

Vieussens' ring fistula to pulmonary artery: embolization with grandmother-mother-child technique

Fístula del anillo de Vieussens a arteria pulmonar: embolización con técnica abuela-madre-hijo

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Abstract

A 53-year-old man with an asymptomatic fistula from the Vieussens ring to the pulmonary artery presented with progressive respiratory distress. Coil embolization of this type of fistula has been described by femoral access. The advanced transradial "grandmother-mother-son" technique for high active support safely allows successful embolization of this type of coronary fistulae.

Keywords: Coronary artery fistula. Percutaneous coronary intervention. Transradial coronary interventions.

Resumen

Un hombre de 53 años con una fístula asintomática del anillo de Vieussens a la arteria pulmonar comenzó con dificultad respiratoria progresiva. La embolización con coils de este tipo de fístulas ha sido descrita por acceso femoral. La técnica transradial avanzada "abuela-madre-hijo" para un alto soporte activo permite de manera segura la embolización exitosa de este tipo fístulas coronarias.

Palabras claves: Fístula coronaria. Intervención coronaria percutánea. Intervención coronaria transradial.

History of presentation

A 53-year-old-male was admitted for rescue percutaneous coronary intervention (PCI) after a failed thrombolysis of an anterior STEMI. During the intervention, a Vieussens' arterial ring (VAR) to main pulmonary artery (PA) fistula was documented. Months after successful PCI with a drug eluting

stent to the mid left anterior descending artery (LAD), he began with progressive shortness of breath.

Medical history

Former smoker, overweight, and ischemic heart disease (the above-mentioned anterior STEMI).

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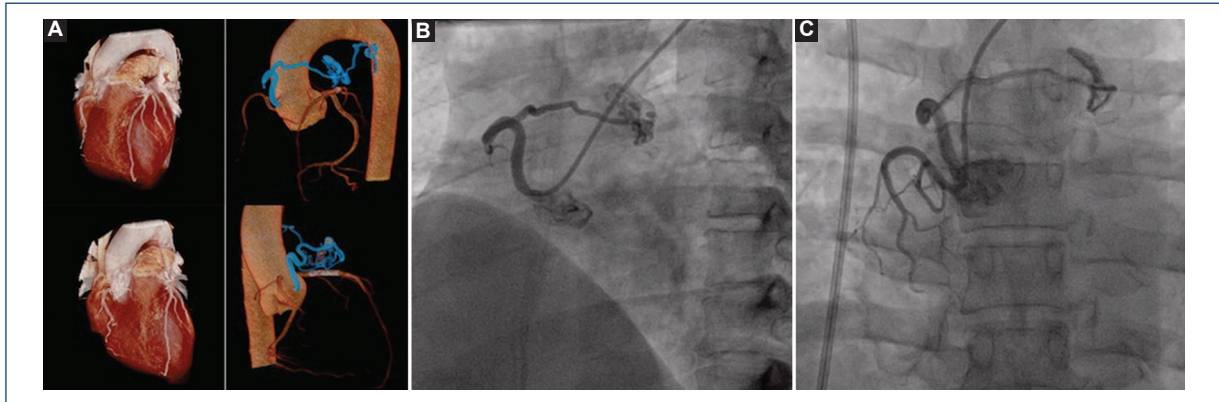


Figure 1. A: coronary computed tomography angiography 3D reconstruction. Vieussens' arterial ring with an additional small bronchial branch surrounding the main pulmonary artery with a large niche that communicates with the pulmonary artery and its relationship with surrounding structures (blue). **B and C:** initial angiography. Small right coronary artery and an independent right conus artery (**B**) with pre and retroconal path (Vieussens' arterial ring) with a large niche that communicates with the main pulmonary artery (contrast media delimitating the PA trunk) (**C**).

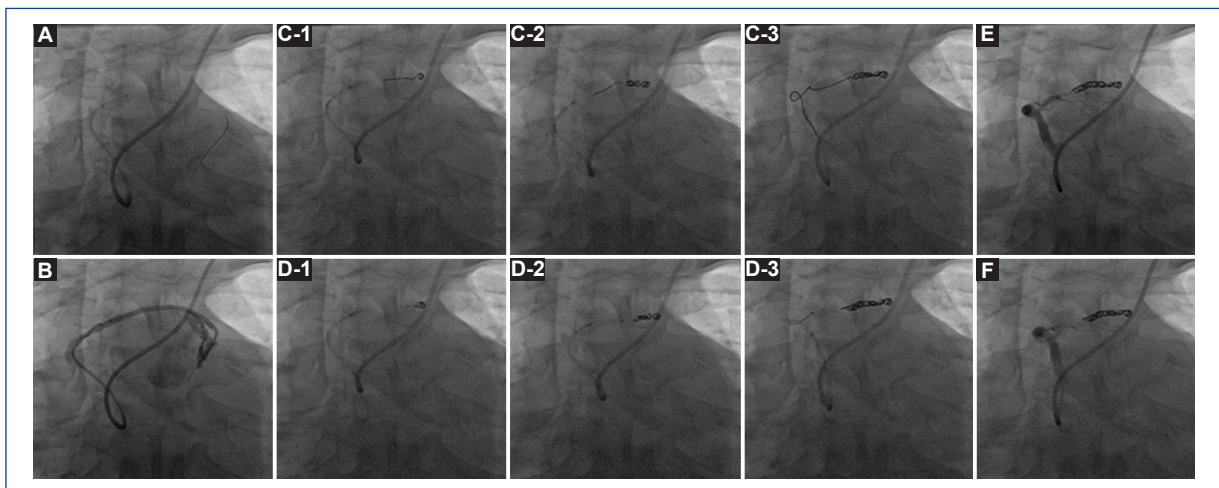


Figure 2. A and B: grandmother-mother-child technique. The setup was a 6 Fr JR 4 guide catheter (the grandmother), a guide extension catheter (the mother) and a microcatheter (the child) over a 0.014" coronary wire. **C-D:** fistula coil embolization. Delivery (C) and deployment (D) of the three sequential coils until complete embolization. **E-F:** final results. Final angiographic control showing the independent right conus artery with absence of contrast media in its distal segments and no evidence of flow to the pulmonary artery.

Investigations

Coronary computed tomography angiography (CCTA) showed a conus artery with independent ostium at the right sinus of valsalva with a tortuous pre-pulmonary path which was anastomosed to with a left branch (from the left main stem) forming a vascular ring with pre and retroconal path, the VAR. The VAR had a fistula at preconal side that communicated with the PA with a niche of $8 \times 14 \times 8$ mm and a 2 mm

branch that was anastomosed to a bronchial branch. In the left coronary artery, the LAD showed the 3.5×21 mm stent. The other coronary arteries were normal (Figure 1, panel A).

Management

We performed a transradial coronary fistula coil embolization. Using the transradial approach, we gain arterial access through the left radial artery with a 6 Fr

hydrophilic introducer sheath. The initial coronary angiogram was performed using a 5 Fr JR 4. The CCTA findings were confirmed. Independent right conus artery and a VAR with pre and retroconal path. The large niche was arising from the preconal branch and it showed a large fistula by means of a large amount of contrast media passing to the main PA. Aiming to achieve the highest available support, a grandmother-mother-child (GMC) technique was performed. For this patient, we used a JR 4 guide catheter (the grandmother), a 6 Fr guide extension catheter (the mother) and a microcatheter (the child) over a 0.014" coronary wire. We took this assembly through the independent right conus artery to the preconal branch of the VAR just before the large niche. Being there, the coils deployment began: first a 2 mm x 4 cm, followed by a 5 mm x 8 cm and finished with a 5 mm x 15 cm coil. It was not until the last (third) coil that angiographic control showed a complete embolization without any evidence of complications (Figure 2).

Follow-up

Patient received same day discharge since the transradial approach allowed faster hemostasis without any vascular access related complications. Shortness of breath was evaluated during the follow-up visits and it was completely solved.

Discussion

The VAR was first described in 1706 by Raymond de Vieussens as a collateral artery between the conus branches of the right coronary artery and the left anterior descending coronary artery, found in almost half of the population¹, such as this case with a vascular ring surrounding the pulmonary artery trunk although with the particular difference of an independent ostium for the right branch of the VAR. The primary pathologies associated to VAR are extremely rare and in the context of a coronary artery fistula, a fistula from a VAR to the pulmonary artery is even infrequent²: it has been reported that incidental diagnostic rate in adults is < 0.1% in patients undergoing invasive cardiovascular imaging³. Usually, coronary to pulmonary artery fistula embolization can be achieved by coils or vascular plugs and this kind of procedures are indicated in cases of symptoms associated with the large shunt caused by the fistula or in cases of asymptomatic patients but a Qp: Qs >1.5³. The first report of percutaneous embolization of a VAR to pulmonary artery was in 2010 by Hirzalla et al. They

successfully used coils and an Amplatzer duct occluder through a transfemoral approach⁴. With the evolution to a minimally invasive PCI and the advent of transradial approach, a continuous number of procedures previously thought to be only doable through a femoral access can now be performed through a radial access. Still there are some limitations like the lack of support such as in complex anatomies, but there are several advanced transradial techniques to improved it. One of these techniques is the so-called GMC technique, in which the operator puts a microcatheter (child) inside a guide extensor catheter (mother) and both go inside the guide catheter (grandmother), achieving the highest active support available for transradial intervention, method that also has been used to safely perform a coronary fistula coil embolization without the classic and more invasive femoral approach⁵. The use of this safe and minimally invasive technique for coil embolization of an extremely rare coronary artery fistula (VAR to main PA fistula) was able to be carried out with success thanks to the proper support achieved with this technique.

Conclusions

Coil embolization of a Vieussens' arterial ring to main pulmonary artery fistula through radial access can be performed using advanced transradial methods like grandmother-mother-child technique to achieve the highest active support for a safe and successful coil delivery.

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Conflicts of interest

The authors declare that they have no conflicts of interest.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the informed consent of the patients and/or subjects referred to in the article.

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