Percutaneous gluteal artery access to embolize false lumen of type B aortic dissection in marfan patient

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ABSTRACT

This case study presents an innovative endovascular approach using percutaneous gluteal artery access for embolizing the false lumen of a type B aortic dissection in a patient with Marfan syndrome. Following multiple complex surgeries, the patient developed an enlarging thoraco-abdominal aneurysm, necessitating an urgent intervention branched endoprosthesis despite persisting false lumen perfusion. Doppler ultrasound-guided percutaneous gluteal access was utilized for spiral-coil embolization of the false lumen. Successful embolization and exclusion of the aneurism, confirmed by follow-up angiography and computed tomography scans, demonstrated the technique's efficacy and safety. This approach underscores the need for innovative solutions addressing complex vascular pathologies in patients with Marfan. (J Vasc Surg Cases Innov Tech 2024;10:101553.)

Keywords: Aortic dissection; BEVAR; False lumen embolization; Gluteal artery puncture; Marfan disease; Complex aortic aneurysm repair

Managing type B aortic dissection (TBAD) in patients with Marfan syndrome (MFS) is challenging due to the genetic mutation in the FBN1 gene, affecting the aortic wall's structure and function. This mutation compromises fibrillin-1 in the extracellular matrix, leading to cardiovascular complications, including increased TBAD risk.[1] In MFS, although the ascending aorta is primarily affected, the descending aorta is also vulnerable.[2] The fragility of aortic tissue in MFS complicates endovascular or surgical interventions, with a heightened risk of rapid aortic dilatation and rupture.[3] The growing use of endovascular therapy in MFS, including innovative approaches like the transgluteal percutaneous Doppler ultrasound, demands understanding of long-term outcomes. This study presents a case using percutaneous gluteal artery access for embolizing a ruptured dissected aneurysm's false lumen in a patient with MFS using branched endovascular aneurism repair (BEVAR), demonstrating the technique's efficacy as highlighted in the literature.[4] The patient provided written informed consent for the report of his case details and imaging studies.

CASE REPORT

A 63-year-old female patient with MFS and arterial hypertension was admitted to the emergency room experiencing thoracic pain and dyspnea. She had undergone several complex surgeries, including the replacement of the aortic valve, the substitution of the ascending aorta due to an acute type non-A, non-B dissection, a total arch replacement utilizing the frozen elephant trunk technique, and thoracic endovascular aortic repair (TEVAR) to address the aneurismatic evolution of the dissection. On oral anticoagulant therapy (warfarin) with an INR of 4.3, emergent computed tomography angiography (CTA) revealed a type 2 thoracoabdominal aortic aneurysm extending to both iliac axes, with a maximum diameter of 70 mm and all visceral vessels originating from the true lumen of the aneurysm sac (Fig 1). The CTA also showed significant left pleural effusion, indicating potential rupture.

An endovascular approach was employed in treating the patient, deploying a Cook thoracic endograft, a T-branch branched endograft, and a Cook Unibody endograft (all from Cook Inc). Subsequently, stenting of all visceral arteries was performed using COVERA stents (Bard), and an iliac branch endoprosthesis (W.L. Gore) was used for the left common iliac artery aneurysm, aiming to preserve the hypogastric artery. This urgent procedure was conducted via percutaneous access through the left subclavian and both common femoral arteries, and utilized Preclose devices (Prostyle, Abbott Vascular). A bifurcated endograft and iliac extensions were deployed, as mistaken release of the iliac branch endoprosthesis in the false lumen had rendered hypogastric artery canulation impossible, due to the dissection lamella interposition (Fig 2). The final angiography confirmed good visceral artery perfusion but indicated a type II endoleak from the left hypogastric artery. Additionally, a covered stent graft was deployed following the failure of percutaneous closure in the left axillary artery.

Post-procedure, the patient was admitted to the intensive care unit for monitoring and was successfully extubated after 12 hours,

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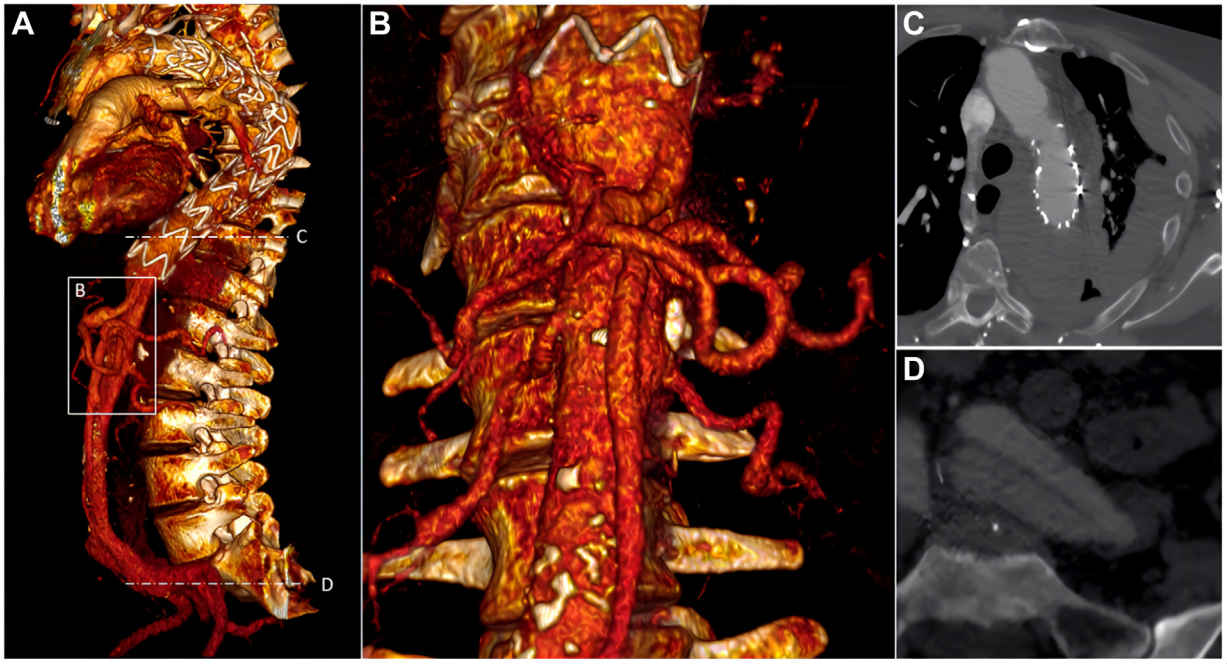

Fig 1. Preoperative computed tomography angiography (CTA) assessment of the aortic topology of the Patient. **A,** Aortic volume rendering reconstruction of the entire aorta; **B,** Volume rendering reconstruction of distal aorta showing visceral arteries origin from the true lumen; **C,** Axial section CTA showing a massive pleural effusion; **D,** Axial section CTA demonstrating the dissection of the left common iliac artery.

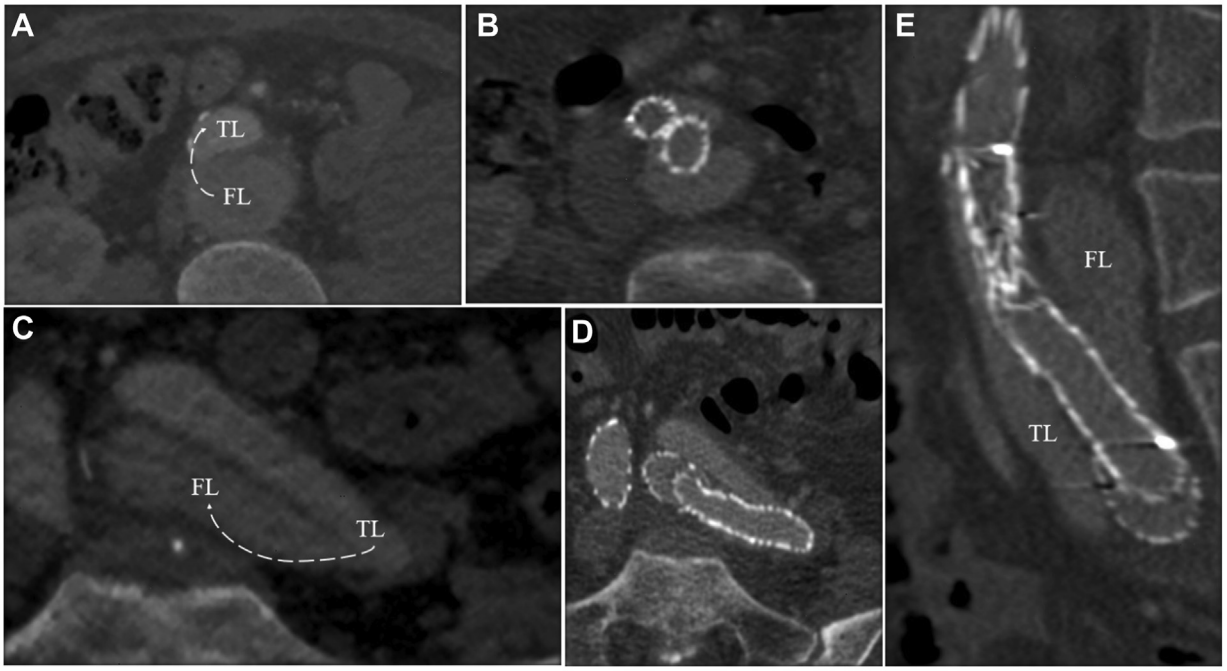

Fig 2. Preoperative (**A** and **C**) and respective postoperative (**B, D, E**) computed tomography angiographies (CTAs) depicting the perfusion of the false lumen (*FL*) through the true lumen (*TL*).

exhibiting no complications or spinal cord ischemia symptoms. On the third day post-operation, a CTA revealed ongoing enlargement of the aneurysmal sac due to false lumen perfusion via the left hypogastric artery, along with worsening pleural effusion. Given the complexity of the case and the necessity for access to the false lumen of the dissected aneurysm despite the presence of the previously deployed stent grafts, the possibility for conventional surgical accesses such as translumbar and transcaval was

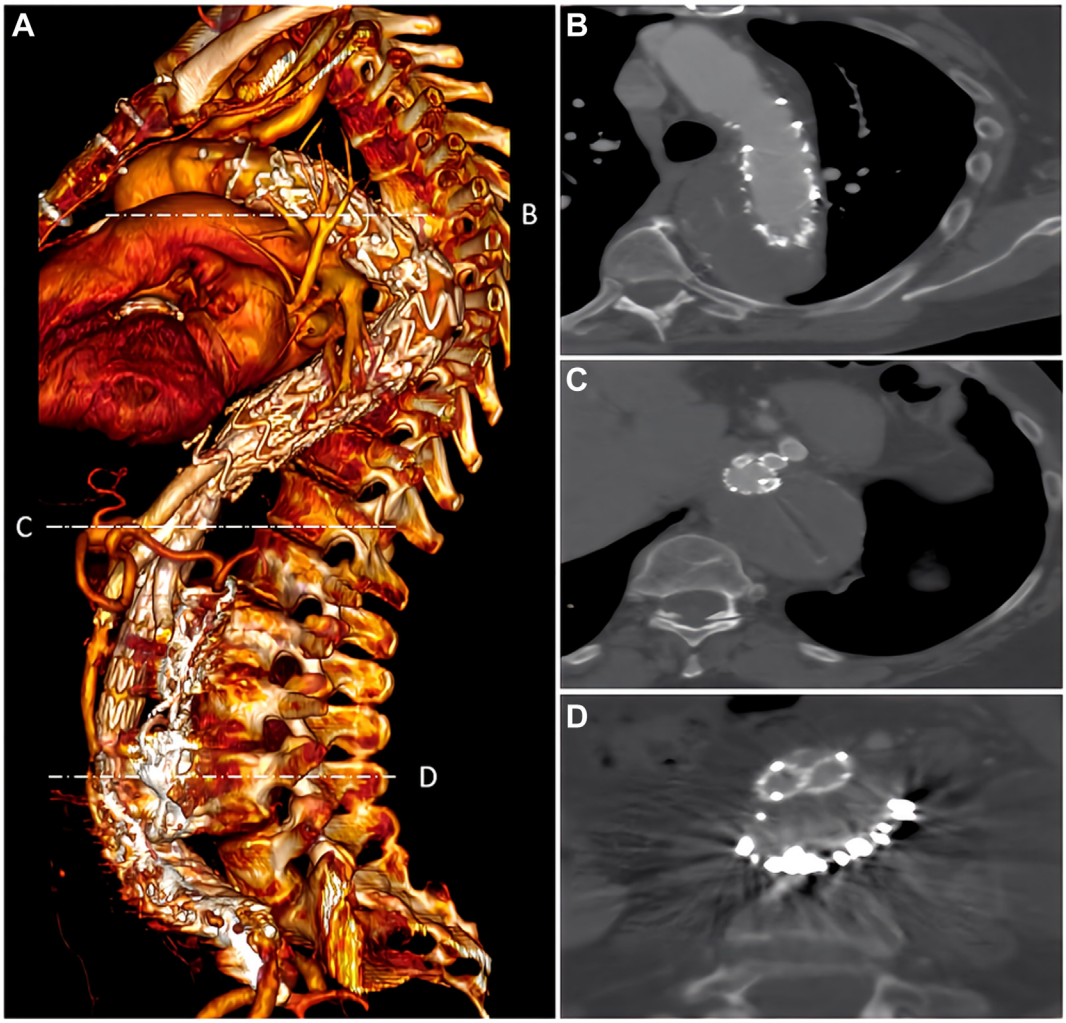

Fig 3. Postoperative computed tomography angiography (CTA) assessment of the aortic topology of the patient. **A,** Aortic volume rendering reconstruction of the entire aorta; **B,** Axial section CTA showing aneurysm shrinkage and left lung re-expansion; **C,** Axial section CTA showing patency of all visceral stent graft; **D,** Axial section CTA demonstrating patency of the aortic endograft and good embolization of the false lumen.

evaluated, initially. Although, considering the superior gluteal artery being a more appropriate choice, considering the patient unfit for open surgery, an endovascular approach was undertaken using the left superior gluteal artery. This approach began with optimal patient positioning for gluteal region exposure, area sterilization, and local anesthesia. The superior gluteal artery was accessed using Doppler ultrasound guide and a Chiba needle[4-6]; subsequently, a 2.7 Progreat microcatheter (Terumo) was introduced to the superior gluteal artery, passing through the left hypogastric artery to reach the false lumen of the dissected aneurism then 21 control-released spiral coils (Ruby Coil Penumbra), were employed for the embolization of the false lumen (Supplementary Video 1, online only).[7,8]

Upon completion, the left hypogastric artery and the punctured branch were additionally embolized. The concluding angiography confirmed the complete exclusion of the aortic aneurysm without reperfusion or endoleak. Postoperative care included regular monitoring to assess the patient's recovery, depicting significant improvements, as the patient experienced no claudication, thoracic pain, or any associated clinical symptoms.[9,10] A 6-month follow-up CTA scan confirmed the successful exclusion of both the false lumen and aneurysm shrinkage (Fig 3).

DISCUSSION

Although promising, the gluteal artery access route has challenges, such as anatomical variations causing complications in cannulation and necessitating a comprehensive approach. Direct artery puncture, although minimally invasive, poses risks like hematomas and pseudoaneurysms, requiring careful postoperative monitoring.[6,8,11] Difficulties in ultrasound visualization due to patient-specific anatomical differences can lead to multiple attempts and longer procedures. The proximity of neural structures in the gluteal region adds to the complexity, demanding high-level expertise. Despite

these issues, the gluteal artery access's versatility and minimally invasive nature make it attractive for complex vascular pathologies, offering quicker recoveries and shorter hospital stays.[12,13] It effectively reduces vascular complications like dissections but depends significantly on the operator's skill, with a continued risk of access site complications and potential nerve injury.[5]

In endovascular interventions, selecting the appropriate vascular access is pivotal. Although traditional approaches like femoral artery access have associated risks, including retroperitoneal hematoma and infections, these are particularly pertinent in patients with specific health conditions, comorbidities, and clinical histories, such as the case described. This necessitates more frequent follow-ups to ensure patient safety and successful outcomes. The radial artery, although beneficial for quicker recovery and less bleeding, has limitations due to its size and occlusion risk.[4] Similarly, the brachial artery, providing direct access to the thoracic aorta, carries risks of pseudoaneurysm and nerve damage.[5] The gluteal artery thus becomes a significant alternative for cases unsuitable for traditional methods, offering direct access to the lower aorta and pelvis, ideal for larger sheaths or devices, as depicted in the case of this patient. Its efficacy and safety have been demonstrated in studies, highlighting its importance in complex cases.[8,12,14] Ultimately, each vascular access route has its own merits and demerits, but gluteal artery access remains critical in challenging anatomical or pathological situations, emphasizing the need for a patient-specific approach and skilled interventionalists.

CONCLUSION

This case report highlights the key aspects of the patient's presentation, intervention, and outcomes, providing insights into this innovative approach to false lumen management of TBAD in patients with MFS. Doppler ultrasound-guided percutaneous gluteal artery access was shown safe and effective as a route to embolize false lumen in TBAD. Despite the rarity of such clinical scenarios, there is an imperative need for longitudinal studies to validate the long-term outcomes for solidification of this technique within the therapeutic approaches for patients with MFS.

DISCLOSURES

None.

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