

Treatment of a traumatic aortic bifurcation injury with an iliac branch endoprosthesis

S. Keisin Wang, MD, Raghu L. Motaganahalli, MD, John G. Maijub, MD, and Alan P. Sawchuk, MD,
Indianapolis, Ind

ABSTRACT

We present the case of a 62-year-old man who sustained a traumatic distal aortic injury associated with an adjacent lumbar vertebral body fracture resulting from a 20-ft fall. Given the site of injury, an iliac artery branched endograft was deployed off-label to preserve the aortic bifurcation and cover a limited amount of healthy aorta to preserve the collaterals. The procedure was successful, with no intraoperative complications or evidence of an endoleak. The aortic bifurcation and distal iliac arteries remained widely patent by computed tomography angiography at the follow-up examination without evidence of sequelae. (*J Vasc Surg Cases and Innovative Techniques* 2020;6:317-9.)

Keywords: Endovascular; Iliac branch endoprosthesis; Off-label; Stent; Trauma

Sudden traumatic deceleration injuries can be associated with aortic and retroperitoneal organ injury at sites of fixation. Often and dramatically, this mechanism results in thoracic aortic transection and catastrophic hemorrhage distal to the left subclavian artery and ligamentum arteriosum.¹ In the abdomen, the aorta and renal arteries can be injured with or without adjacent vertebral fractures, leading to dissection, thrombosis, and, less frequently, transection.² We report such a case in which a lumbar vertebral fracture resulted in an injury to the aortic bifurcation, leading to pseudoaneurysm formation. Written informed consent was obtained previous to the submission of this manuscript and is available upon request.

CASE REPORT

The patient was a 62-year-old man who had fallen from 20 ft. after losing his balance on a ladder while changing a light bulb. The patient immediately experienced back pain and was evaluated on scene by emergency personnel. He remained hemodynamically stable and was brought to our facility as a trauma activation. In the emergency room, computed tomography angiography was ordered as part of his workup, which demonstrated a saccular pseudoaneurysm arising posterior and to the left of the most distal aspect of the abdominal aorta, extending slightly into the left common iliac artery, with an adjacent small hematoma (Fig 1).

Additional injuries included a comminuted fracture of the L4 vertebral body, minimally displaced L1–L4 transverse process fractures, and a transversely oriented dissection flap within the mid to distal superior mesenteric artery, which did not appear to be flow limiting.

Because of the short segment of aortic injury, involvement of the aortic bifurcation, and a normal aortic diameter, we ultimately elected to deploy an iliac branch endoprosthesis (IBE; WL Gore and Associates, Flagstaff, Ariz) to cover the aortic defect, preserve the hypogastric and external iliac arteries, and minimizing coverage of the adjacent normal aorta and its branches. The off-label use of this device was discussed with the patient, and he had provided written informed consent to proceed to the hybrid operating room.

After general anesthesia had been induced, percutaneous ultrasound-guided access of the common femoral arteries was obtained, and the arteriotomies were preclosed with the assistance of Proglide devices (Abbott, Chicago, Ill) using a modified Seldinger technique. We upsized access to bilateral 16F sheaths and then introduced the IBE through the right iliac system with the assistance of a stiff wire. The IBE (23 mm × 10 cm) was partially deployed, with the “hypogastric” contralateral gate positioned within the left common iliac artery. The contralateral gate was then cannulated and extended using an Excluder limb (16 mm × 7 cm; WL Gore and Associates). Intraoperative angiograms before and after endovascular repair are shown in Fig 2. The patient was discharged after evaluation and treatment of his traumatic injuries and was seen in the clinic at 1 and 4 months after the procedure. Surveillance computed tomography angiography demonstrated an intact repair, preserved iliac and lumbar flow, and no evidence of endoleak (Fig 3).

DISCUSSION

In the present clinical case, we have described the use of an IBE to treat a localized, traumatic injury of the aorta extending into the proximal left common iliac artery. The advantages of using an iliac artery branched stent graft include easy deployment, localized coverage of the area of injury, preservation of the lumbar branches, preservation of a normal aortic bifurcation if further

From the Division of Vascular Surgery, Department of Surgery, Indiana University School of Medicine.

Author conflict of interest: none.

Correspondence: Alan P. Sawchuk, MD, Division of Vascular Surgery, Department of Surgery, Indiana University School of Medicine, 1801 North Senate Boulevard, MPC2-3500, Indianapolis, IN 46202 (e-mail: asawchuk@iupui.edu).

The editors and reviewers of this article have no relevant financial relationships to disclose per the Journal policy that requires reviewers to decline review of any manuscript for which they may have a conflict of interest.

2468-4287

© 2020 The Authors. Published by Elsevier Inc. on behalf of Society for Vascular Surgery. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

<https://doi.org/10.1016/j.jvscit.2020.04.002>

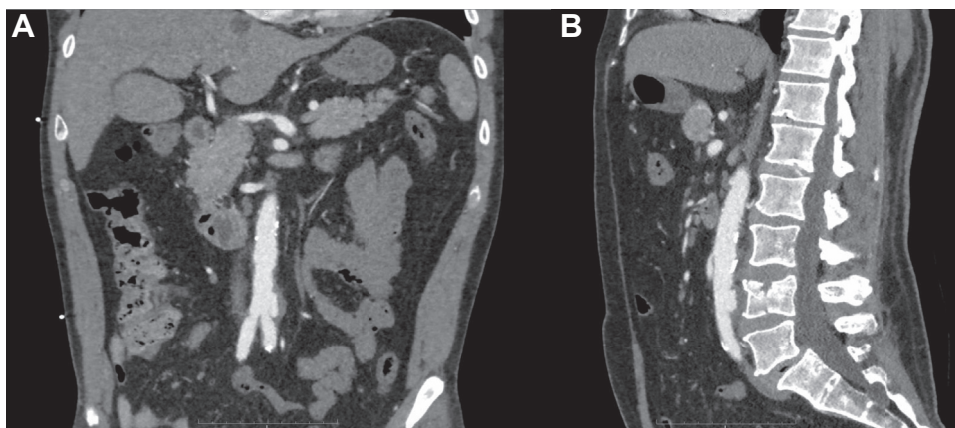


Fig 1. **A**, Coronal and **B**, sagittal depictions of the traumatic distal aortic injury adjacent to a lumbar vertebral body fracture.

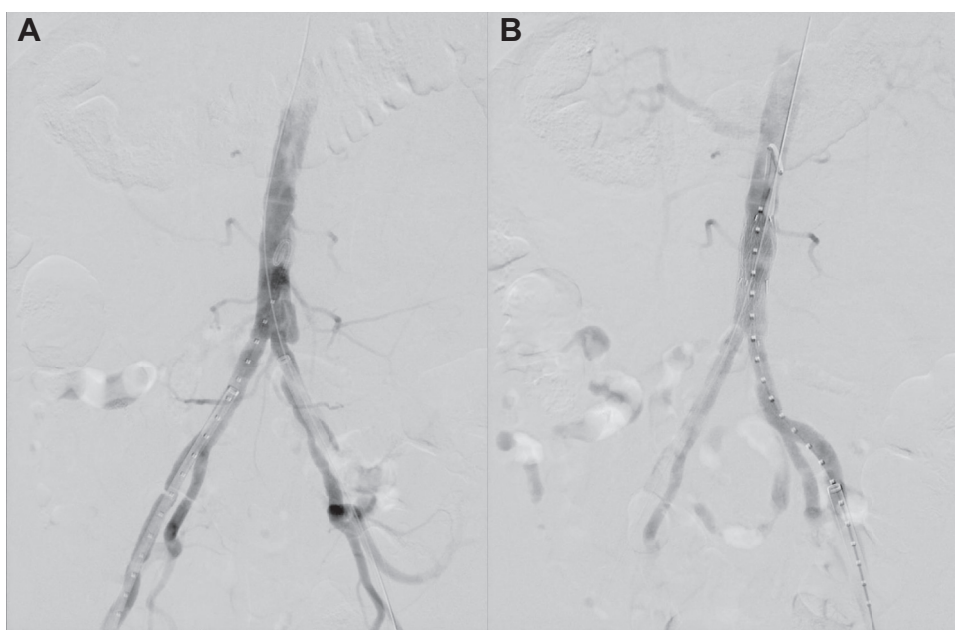


Fig 2. Digital subtraction arteriograms demonstrating the location of the distal aortic injury before **(A)** and after **(B)** deployment of the iliac branch endoprosthesis in an aortoiliac configuration.

endovascular procedures would be required, and the availability of smaller diameter devices.

The availability of an IBE is a somewhat newer development in endovascular aneurysm repair and has been shown to be effective in preservation of the iliac artery bifurcation during abdominal aortic aneurysm and common iliac artery aneurysm repair.³⁻⁸ Two studies have reported using an IBE to treat abdominal aortic aneurysms with a small neck.^{9,10} These reports found its use to be effective and durable. However, the proximal diameter of the WL Gore IBE is fixed at 23 mm; thus, the widespread applicability of this technique is limited. However, the present patient had a distal aortic diameter of 19 to 20 mm, allowing for oversizing of ~15%.

Other options for endovascular repair for this type of aortic injury include the use of a traditional aortic endograft with its longer length of coverage or covered stent grafts in a “kissing” configuration. We elected to forego these options to conserve as much of the native aortic bifurcation as possible without coverage of the collaterals. Open repair would also be an option, although it would be more invasive and might have a greater complication rate owing to the adjacent lumbar spine fractures and hematoma.

CONCLUSIONS

Traumatic distal aortic injuries represent challenging pathologic entities, given the limited range of endovascular devices available. In the present case report, we

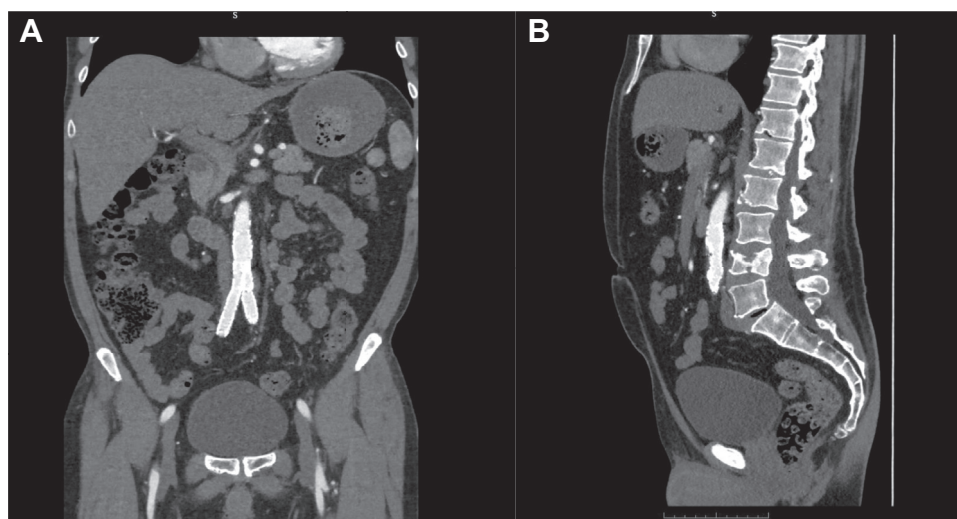


Fig 3. Surveillance computed tomography angiogram 4 months after the procedure demonstrating the iliac branch endoprosthesis without evidence of endoleak or migration in the coronal (**A**) and sagittal (**B**) projections.

have described successful implantation of a WL Gore IBE in an aortoiliac configuration to treat a full-thickness distal aortic injury secondary to a traumatic deceleration injury.

REFERENCES

1. Lee WA, Matsumura JS, Mitchell RS, Farber MA, Greenberg RK, Azizzadeh A, et al. Endovascular repair of traumatic thoracic aortic injury: clinical practice guidelines of the Society for Vascular Surgery. *J Vasc Surg* 2011;53:187-92.
2. Bruce LM, Croce MA, Santaniello JM, Miller PR, Lyden SP, Fabian TC. Blunt renal artery injury: incidence, diagnosis, and management. *Am Surg* 2001;67:550-4; discussion 555-6.
3. Bosiers MJ, Panuccio G, Bisdas T, Stachmann A, Donas KP, Torsello G, et al. Longer bridging stent grafts in iliac branch endografting doesn't worsen outcome and expands its applicability, even in concomitant diseased hypogastric arteries. *J Cardiovasc Surg (Torino)* 2018;61:191-5.
4. Giaquinta A, Ardita V, Ferrer C, Beggs CB, Veroux M, Barbante M, et al. Isolated common iliac artery aneurysms treated solely with iliac branch stent-grafts: midterm results of a multicenter registry. *J Endovasc Ther* 2018;25:169-77.
5. Jongsma H, Bekken JA, Bekkers WJ, Zeebregts CJ, van Herwaarden J, Hoksbergen A, et al. Endovascular treatment of common iliac artery aneurysms with an iliac branch device: multicenter experience of 140 patients. *J Endovasc Ther* 2017;24:239-45.
6. Marques de Marino P, Botos B, Kouvelos G, Verhoeven ELG, Katsargyris A. Use of bilateral Cook Zenith iliac branch devices to preserve internal iliac artery flow during endovascular aneurysm repair. *Eur J Vasc Endovasc Surg* 2019;57:213-9.
7. Schneider DB, Matsumura JS, Lee JT, Peterson BG, Chaer RA, Oderich GS. Prospective, multicenter study of endovascular repair of aortoiliac and iliac aneurysms using the Gore iliac branch endoprosthesis. *J Vasc Surg* 2017;66:775-85.
8. Schneider DB, Milner R, Heyligers JMM, Chakfe N, Matsumura J. Outcomes of the Gore iliac branch endoprosthesis in clinical trial and real-world registry settings. *J Vasc Surg* 2019;69:367-77.e1.
9. Rossi UG, Santuari D, Dallatana R, Cariati M. Use of iliac branch device for endovascular treatment for abdominal aorta aneurysm with small diameter neck. *Aorta (Stamford)* 2017;5:181-3.
10. Shiraev TP, Dubenec S. Novel use of an iliac branch device in the treatment of an abdominal aortic aneurysm. *Ann Vasc Surg* 2016;34:272.e1-4.

Submitted Feb 26, 2020; accepted Apr 8, 2020.