. Cadaveric cryopreserved conduit would have been a suitable option but could not be obtained at our institution on such short notice.

We decided to debranch with autogenous conduits and treat the aneurysm with an aortic endograft because we felt that the aortitis was most likely autoimmune rather than of infectious etiology. We felt that the endograft was the best option as it most likely will deal with the aortitis and does not jeopardize future management options. If the patient is to develop ongoing infection from the aorta after the endograft, we can treat the patient with explant, aortic excision, and in situ repair with the neoaortoiliac system, or cadaveric cryopreserved conduit, or extra-anatomical repair with axillofemoral bypasses. The debranching autogenous bypasses would serve this patient well in such a scenario by averting the need for further visceral revascularization.

Using the gonadal vein as an arterial graft is uncommon and only exists in the transplantation literature. There are seven reports of its use in hepatic and renal artery reconstruction with no vascular complications in the short term and one case reporting a follow-up of up to 3 years.[9-14] We did not find any previous cases of the gonadal vein being used as a bypass conduit for aortic debranching. A benefit to using the gonadal vein for this indication includes avoiding an additional incision at another body site and

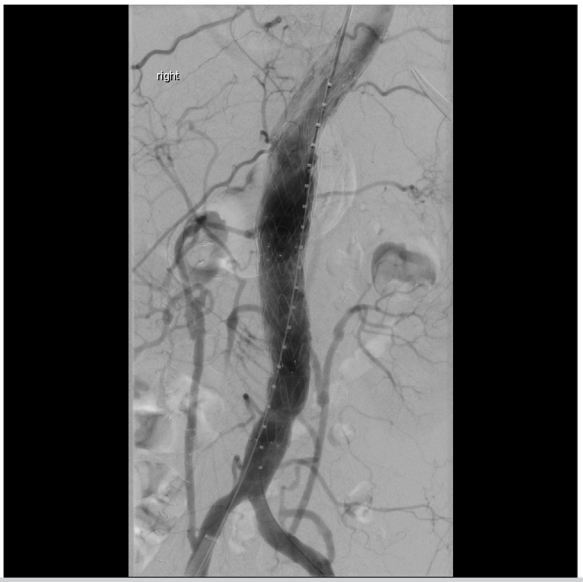

Fig 3. Intraoperative angiogram taken at the end of the endovascular aneurysm repair procedure. The endograft is shown as well as the bypasses extending from the common iliac arteries bilaterally.

Fig 4. Computed tomography imaging at 2-month follow-up. The *white arrow* indicates the right renal bypass that remained patent.

the rare but potentially major leg wound complications associated with GSV harvesting.[15]

The safety of removing the gonadal vein has been documented in the treatment of pelvic congestion syndrome with some studies reporting 8-year follow-up with minimal rates of complications.[16] A more recent study of 28 patients who underwent endoscopic gonadal vein resection similarly reported minimal complications.[17] Embolization of the gonadal vein is a well-tolerated treatment of varicocele in males and pelvic congestion syndrome in females, with complications occurring in 3% to 10% and largely related to the procedure itself such as recurrence of varices or nontarget embolization.[18,19] In the setting of kidney transplantations, gonadal vein resection does not impact the frequency of ureteral complications.[20] Given the safety demonstrated in these studies, we wonder if the gonadal vein may be a good source of vein conduit for patients who need intra-abdominal vascular procedures.

A drawback to using vein grafts for visceral bypass is the concern of aneurysmal degeneration. In two studies reporting on more than 200 aortorenal vein grafts, the rate of aneurysmal degeneration was 5% to 6%.[21,22] Similarly, saphenous vein graft aneurysms are a documented concern among peripheral arterial reconstruction and coronary artery bypass grafting procedures.[23,24] Although there are limited data specifically on the gonadal vein, the inferred risk of aneurysmal degeneration must be considered, but there are insufficient data to compare this risk with that of other vein conduits.

CONCLUSIONS

The gonadal vein is a potentially good conduit for visceral arterial reconstruction as an alternative to prosthetic and GSV grafts, particularly in cases of suspected infection or when leg veins are not ideal. Further study is needed to determine its long-term patency and safety.

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