Protected retrieval of a detached iliac branch device nosecone

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ABSTRACT

The detachment of components of endovascular devices is a rare but potentially harmful complication. This report describes a clinical case of nosecone detachment from an iliac branch device delivery system during an aortoiliac aneurysm exclusion in a 73-year-old male patient. After correct deployment, the iliac branch device nosecone detached during the removal of the delivery system. The guidewire was snared from the contralateral side, and two long sheaths were advanced to trap and protect the fractured piece, ensuring nice alignment and enabling its safe removal. This case highlights key strategies for managing serious complications encountered during endovascular aortic repair. (J Vasc Surg Cases Innov Tech 2025;11:101835.)

Keywords: Endovascular aneurysm repair; Iliac branch device; Intravascular foreign body; Nosecone detachment; Protected retrieval

Endovascular aneurysm repair (EVAR) has become the standard treatment for abdominal aortic aneurysms due to its minimally invasive nature and reduced perioperative morbidity compared with open surgery.[1] Despite its widespread adoption, EVAR is not without risks. Complications, although infrequent, can be severe and potentially life-threatening.[2] Device-related complications include endoleaks, endograft migration or collapse, kinking or stenosis of endograft limbs, and graft infection.[3] Rare mechanical failures, such as structural stent fracture,[4,5] have also been reported and can lead to serious outcomes if not promptly managed. In other situations, although scarcely reported, mechanical issue involves the delivery system, which can be impossible to retrieve due to its entrapment,[6,7] failure to release, or fracture.

Modern endovascular devices, although versatile, pose technical challenges, reflecting procedural complexity and increasing stress on devices and delivery systems. With continuous manipulation by the operator, components of the delivery system may become damaged or even break, turning into foreign bodies that require removal. Although intraoperative failure to deploy the stent graft is extremely rare, if all troubleshooting strategies are unsuccessful, open surgical conversion may be the only remaining option to save the patient.[8]

Thorough preoperative assessment and device knowledge are essential for minimizing these risks.

For iliac aneurysms, iliac branch devices (IBDs), depending on the anatomy being appropriate to the instructions for use, have become the standard of care, providing effective treatment while preserving internal iliac artery (IIA) patency. Embolization of the IIA, commonly performed in the past, is now preferably avoided whenever possible. Treatment with IBD is associated with lower rates of buttock claudication, erectile dysfunction, and bowel ischemia.[9,10] For small iliac aneurysms, bell-bottom limbs are also sometimes utilized to spare the iliac bifurcation.[11]

This report illustrates a rare instance of an IBD nosecone fracture and detachment, followed by a challenging retrieval, and highlights an effective endovascular rescue strategy.

CASE REPORT

A 73-year-old male with a history of dyslipidemia, benign prostatic hyperplasia, hyperuricemia, and chronic kidney disease (preoperative creatinine, 1.53 mg/dL) presented with an asymptomatic 55-mm abdominal aortic aneurysm and a 32-mm right common iliac artery aneurysm. The patient was on aspirin and a lipid-lowering therapy (atorvastatin/ezetimibe).

The planned procedure involved the endovascular exclusion of the aortoiliac aneurysm using an IBD E-liac stent graft system (Artivion) and a BeGraft peripheral stent graft system (Bentley InnoMed GmbH) to preserve the right IIA patency. A low-profile trimodular abdominal endoprosthesis, ALTO abdominal stent graft system (Endologix) was planned to exclude the aortoiliac aneurysm definitively.

Under local anesthesia, common femoral arteries were accessed, and short introducers (12F-33 cm on the left and 9F-10 cm on the right) were positioned after the pre-implantation

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Fig 1. Baseline angiography. After obtaining the internal iliac artery (IIA) projections as planned, the angiography is performed, clearly visualizing the right common iliac artery aneurysm. The introducer is positioned over the crossover guidewire at the aortic carrefour, with the extra-stiff guidewire in place within the aorta.

of a single Perclose ProStyle (Abbott Vascular) on each side. The baseline angiography of the right iliac axis (Fig 1) was acquired. The IBD was advanced and deployed in a standard fashion, with angiography confirming the correct placement.

During the retraction of the delivery system, the delivery shaft fractured distal to the nosecone, at the junction point, and the latter remained detached within the arterial lumen. (Fig 2, *A*).

The intact part of the delivery system was removed and replaced with a long 16F introducer, paying attention to maintain the fractured piece on the stiff guidewire located in the aorta. To stabilize the nosecone, the guidewire was gently retrieved and snared from the contralateral side (Fig 2, *B*).

A long 12F sheath was subsequently advanced from the left femoral access until "touching" the distal tip of the delivery fragment (Fig 2, *C*). By performing this maneuver, the intravascular foreign body remained trapped, aligned, and protected between the two introducers. A double mosquito was placed on the externalized guidewires at the edge of both valved sheaths to lock the fractured nosecone between the tips of the sheaths.

Despite iliac calcifications and the presence of the just-implanted iliac branch, a smooth and safe extraction from the right femoral artery was obtained by pulling the right mosquito and simultaneously by pushing the left introducer (Fig 2, *D*). Control angiograms did not highlight vessel damages at any level, including the right common femoral artery access.

Fig 3 shows schematically the "kissing introducers"-protected retrieval.

The EVAR procedure was concluded successfully (Fig 4). At the end of the procedure, the fractured piece was examined (Fig 5). The total duration of the intervention was 100 minutes.

The patient's postoperative course was uneventful, and renal function remained stable. The patient was discharged on the third postoperative day in good general condition.

At 1-month follow up, the good aneurysm exclusion, along with the absence of complications at the level of the accesses, were observed.

Written informed consent for publication was obtained from the patient.

DISCUSSION

This report offers a possible guide on resolving a rare, complex intra-procedural complication during routine procedures.

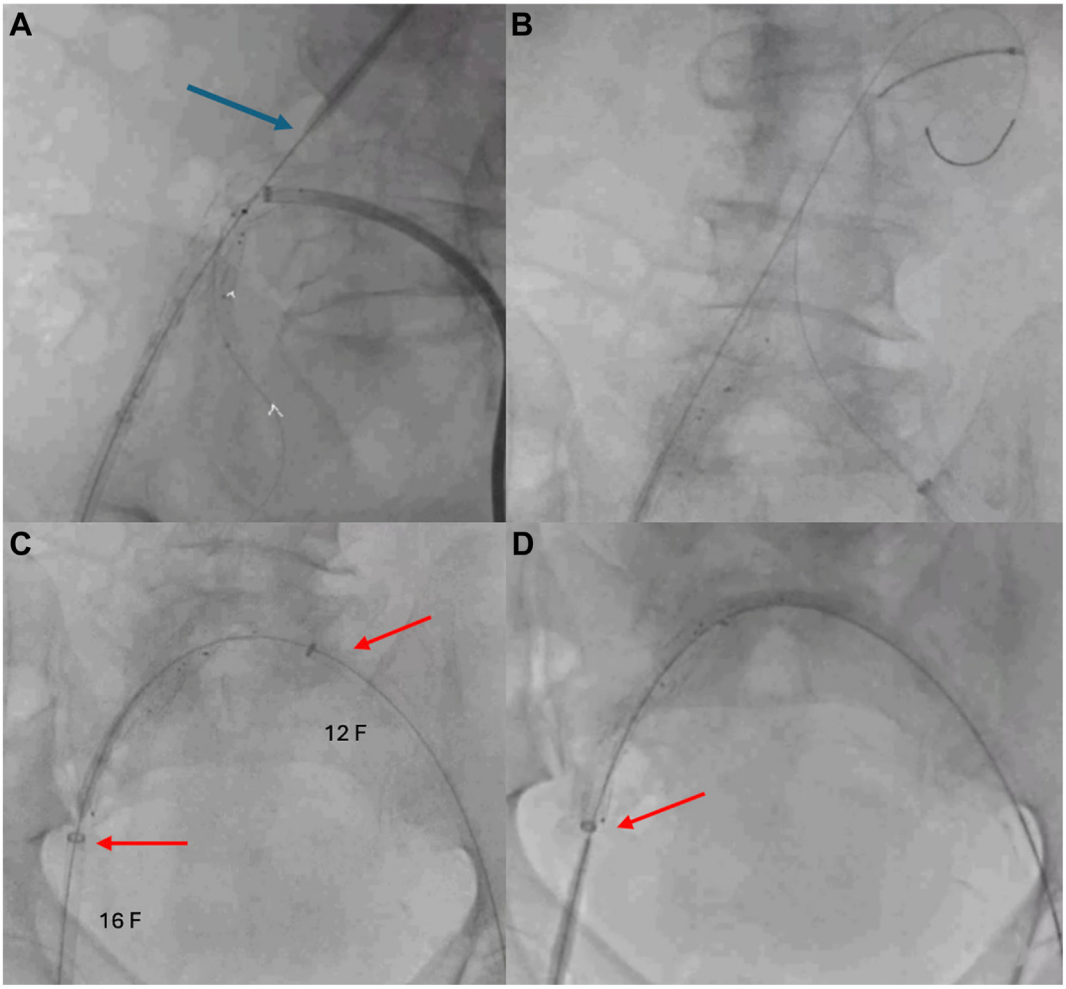

Fig 2. Procedural steps. **(A)** Iliac branch device (IBD) nosecone fracture and detachment after correct deployment; the *blue arrow* indicates the fracture at the junction point between the shaft and the nosecone. **(B)** Guidewire snared from the contralateral side. **(C)** A long 16 F introducer from the ipsilateral side and a long 12 F introducer from the controlateral side are advanced next to the nosecone, the *red arrows* indicate the long introducers' tips. **(D)** Protected removal of the fractured nosecone from the vasculature.

Although EVAR is associated with low morbidity, complications may arise, particularly in anatomically or procedurally challenging cases. Some authors have reported mechanical device complications such as fracture or separation of components.[4] Nosecone detachment is an uncommon event but poses significant risks, including vascular injury, thrombosis, or embolization.

Delivery system failure during EVAR is poorly described in the literature.

In their systematic review and meta-analysis, Freyrie at al found that problems with the delivery system are a quite significant cause of early open conversion after EVAR, accounting for 9% of cases.[12] In the review, however, the 'problems with delivery system' issue was defined as the inability to release the graft from the delivery system. This usually happens in case of the impossibility of safely navigating the iliac arteries. Cuypers et al observed that device malfunction during deployment caused primary open conversion or abandoning the procedure in three of 59 patients. However, the data source is outdated, and the malfunction issue is not analyzed in depth.[13] Millon et al described a case of primary open conversion after EVAR due to the impossibility of delivering the whole endograft from its delivery shaft.[14]

IBD nosecone detachment does not appear to be reported in the literature.

In our case, the detachment likely occurred during the pull-back maneuvers due to an unknown reason (ie, manufacturer issue, friction). The described maneuvers of kissing the nosecone between two sheaths and

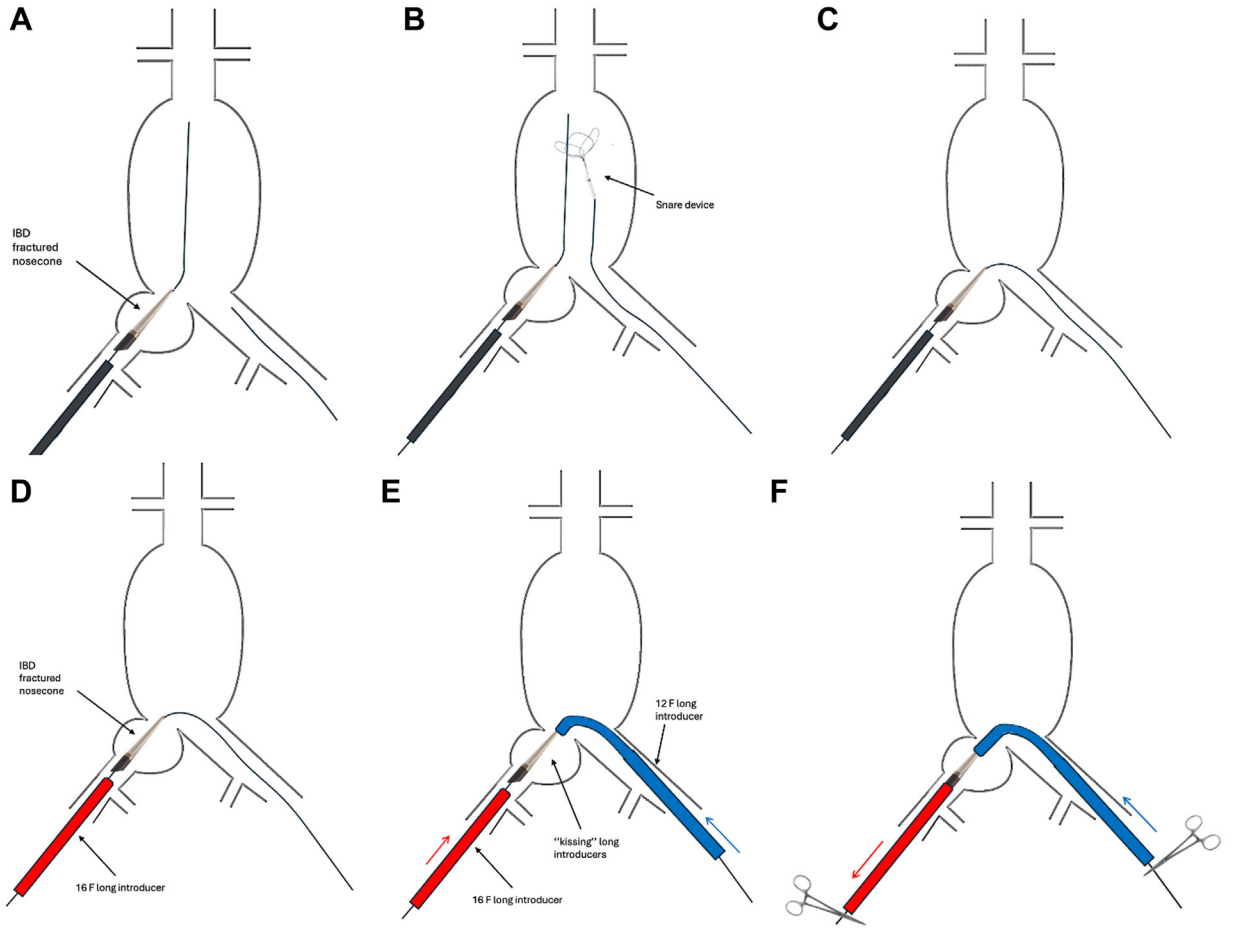

Fig 3. "Kissing" introducers protected retrieval; schematization of the technique. **(A)** The fractured iliac branch device (*IBD*) nosecone is shown. **(B)** The extra stiff guidewire is snared from the contralateral side. **(C)** The rendezvous is achieved. **(D)** The remaining part of the delivery system is removed and replaced with a long 16 F introducer. **(E)** The fragment is aligned and stabilized between two introducers; a long 12 F introducer is advanced from the contralateral side. **(F)** Smooth extraction from the right femoral artery is achieved by pulling the right mosquito and simultaneously pushing the left introducer.

guidewire stabilization with mosquitos allowed a nice alignment of the fractured piece, avoiding any possible kink, rupture or, eventually, loss into the vasculature.

An alternative endovascular solution, albeit a drastic one, it could have been to 'park' the nosecone inside the aneurysmal sac, leaving the risk of tissue reaction and eventually infection related to the foreign body presence.

The use of long introducers ensured that the nosecone remained stable and protected during extraction, minimizing vascular trauma. The described technique appears to be an effective and safe solution during EVAR. However, this technique could also be applied to other situations, such as peripheral arteries or deep veins (eg, fractured guidewire/catheter in the femoro-popliteal district or removal of inferior vena cava filter). In these scenarios, a retrograde approach would allow for the straightforward execution of the presented technique, facilitating the removal of the IFB from the vasculature without risks.

CONCLUSIONS

The successful management of nosecone detachment during EVAR requires immediate recognition and innovative techniques. This case illustrates a safe and effective approach to align and remove the fractured device piece, fixing such a complication percutaneously.

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None.

DISCLOSURES

None.

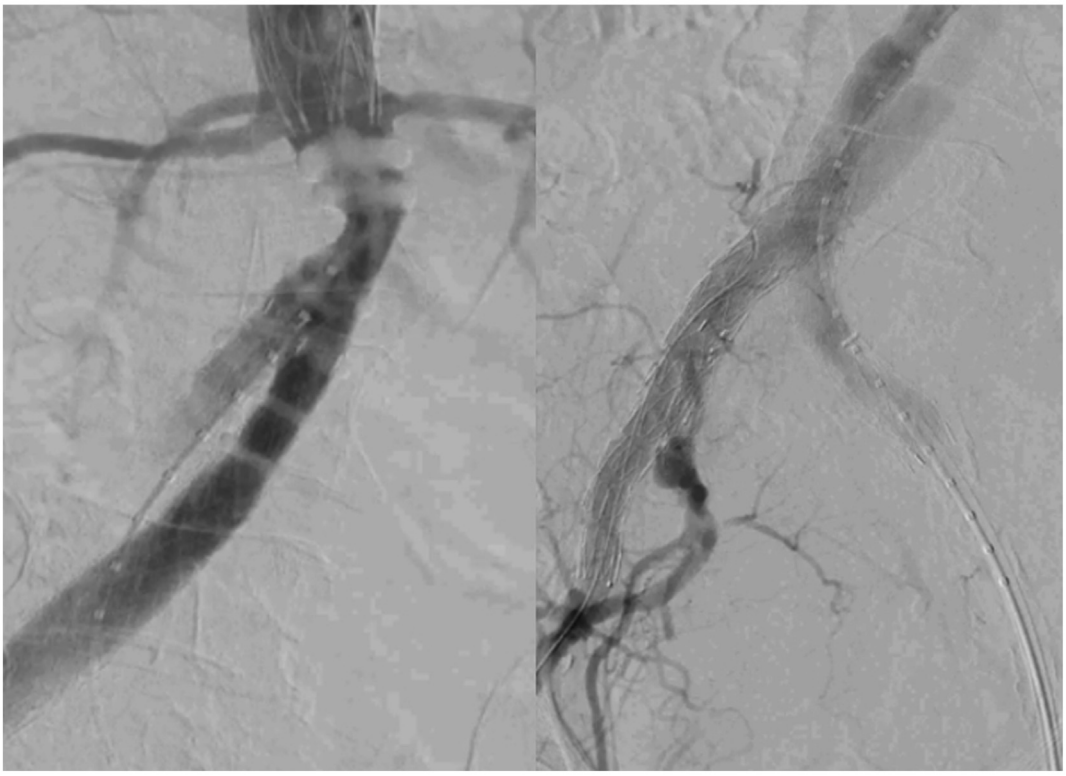

Fig 4. Final angiography. Good patency of the implanted endoprosthesis is observed, with no evidence of endoleak or vessel damage.

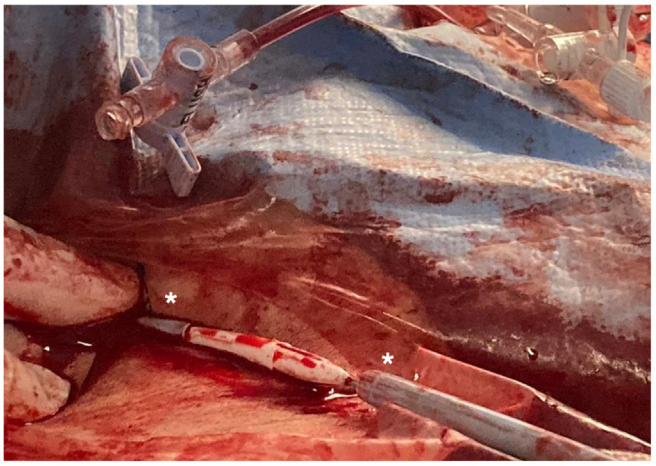

Fig 5. Fractured nosecone examination. The removal is successfully performed after fragment protection and stabilization between shafts (*). The fractured piece presents an irregular profile with sharp edges.

REFERENCES

1. Wanhainen A, Van Herzeele I, Bastos Goncalves F, et al. Editor's choice – European Society for Vascular Surgery (ESVS) 2024 clinical practice guidelines on the management of abdominal aorto-iliac artery aneurysms. *Eur J Vasc Endovasc Surg.* 2024;67:192–331. https://doi.org/10.1016/j.ejvs.2023.11.002
2. Cheun TJ, Jayakumar L, Davies MG. 4 - General Complications of EVAR. In: Dryjski ML, Harris LM, eds. *Complications in endovascular surgery.* Elsevier; 2022:23–31. https://doi.org/10.1016/B978-0-323-55448-0.00004-8, 9780323554480.
3. Verzini F, Cieri E, Kahlberg A, et al. A preliminary analysis of late structural failures of the Navion stent graft in the treatment of descending thoracic aortic aneurysms. *J Vasc Surg.* 2021;74:1125–1134. e2. https://doi.org/10.1016/j.jvs.2021.04.018
4. Daye D, Walker TG. Complications of endovascular aneurysm repair of the thoracic and abdominal aorta: evaluation and management. *Cardiovasc Diagn Ther.* 2018;8(Suppl 1):S138–S156. https://doi.org/10.21037/cdt.2017.09.17
5. Smith J, Joseph S, Thoo C. Zenith AAA endovascular graft suprarenal bare metal stent separation with graft migration and type IA

endoleak. *Vascular*. 2023;31:266–269. https://doi.org/10.1177/17085381211062737
6. Berchiolli RN, Marconi M, Bargellini I, et al. An unusual cause of failure in zenith alpha abdominal endograft. *Eur J Med Res*. 2022;27:32. https://doi.org/10.1186/s40001-022-00656-5. Erratum in: Eur J Med Res. 2022 Apr 7;27(1):54. doi: 10.1186/s40001-022-00680-5.
7. Georgiadis GS, Antoniou GA, Trellopoulos G, Georgakarakos EI, Argyriou C, Lazarides MK. Troubleshooting techniques for the Endurant™ device in endovascular aortic aneurysm repair. *Cardiovasc J Afr*. 2014;25:239–243. https://doi.org/10.5830/CVJA-2014-049
8. Kohler C, Wyss TR, Mertineit N, Makaloski V, Schmidli J. Emergent open conversion for stent-graft deployment failure in a ruptured thoracic aneurysm. *J Vasc Surg Cases Innov Tech*. 2020;7:180–182. https://doi.org/10.1016/j.jvscit.2020.10.017
9. Giosdekos A, Antonopoulos CN, Sfyroeras GS, et al. The use of iliac branch devices for preservation of flow in internal iliac artery during endovascular aortic aneurysm repair. *J Vasc Surg*. 2020;71:2133–2144. https://doi.org/10.1016/j.jvs.2019.10.087
10. Oishi A, Matsushita S, Dohi S, Yamamoto T, Kajimoto K, Amano A. Endovascular repair for iliac artery aneurysms. *Surg Pract Sci*. 2022;11:100141. https://doi.org/10.1016/j.sipas.2022.100141
11. Pagliariccio G, Gatta E, Schiavon S, et al. Bell-bottom technique in iliac branch era: mid-term single stent graft performance. *CVIR Endovasc*. 2020;3:57. https://doi.org/10.1186/s42155-020-00147-w
12. Cicala N, Perini P, Catasta A, Fornasari A, Ucci A, Freyrie A. Systematic review and meta-analysis of incidence, indications, and outcomes of early open conversions after EVAR for abdominal aortic aneurysms. *Int Angiol*. 2024;43:271–279. https://doi.org/10.23736/S0392-9590.24.05153-8
13. Cuypers PW, Laheij RJ, Buth J. Which factors increase the risk of conversion to open surgery following endovascular abdominal aortic aneurysm repair? The EUROSTAR collaborators. *Eur J Vasc Endovasc Surg*. 2000;20:183–189. https://doi.org/10.1053/ejvs.2000.1167
14. Millon A, Deelchand A, Feugier P, Chevalier JM, Favre JP, University Association for Research in Vascular Surgery (AURC). Conversion to open repair after endovascular aneurysm repair: causes and results. A French multicentric study. *Eur J Vasc Endovasc Surg*. 2009;38:429–434. https://doi.org/10.1016/j.ejvs.2009.06.001

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