



Successful Embolization with Inflow and Outflow Control using a Vascular Plug and Balloon for a Left Coronary Artery Fistula with Large Aneurysms



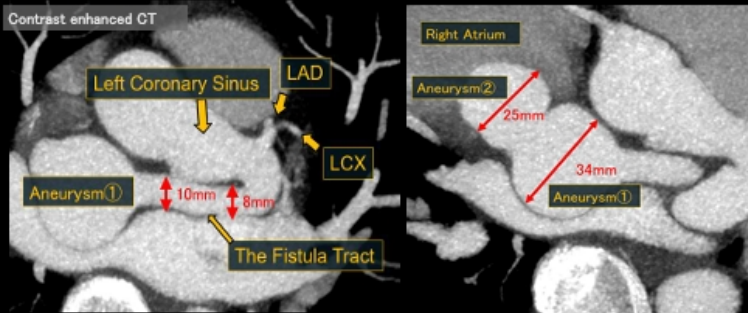
Misa Iwasaki, Tatsuo Ueda, Fumie Sugihara, Hidemasa Saito, Sayaka Shirai, Ryutaro Fujitsuna, Hiromitsu Hayashi, Shinichiro Kumita Department of Radiology, Nippon Medical School Hospital, Tokyo, Japan

Case Presentation : A Japanese female in her 40s

Clinical History

X-5year : Coronary arteriovenous fistula (CAF) detected during pregnancy; asymptomatic and followed conservatively.
X-1year : Onset of palpitations.
X year : Referred to our hospital for further evaluation and treatment

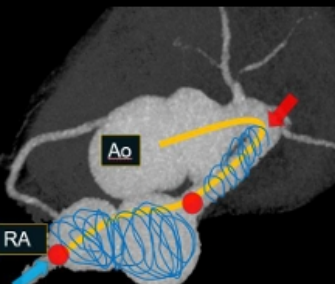
- **Vital Signs:** BP 101/53 mmHg, HR 77/min, SpO₂ 98% (RA)
- **Physical examination:** Systolic murmur at RSB 2nd ICS. (RSB: right sternal border, ICS: intercostal space)
- Blood tests, chest X-ray, and ECG: unremarkable.
- Echocardiography : LVEF 73%, LVDD 57 mm, LVDs 33 mm, Dilatation of left and right atria
- Right Heart Catheterization : PCWP 11 mmHg, mPAP 16 mmHg, RA 6 mmHg
Qp/Qs = 1.81 (significant left-to-right shunt: threshold >1.3)



Aneurysmal coronary arteriovenous fistula(CAF) originating from the left coronary sinus and draining into the right atrium.

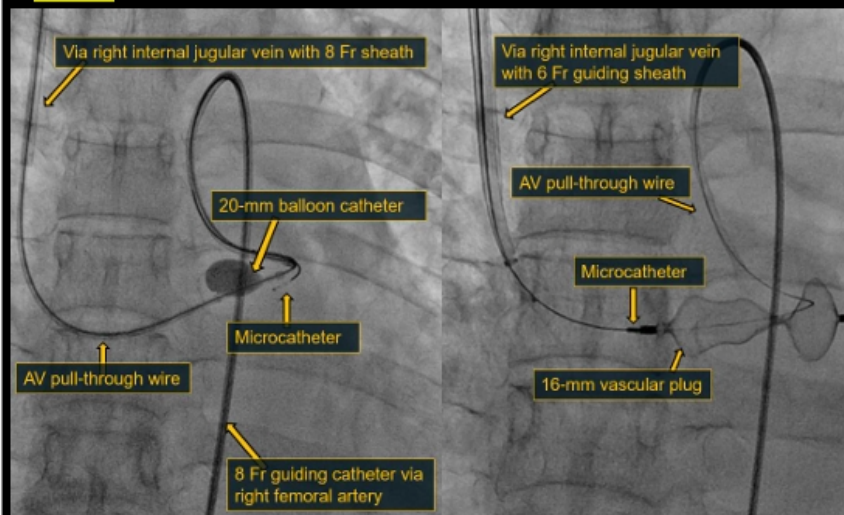
Treatment options & Results

- ✓ Symptomatic coronary arteriovenous fistula with Qp/Qs = 1.81; treatment indicated.
- ✓ Surgical repair considered due to large aneurysmal dilation, however concern for progression of left coronary sinus dilation and potential need for reoperation.
- ✓ Anatomy suitable for endovascular treatment.

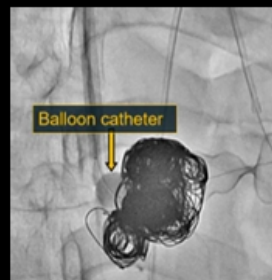


1. Arteriovenous approach
2. AV pull-through
3. Balloon-assisted flow control
⇒ Embolic protection to prevent MI and PE due to material migration.
4. Coil embolization of the fistulous tract distal to the LCX origin
⇒ MI prevention from thrombosis in Valsalva sinus and coronary artery.
5. Coil packing of the aneurysmal sac
⇒ Prevention of thrombus migration to avoid pulmonary embolism.

Results



Coil embolization abandoned due to insufficient flow control.
⇒ Converted to plug embolization of the fistulous tract.
⇒ To prevent migration, the plug was not released; coil embolization was performed.



Balloon occlusion of outflow tract after plug deployment to prevent coil migration.

- 1 Coil Embolization under Inflow Occlusion with Plug
Microcoils : 22 mm / 60 cm × 8, 20 mm / 50 cm × 8, 18 mm / 50 cm × 5
- 2 Plug Deployment
- 3 Coil Embolization under Outflow Occlusion with Balloon
Microcoils: 14 mm / 50 cm × 9

Post-Embolization Course

- Qp/Qs improved from 1.81 to 1.06
- POD 1: Initiated warfarin and clopidogrel
- POD 3: Coronary CT showed patent LAD and LCX; no residual flow in fistula or aneurysm
- POD 8: Discharged
- Currently, ~3 years post-op with favorable outcome.



Discussion

- Coronary artery fistulas (CAFs) are rare, with a prevalence of 0.002% in the general population, and are often asymptomatic.
- Treatment is indicated in the following cases:
 - 1 Symptomatic
 - 2 Fistula diameter ≥ non-involved coronary artery
 - 3 Presence of coronary artery aneurysm
- An arteriovenous (AV) loop approach is recommended for access to tortuous and dilated vessels.

1 Al-Hijji M, et al. JACC Cardiovasc Interv. 2021;14:1393-1406.
2 Jun Y, et al. J Cardiothorac Surg. 2022;17:104.

In this case

AV fistula originated directly from the coronary sinus.
Initial coil embolization under balloon-assisted flow control was planned.
⇒ Due to vessel dilation, flow control was insufficient.
⇒ Switched to plug embolization; flow control achieved by leaving the plug undeployed, enabling safe coil embolization.

Take-home Points

Coronary artery fistulas (CAFs)

- Rare, however treatment should be considered in symptomatic cases, those with large fistulous diameter, or associated aneurysms.

Treatment Strategy

- The choice of approach depends on the fistula location; in cases with tortuous or dilated tracts, an arteriovenous (AV) approach is effective.
- Controlling both inflow and outflow is crucial. In our case, although coil embolization under balloon-assisted flow control was planned, safe coil embolization was achieved using flow control with a vascular plug.

Prevention of Complications

- Thrombus migration was prevented by aneurysmal sac packing.
- Coronary thrombosis was avoided through antithrombotic therapy and by eliminating blind ends of the fistulous tract.