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Percutaneous management of coronary aneurysms: case report and evidence base perspective

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Abstract

Coronary artery aneurysms (CAAs) are uncommon but potentially serious findings increasingly detected through advanced coronary imaging. Their etiology is diverse, including atherosclerosis and iatrogenic injury, and their clinical implications range from benign to life-threatening. Treatment strategies vary based on aneurysm size, location, and associated symptoms, and while surgical options have been traditional, percutaneous techniques are gaining ground. We hereby report the case of a

patient with an incidentally discovered aneurysm arising from a secondary branch of the proximal right coronary artery. Following heart team evaluation, coil embolization was successfully performed via femoral access using selective wiring and deployment of neurovascular coils, achieving complete exclusion of the aneurysm. We also review the current evidence supporting percutaneous options for CAA management, including covered stents, coils, vascular plugs, liquid embolics, and custom devices. While percutaneous techniques offer promising outcomes with lower procedural morbidity, high-quality comparative data are lacking. Our case highlights the feasibility and safety of coil embolization in anatomically favorable scenarios and supports the need for individualized procedural planning. Broader adoption of these strategies will require systematic data collection and consensus-driven guidelines to optimize long-term outcomes in CAA management.

Introduction

Coronary artery aneurysms (CAAs) are defined as localized dilatations of the coronary vessel wall exceeding 1.5 times the diameter of adjacent normal segments and, though relatively rare, their detection has increased with the widespread use of advanced coronary imaging.1 These aneurysms can result from a variety of pathophysiological processes including atherosclerosis, connective tissue disorders, and iatrogenic injury, particularly following percutaneous coronary interventions.2 Their clinical significance is variable, ranging from incidental findings to triggers of life-threatening complications such as thrombosis, rupture, or myocardial ischemia.3

The presentation of CAAs is often nonspecific, with symptoms mimicking typical coronary artery disease or remaining entirely asymptomatic until complications arise, and thus diagnosis often requires a high index of suspicion and is commonly established through coronary angiography or computed tomography angiography (CTA).4 The absence of standardized treatment guidelines, especially for large or symptomatic aneurysms, poses a significant clinical challenge. Historically, management strategies have included medical therapy, surgical resection or bypass, and more recently, percutaneous techniques which offer promising alternatives in high-risk or inoperable patients.1-2,4

This manuscript presents a compelling case of percutaneous management of a coronary aneurysm, followed by a critical review of the current literature. The case illustrates procedural nuances and clinical decision-making in a high-risk scenario, emphasizing the role of covered stents and coil embolization. Through this combined narrative and evidence-based approach, we aim to inform

contemporary clinical practice and highlight the need for consensus-driven guidelines in the management of CAAs.

Case

A 69-year-old woman was referred to our institution for accidental discovery during CTA of a large (9 mm in diameter) aneurysm originating from a secondary branch of the proximal right coronary artery (RCA) (Figure 1). After collegial heart team discussion, we opted for percutaneous treatment of the aneurysm. The procedure was scheduled and written informed consent obtained, also for anonymized data sharing.

After right femoral artery access, a 7 French JR4 guiding catheter was used to selectively engage the RCA, in order to maximize passive support. Subsequently, a 0.014" BMW guidewire was deployed as buddy wire and to protect the RCA, followed by selective wiring of the target branch using a 0.014" Samurai RC guidewire (Boston Scientific, Natick, MA, USA). This guidewire was then used to deliver a Finecross MG microcatheter (Terumo, Tokyo, Japan), eventually enabling the deployment of 3 Target 360 Nano coils (Stryker, Fremont, CA, USA), with total occlusion of the afferent vessel and thus exclusion of the aneurysm. The subsequent follow-up was uneventful.

Review of the evidence

Management of coronary artery aneurysms (CAAs) is guided by aneurysm size, morphology, location, and associated symptoms.[1-4] While some aneurysms can be observed conservatively, intervention is often warranted in the presence of ischemia, rapid growth, or high rupture risk.[5] Medical therapy, primarily with antiplatelets and anticoagulants, plays a supportive role, especially in asymptomatic or small aneurysms without thrombotic complications. However, there is a lack of robust outcome data supporting medical therapy as a definitive strategy. Surgical approaches, including aneurysm resection, ligation, or bypass grafting, have traditionally been used for large or complex aneurysms.[6] These procedures offer definitive exclusion but carry significant perioperative risks, particularly in patients with prior cardiac surgery or comorbidities. The evolution of interventional cardiology has led to increased use of percutaneous techniques in selected cases (Table 1). Compared with surgery, these approaches often offer reduced morbidity and shorter recovery

times. Nonetheless, careful anatomical and risk assessment remains essential in selecting the optimal modality for each patient.

Covered stent implantation is a primary percutaneous option for excluding coronary artery aneurysms from circulation.[7] These devices combine a metallic stent scaffold with a synthetic or biologic membrane, allowing immediate sealing of the aneurysm sac while preserving distal blood flow. They are particularly suited for saccular aneurysms with well-defined necks and in vessel segments with sufficient landing zones. Reported outcomes indicate high procedural success, though risks include in-stent restenosis, thrombosis, and the need for prolonged dual antiplatelet therapy. Careful imaging-based planning is essential to ensure accurate deployment and to avoid compromise of adjacent side branches.

Coil embolization is a minimally invasive technique used to induce thrombosis within coronary artery aneurysms by deploying metallic coils into the aneurysmal sac.[8-9] It is particularly suitable for small to moderate-sized saccular aneurysms with narrow necks or those arising from side branches. The procedure can be performed using detachable or pushable coils, often under fluoroscopic or adjunctive imaging guidance such as OCT. Successful embolization typically results in flow cessation within the aneurysm and subsequent shrinkage or stabilization. However, challenges include coil migration, incomplete occlusion, and the need for multiple coils to achieve durable thrombosis. In some cases, adjunctive techniques such as balloon assistance or stent scaffolding may enhance coil stability and occlusion rates. Despite these limitations, coil embolization remains a valuable option in anatomically favorable cases and continues to be reported with high technical success in the coronary context.

Vascular plugs, such as the Amplatzer Vascular Plug (AVP) family, are approved and increasingly utilized for endovascular exclusion of coronary artery aneurysms in select cases.[10] These self-expanding nitinol mesh devices are designed for controlled deployment and can effectively occlude aneurysmal inflow or outflow tracts with high precision. Their use is particularly advantageous in large-necked or high-flow aneurysms where conventional coil embolization may be inadequate. Clinical experience demonstrates favorable procedural success and minimal device migration when appropriate landing zones are available. However, due to limited coronary-specific data, their use remains off-label in the coronary circulation and should be guided by case complexity and operator expertise.

Combinations of the above strategies can also be envisioned, and the same applies to custom-made devices for percutaneous management of coronary aneurysms which can prove useful in challenging

anatomical scenarios.[11] One example includes the use of a stent combined with a truncated balloon segment to create a "stent plug," enabling mechanical occlusion of the aneurysm's inflow or outflow tract. These constructs are typically deployed when no commercial device fits the lesion morphology or access constraints. While technically demanding, they offer a feasible solution in salvage or off-guideline cases. However, due to their individualized design, procedural reproducibility and outcome data are currently lacking.

Devices and techniques for the percutaneous treatment of coronary aneurysms could tentatively include bioresorbable scaffolds, hybrid plug-stent constructs, and flow-diverting technologies adapted from neurovascular interventions, but more data are needed to support their role in this uniquely challenging setting. Irrespectively, adjunctive use of intravascular imaging such may improve decision-making, procedural outcomes and post-procedural assessment. However, most innovations remain supported only by case reports or small series, underscoring the need for prospective trials to establish safety and efficacy.

Despite increasing use of percutaneous therapies for coronary artery aneurysms, robust clinical trial data remain scarce. Most available evidence is derived from case reports, small case series, and retrospective registries, limiting the generalizability of outcomes. There is a lack of standardized definitions, procedural algorithms, and consensus on long-term antithrombotic strategies following intervention. Additionally, few studies have systematically compared percutaneous techniques head-to-head or against surgical approaches. Device innovation continues to outpace formal evaluation, leading to off-label and customized solutions without regulatory endorsement. Future research must focus on multicenter registries and prospective trials to establish evidence-based guidelines and optimize patient outcomes.

Conclusions

Percutaneous management of coronary aneurysms offers a versatile and less invasive alternative to surgery, especially in high-risk patients. The current landscape is shaped by individualized approaches, technical creativity, and growing procedural expertise. Systematic data collection and prospective evaluation are essential to guide future clinical decision-making. Despite its anecdotal scope, our case demonstrates the feasibility and safety of coil embolization for excluding a coronary side-branch aneurysm. It highlights the value of careful anatomical assessment and tailored

percutaneous strategies in high-risk patients. Such real-world applications support the expanding role of minimally invasive approaches in managing complex coronary aneurysms.

Declarations

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Conflict of Interest

The Authors declare that there is no conflict of interest.

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Disclosure

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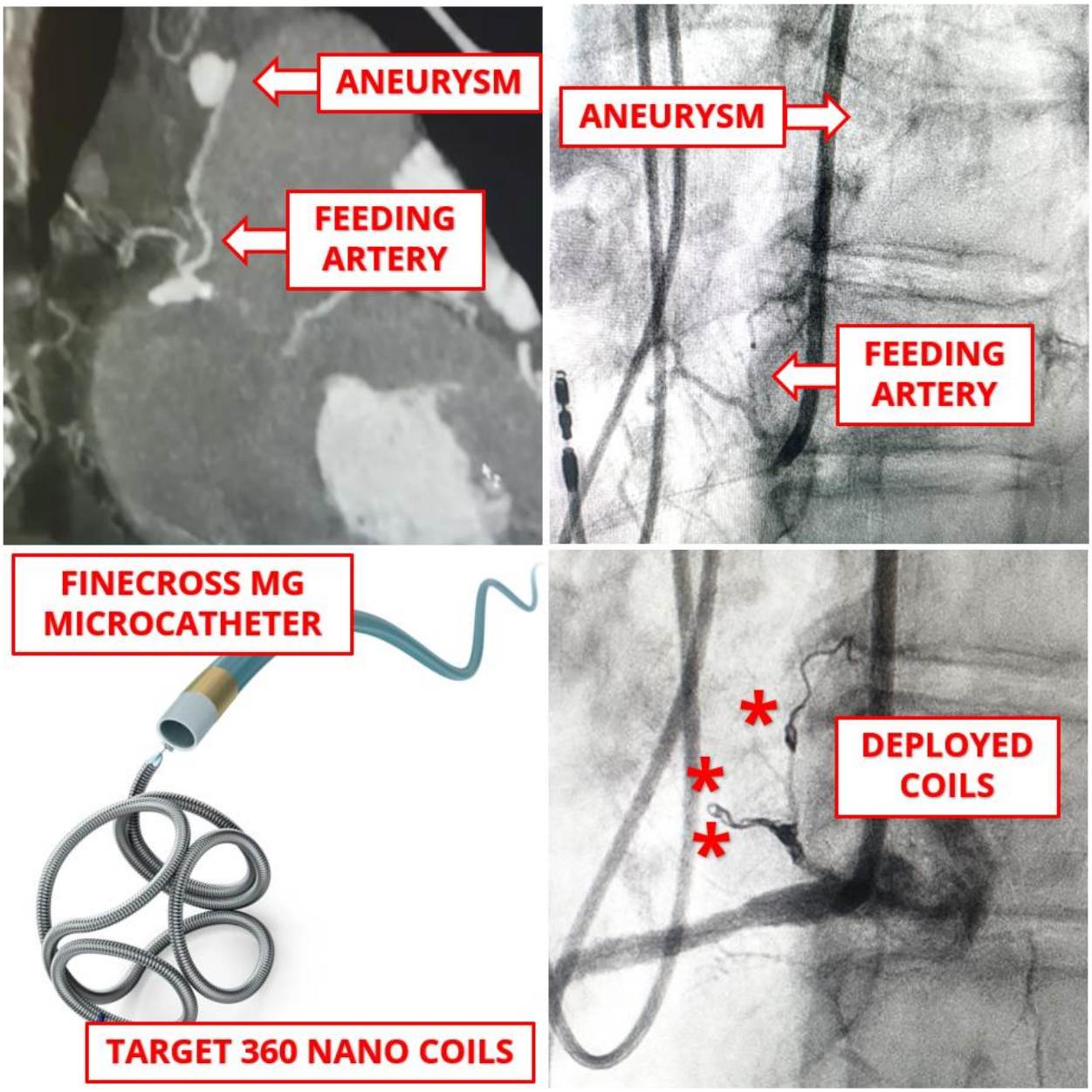
Table 1

Alternative percutaneous approaches for coronary aneurysms.

Technique	Mechanism	Common Indications	Advantages	Limitations/Considerations
Coils	Deploy metal coils to promote thrombosis within the aneurysm sac	Small to moderate aneurysms with narrow necks	Widely available, effective in staged embolization	Risk of migration or recanalization; may require multiple coils
Covered stents	Exclude aneurysm from circulation by sealing it with a graft-covered stent	Saccular or fusiform aneurysms in accessible locations	Immediate aneurysm exclusion, maintains vessel patency	Risk of restenosis, thrombosis, need for precise deployment
Custom devices	Off-label constructs using stents with obstructive components (e.g., half-balloon inside stent)	Complex anatomies, bailout in absence of commercial devices	Adaptable, creative solutions when standard tools fail	Lack of regulatory approval; procedural complexity; operator-dependent
Liquid embolics	Polymerize in situ to occlude aneurysm sac	Tortuous anatomy, pseudoaneurysms, or complex fistulae	Rapid occlusion, adaptable to anatomy	Rarely used in coronary beds; risk of embolization with ensuing ischemia/infarction.
Microspheres	Block distal flow by lodging in microvasculature	Adjunct for high-flow aneurysmal communications	Flow reduction prior to definitive embolization	Rarely used in coronary beds; risk of embolization with ensuing ischemia/infarction.
Vascular plugs	Expandable mesh devices to occlude inflow/outflow tracts of aneurysms	Large-necked aneurysms, proximal feeder vessels	Controlled, stable deployment; useful in high-flow lesions	Requires sufficient landing zone; may need additional embolization

Figure 1

Highlights of percutaneous management of a coronary aneurysm in a 69-year-old woman.



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